March—April, 1997

Vol. 3 No. 2

Literature Update on

Wheat, Barley, and Triticale

CIMMYT

ICARDA

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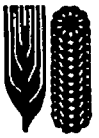

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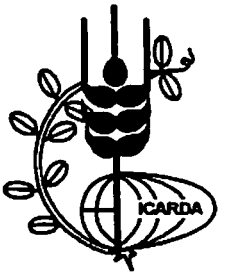

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Several CIMMYT staff made important contributions to this document: Dr. Edith Hesse, Information Technology Manager (editor); Fernando García, Electronic Information Specialist, and Pedro Santamaría, Database Administrator (data processing); Corinne de Gracia, Head Librarian, Efrén Orozco, Cataloguer, and José Juan Caballero, Cataloguer (categorization); Miguel Mellado, Coordinator of Design and Photography Department, and Eliot Sánchez, Design Assistant (design); Laura González, Bilingual Secretary (production, coordination and distribution).

Literature Update on Wheat, Barley, and Triticale

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Subject Headings and Reference Numbers

PREFACE

To maintain quality in their research and training work, scientists need prompt and reliable access to up-to-date scientific information. However, in developing countries, the information resources are often weak, and the scientists are at a great disadvantage as compared with their colleagues in more developed countries and in international institutions. For lack of foreign currency, their librarians may be unable to buy the more recent scientific books and journals; and, for lack of access to bibliographic data, the scientists themselves cannot easily identify the most useful reprints to request from their colleagues in other countries.

CIMMYT and ICARDA seek to offset these disadvantages: they sponsor workshops at which researchers can exchange knowledge, and they produce publications which are made available free of charge to research institutions in developing countries. For a decade or so (1984-1994), CIMMYT also purchased bulk subscriptions to *Wheat, Barley and Triticale Abstracts* from CAB International, and the individual issues were sent directly to developing-country recipients that CIMMYT had nominated.

Both CIMMYT and ICARDA recognize the high quality of the products from CAB International; however, our budgetary realities require that we look for the least costly means to provide announcements of current information. In 1994, contacts were made with the Institute for Scientific Information (ISI), the private corporation based in Philadelphia, Pennsylvania, which produces *Current Contents*: *Agriculture, Biology and Environmental Sciences*. This is a weekly CD-ROM service giving abstracts of articles from the current issues of the world's most influential scientific journals. ISI has authorized us to extract the abstracts that deal with wheat, barley and triticale and to distribute these abstracts - in printed form - to collaborators in developing countries.

This authorization is the basis on which CIMMYT and ICARDA are now offering *Literature Update on Wheat, Barley and Triticale*. However, since *Current Contents* covers only the more prominent journals, it lacks coverage of other types of publication - for example, reports and conference proceedings - and it does not report the articles that appear in the less well known journals, many of which are published in the developing countries themselves. Therefore, to give more balance to the product, we are also including references and abstracts from the AGRIS database.

AGRIS, the International Information System for the Agricultural Sciences and Technology, is managed by FAO, and its database is constructed by contributions from some 135 participating centers which represent most of the countries of the world plus many of the regional and international organizations working in the agricultural sector. Relevant AGRIS items are extracted from tapes obtained from FAO and are merged with the items from *Current Contents*. Because CIMMYT and ICARDA are two of the centers contributing to the AGRIS database, we are able to use this material without payment of royalties.

Today's product was designed for greater economy, but we believe recipients will now welcome speed of reporting on the one hand (material from *Current Contents*) and in-depth coverage on the other (material from AGRIS).

CIMMYT and ICARDA back up this product with an offer to provide photocopies of individual articles that readers need and are unable to obtain. Details are explained separately, but this service has to be on a very limited basis, both to respect copyright restrictions and because of our own modest capacity to respond.

We welcome comments and suggestions on how to improve our product; we emphasize that it can be distributed only in developing countries; we thank the Institute for Scientific Information for allowing us to reproduce its material; and we salute our fellow-participants who, with the leadership of FAO, have built AGRIS into one of the world's richest sources of bibliographic information in agriculture.

Timothy Reeves
Director General, CIMMYT

Adel El-Beltagy
Director General, ICARDA

a) Sample entry retrieved from ISI-Current Contents (journal article)

1 172 Reynolds, MP.; Sayre, KD.; Vivar, HE. (1994) **INTERCROPPING WHEAT AND BARLEY WITH N-FIXING LEGUME SPECIES - A METHOD FOR IMPROVING GROUND COVER, N-USE EFFICIENCY AND PRODUCTIVITY IN LOW INPUT SYSTEMS.** *Journal of Agricultural Science. 123(Part 2):175-183.* English [CIMMYT WHEAT PROGRAM LISBOA 27 APDO POSTAL 6-641 MEXICO CITY 06600 DF MEXICO].

b) Sample entry retrieved from AGRIS (journal article)

1 69 Alizaga, R. (Costa Rica Univ., San Jose (Costa Rica). Centro para Investigaciones en Granos y Semillas); Sterling, F.; Herrera, J. (1992) **[Evaluation of the vigor in maize seeds and its relationship with the behaviour in the field]. Evaluacion del vigor en semillas de maiz y su relacion con el comportamiento en el campo.** *Agronomia Costarricense (Costa Rica) v. 16(2) p. 203-210.* 20 ref.; grafs. Spanish . (AGRIS 94-116456).

c) Sample entry retrieved from AGRIS (article in conference proceedings)

1 1 Gonzalez Estrada, Adrian (INIFAP. C.E. Valle de Mexico. Ap. Postal 10, Chapingo, Mex. 56230 (Mexico)) (1992) **[Economic aspects of agricultural research in relation to the production of wheat in Mexico]. Aspectos economicos de la investigacion agricola en el cultivo del trigo en Mexico.** Primera conferencia nacional sobre la produccion de trigo en Mexico. (Memoria); Cd. Obregon, Sonora (Mexico); 22-25 Mar 1988. [National conference on wheat production in Mexico. (1, 1988, Cd. Obregon, Son.) (Proceedings)]. Conferencia nacional sobre la produccion de trigo en Mexico. (1, 1988, Cd. Obregon, Son.) (Memoria). *Publicacion Especial. Centro de Investigacion Regional del Noroeste (Mexico); no. 4 p. 539-550.* Centro de Investigacion Regional del Noroeste. 21 ref. 2o. tomo. Spanish. (AGRIS 94-114649).

1 Entry number
2 Author(s)
3 Publication year
4 Title in English
5 Original title (only in entries retrieved from AGRIS)
6 Source
7 Language of text
8 Organization where work was carried out
9 AGRIS Reference Number, only for entries retrieved from AGRIS

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The source of each entry - whether *Current Contents* or AGRIS - can be readily inferred from its appearance: TITLES from *Current Contents* are wholly in uppercase, whereas those from AGRIS are in upper and lower case. For non-English documents, *Current Contents* gives only an English translation of the title, but AGRIS normally gives both the translation and the title in its original language. There are many other minor differences in the presentation and sequencing of data from the two sources. In the case of entries from AGRIS, please note the reference number given in parentheses at the end of the bibliographic description: often, this number may be used as a surrogate for the whole description in communications between libraries seeking loans or photocopies.

Users of the indexes are also cautioned that the same item may appear in two slightly different forms: for example, the author Kim, S.K. may also be listed as Kim, SK and the subject AFLATOXIN may be followed by a separate entry for AFLATOXINS. To harmonize such data from two different systems would require complex programming and operations, and we hope that our readers will not find these minor anomalies too troublesome.

A50 AGRICULTURAL RESEARCH

1379 **CIMMYT/NARS Consultancy on ME1 bread wheat breeding; Cd. Obregon, Sonora, Mexico; 4-7 Apr 1995** (1995) Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). *CIMMYT Wheat Special Report (CIMMYT); no. 38 30 p.* CIMMYT. English. (AGRIS 97-014718).

D50 LEGISLATION

1380 Carlson, GR.; Bruckner, PL.; Berg, JE.; Kushnak, GD.; Wichman, DM.; Eckhoff, JL.; Tilley, KA.; Stallknecht, GF.; Stougaard, RN.; Bowman, HF.; Morrill, WL.; Taylor, GA.; Hockett, EA. (1997) **REGISTRATION OF VANGUARD WHEAT.** *Crop Science. 37(1):291.* English. [MONTANA STATE UNIV DEPT PLANT SOIL & ENVIRONM SCI BOZEMAN, MT 59717 USA].

1381 Clarke, JM.; Leisle, D.; Depauw, RM.; Thiessen, LL. (1997) **REGISTRATION OF FIVE PAIRS OF DURUM WHEAT GENETIC STOCKS NEAR-ISOGENIC FOR CADMIUM CONCENTRATION.** *Crop Science. 37(1):297.* English. [AGR & AGRI FOOD CANADA SEMIARID PRAIRIE AGR RES CTR SWIFT CURRENT SK S9H 3X2 CANADA].

1382 Depauw, RM.; Knox, RE.; Mccaig, TN.; Clarke, JM.; Mcleod, JG.; Fernandez, MR. (1997) **REGISTRATION OF AC KARMA WHEAT.** *Crop Science. 37(1):289-290.* English. [AGR & AGRI FOOD CANADA SEMIARID PRAIRIE AGR RES CTR POB 1030 SWIFT CURRENT SK S9H 3X2 CANADA].

1383 Depauw, RM.; Mccaig, TN.; Clarke, JM.; Mcleod, JG.; Fernandez, MR.; Knox, RE. (1997) **REGISTRATION OF AC BARRIE WHEAT.** *Crop Science. 37(1):289.* English. [AGR & AGRI FOOD CANADA SEMIARID PRAIRIE AGR RES CTR POB 1030 SWIFT CURRENT SK S9H 3X2 CANADA].

1384 Elias, EM.; Miller, JD.; Francl, LJ. (1997) **REGISTRATION OF MUNICH DURUM WHEAT.** *Crop Science. 37(1):290.* English. [N DAKOTA STATE UNIV DEPT PLANT SCI FARGO, ND 58105 USA].

1385 Elsayed, AA.; Noaman, MM.; Asaad, FA.; Elsherbini, AM.; Elbawab, AO.; Elgamal, AS.; Abdelhameed, M.; Megahed, M.; Dessouki, EE. (1996) **REGISTRATION OF GIZA 128 TWO-ROWED BARLEY.** *Crop Science. 36(6):1715.* English. [AGR RES CTR BARLEY RES DEPT FIELD CROPS RES INST POB 12619 GIZA EGYPT].

1386 Elsayed, AA.; Noaman, MM.; Elsherbini, AM.; Asaad, FA.; Elgamal, AS.; Elbawab, AO.; Megahed, M.; Abdelhameed, M.; Dessouki, EE. (1996) **REGISTRATION OF GIZA 127 TWO-ROWED BARLEY.** *Crop Science. 36(6):1714.* English. [AGR RES CTR FIELD CROPS RES INST BARLEY RES DEP POB 12619 GIZA EGYPT].

1387 Martin, TJ.; Harvey, TL. (1997) **REGISTRATION OF KS94WGRC29, KS94WGRC30, AND KS94WGRC31 WHEAT GERMPLASMS RESISTANT TO RUSSIAN WHEAT APHID.** *Crop Science. 37(1):296.* English. [KANSAS STATE UNIV AGR RES CTR HAYS, KS 67601 USA].

1388 Smith, EL.; Carver, BF.; Hunger, RM.; Sherwood, JL.; Ward, RG.; Jordan, BG. (1997) **REGISTRATION OF OK91P648, AN ACID-SOIL TOLERANT WHEAT GERMPLASM.** *Crop Science. 37(1):296-297.* English. [OKLAHOMA STATE UNIV DEPT AGRON STILLWATER, OK 74078 USA].

1389 Vallega, VE. (1996) **REGISTRATION OF PARTIALLY FREE-THRESHING DIPLOID WHEAT GERMPLASM.** *Crop Science. 36(6):1717.* English. [IST SPERIMENTALE CEREALICOLTURA VIA CASSIA 176 I-00191 ROME ITALY].

E10 AGRICULTURAL ECONOMICS AND POLICIES

1390 Anon. (1995) **[Statistics. Barley]. Statistiques. L'orge.** *BIOS BOISSONS (France) v. 26(255) p. 20-34.* 9 tableaux, 8 p. p. seulement. French. (AGRIS 97-000220).

Sont presentes les tableaux suivants: superficie et production d'orge en France en 1991, quantites d'orge commercialisees de 1985 a 1994 en France, importations francaises de 1990 a 1994, exportations francaises de 1990 a 1994, superficies, rendements et recoltes d'orge dans la CEE de 1991 a 1994, production mondiale d'orge 1991-1992, commerce exterieur mondial d'orge de 1991-1993.

1391 Anon. (1996) **[Statistics. Barley]. Statistiques. Orge.** *BIOS BOISSONS (France) v. 27(261) p. 21-34.* 7 tableaux, 8 p. p. seulement. French. (AGRIS 97-000222).

Sont presentes les tableaux suivants: liste officielle des Malteurs de France, superficie et production d'orge en France de 1992-93 a 1995-96, quantites d'orge commercialisees de 1986 a 1995 en France, importations francaises de 1991-92 a 1994-95, exportations francaises de 1991-92 a 1994-95, superficies, rendements et recoltes d'orge dans l'Union europeenne de 1992 a 1995, production mondiale d'orge de 1992 a 1994, commerce exterieur mondial d'orge de 1992 a 1994.

1392 Jones, JR.; Li, SL.; Devadoss, S.; Fedane, CJ. (1996) **THE FORMER SOVIET UNION AND THE WORLD WHEAT ECONOMY.** *American Journal of Agricultural Economics. 78(4):869-878.* English. [UNIV IDAHO DEPT AGR ECON & RURAL SOCIOL MOSCOW, ID 83843 USA].

The impacts of the former Soviet Union leaving the world wheat market as a consistent net importer are investigated using a modified spatial trade equilibrium model. The simulation results suggest that the former Soviet Union, following Bigman's stochastic trade hypothesis, can have a stabilizing role in the future world wheat economy. [References: 27].

1393 Kastens, TL.; Schroeder, TC. (1996) **EFFICIENCY TESTS OF JULY KANSAS CITY WHEAT FUTURES.** *Journal of Agricultural & Resource Economics. 21(2):187-198.* English. [KANSAS STATE UNIV DEPT AGR ECON MANHATTAN, KS 66506 USA].

Three procedures are used to test Fama semistrong form efficiency of harvesttime price of Kansas City July wheat futures from 1947 through 1995. The three methods are (a) testing for jointly significant parameter estimates on nonfutures explanatory variables in econometric forecasting models, (b) testing the relative accuracy between model-based forecasts and using deferred futures prices as forecasts, and (c) testing for abnormal profits associated with simulated futures trading signaled by the forecasts. Kansas City July wheat futures are generally efficient. Furthermore, relative to the efficiency associated with forecasts constructed one to two months before harvest, the efficiency associated with the five- to six-month period before harvest has increased, especially since the early 1980s. [References: 42].

1394 Krause, MA.; Koo, WW. (1996) **ACREAGE RESPONSES TO EXPECTED REVENUES AND PRICE RISK FOR MINOR OILSEEDS AND PROGRAM CROPS IN THE NORTHERN PLAINS.** *Journal of Agricultural & Resource Economics. 21(2):309-324.* English. [N DAKOTA STATE UNIV DEPT AGR ECON FARGO, ND USA].

Wheat, barley, flaxseed, and oilseed sunflower acreage respond to different economic variables. Wheat and barley acreage must be divided among program-complying, program-planted, and nonprogram-planted acreage because these categories respond to different variables and respond to own expected-revenue and price-risk variables in opposite ways. Flaxseed, sunflower, and nonprogram-planted acreage of wheat and barley have highly significant, positive responses to their own expected revenue and negative responses to their own-price risk. Flaxseed and sunflower acreage have been more responsive to their lagged values than to expected revenues for wheat. [References: 27].

1395 Macagno, L.F.; Gomez Chao, V.L. (1995) **[Impact of the investigation on wheat in Argentina. An economic analysis "ex-post"]. Impacto de la investigacion en trigo en la Argentina. Un analisis economico "ex-post".** *[Wheat breeding in Argentina: Thirty years of cooperative investigation with CIMMYT; Balcarce, Argentina; 7-8 Oct 1992]. El mejoramiento de trigo en Argentina: Treinta anos de investigacion cooperativa con el CIMMYT; Balcarce,*

Argentina; 7-8 Oct 1992. Kohli, M.M.; Nisi, J.E.; Rajaram, S. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 149-180. CIMMYT. 21 tables; 2 graphs; 15 ref. Spanish. (AGRIS 97-015047).

The results of this study show that the investment made in the national wheat research in Argentina has produced a very profitable internal rate of return of 32 percent. At present, 90 percent of the wheat production is derived from the varieties with Mexican germplasm. From the time of the release of these new varieties till 1991 the production increased at a rate of 2.5 percent annually while the yields increased at the rate of 1.5 percent annually. The total benefits of the technological changes in wheat production between 1966 and 1990 reached 1558 million dollars of 1990, while the total cost of the program was that of 154 million dollars. The public sector participated with 78 50 in the total investment in research while the contribution of the private sector was of 22 percent. Los resultados de este trabajo senalan que la inversion realizada en investigacion en trigo ha sido muy rentable para el pais pues la tasa interna de retorno fue del 32 porciento. En la actualidad la produccion proveniente de variedades con germoplasma mexicano en el pais ha alcanzado mas del 90 porciento. Desde el momento que se lanzaron estas nuevas variedades al mercado hasta el ano 1991, la produccion aumento a un ritmo del 2.5 porciento anual mientras que los rendimientos al l.5 porciento anual. Los beneficios totales del cambio tecnologico en trigo alcanzaron los 1 558 millones de dolares de 1990 mientras que los costos fueron de 154 millones de dolares. El sector publico participo con un 78 porciento de la inversion total en investigacion mientras que el sector privado solo costeo un 22 porciento.

1396 Rathore, AL. (1996) **ECONOMICS OF BIO, ORGANIC AND INORGANIC SOURCES OF NUTRIENT IN RICE (ORYZA SATIVA) WHEAT (TRITICUM AESTIVUM) CROPPING SYSTEM.** *Indian Journal of Agronomy. 41(3):502-504.* English. [IGKVV DEPT LAND & WATER MANAGEMENT RAIPUR 492012 MADHYA PRADESH INDIA].

E16 PRODUCTION ECONOMICS

1397 Maredia, M.K. (Michigan State Univ., East Lansing, MI (USA). Dept. of Agricultural Economics); Ward, R.; Byerlee, D. (1996) **Econometric estimation of a global spillover matrix for wheat varietal technology.** *Agricultural Economics (Netherlands) v. 14(3) p. 159-173.* 21 ref. English. (AGRIS 97-015330).

1398 Saade, M.E. (1995) **Triticale production and utilization in Tunisia: Constraints and prospects.** Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). *CIMMYT Economics Working Paper (CIMMYT); no. 95-4 63 p.* CIMMYT. 34 tables; 4 figs.; 1 map; 34 ref. English. (AGRIS 97-015327).

This study offers new, in-depth information about the production and utilization of triticale in Tunisia as a better basis for assessing alternative policy measures. Specifically, it analyzes recent trends in triticale production and utilization in Tunisia and identifies the related policy issues; examines how Tunisian farmers in different agroclimatic zones integrate triticale into their farming systems; determines the extent and modes of triticale utilization on the farm; identifies agronomic and socioeconomic constraints to the adoption and diffusion of triticale; examines alternative short- and long-term policy measures related to triticale production, utilization, marketing, and pricing; and recommends future directions for triticale research.

1399 Zulauf, C. (Ohio State University.); Tweeten, L. (1996) **The post-commodity-program world.** *Choices (Ames, Iowa) (USA) v. 11(1) p. 8-10.* references. English. (AGRIS 97-000627).

E20 ORGANIZATION, ADMINISTRATION AND MANAGEMENT OF AGRICULTURAL ENTERPRISES OR FARMS

1400 Abrecht, D.G. (Department of Agriculture Western Australia, South Perth, W.A. (Australia). Crop Science Branch); Robinson, S.D. (1996) **TACT: a tactical decision aid using a CERES based wheat simulation model.** *Ecological Modelling (Netherlands) v. 86(2-3) p. 241-244.* 6 ref. English. (AGRIS 97-015475).

1401 Anon. (1995) **Analyzing ag spreads.** Chicago Board of Trade (USA); Knight-Ridder, Firm (USA). *Grain merchandiser series (USA); no. 4 36 p.* CBOT. charts. Cover title. "Charts prepared by: Knight-Ridder Financial"--P. 36. English. (AGRIS 97-015456).

1402 Brester, G.W. (Kansas State University.); Biere, A.; Armbrister, J. (1996) **Marketing identity preserved grain products: the case of American White Wheat Producers Association.** *Agribusiness : an international journal (USA) v. 12(3) p. 301-308.* references. English. (AGRIS 97-000727).

Increasing demand for identity preserved grains in the production of new food and nonfood products may stimulate a parallel development of new marketing channels. Observations of strategic issues that must be addressed by firms seeking to market identity preserved grains were obtained from studying the development of the American White Wheat Producers Association. Potential backward integration by marketing firms and forward integration by farmers presents each group with new risks and uncertainties. For any single firm, barriers to entry will be a crucial component of the profitability of identity preserved grain marketing.

1403 Brorsen, B.W. (Oklahoma State University.); Coombs, J.; Anderson, K. (1995) **The cost of forward contracting wheat.** *Agribusiness : an international journal (USA) v. 11(4) p. 349-354.* references. English. (AGRIS 97-000729).

Gulf wheat forward basis bids increase as harvest approaches. Forward contract prices four months before harvest average $0.4/bu. less than prices at harvest. Prices received by directly hedging in the futures market are estimated to be higher than prices received through forward contracts.

1404 Davidson, G. (Agricultural Economics Unit, Department of Land Economy, 19 Silver Street, Cambrdige CB3 9EP (United Kingdom)) (1996) **Wheat and barley production in Great Britain, 1994/95: year two of the CAP reform.** *Special Studies in Agricultural Economics (United Kingdom); no. 29 vii + 53 p.* Agricultural Economics Unit, University of Cambridge. English. (AGRIS 97-000656).

1405 Donaldson, J.V.G.; Hughes, J.; Dixon, S.D.; Clements, R.O. (IGER, North Wyke Research Station, Okehampton, Devon EX20 2SB (United Kingdom)) (1995) **Evaluation of energy usage for machinery operations in the development of cereal clover bicropping systems.** *Integrated crop protection: towards sustainability? Proceedings of a Symposium, Edinburgh, Scotland, 11-14 September 1995. p. 143-150.* British Crop Protection Council. 6 ref. English. (AGRIS 97-015421).

1406 Garcia, R.J. (University of Illinois.); Quinton, J.E. (1996) **Acreage response under policy incompatibilities: the US durum wheat situation.** *Agribusiness : an international journal (USA) v. 12(1) p. 67-77.* references. English. (AGRIS 97-000728).

Estimation of durum wheat acreage response models indicate that declining US durum acreage relative to Canada is a result of the relative prices of durum and spring wheat, and US agricultural policies that (a) affect the relative income-support levels of wheat and barley, (b) tie income-support payments to acreage idling, and (c) idle land for conservation purposes. There is evidence suggesting that US agricultural policy objectives are incompatible with foreign policy to liberalize trade with Canada, and has contributed to the relative decline.

1407 Kruse, C. (Landwirtschaftsberatung Mecklenburg Vorpommern / Schleswig Holstein GmbH, Bad Doberan (Germany)) (1996) **[Report of the working group cash cropping in 1995: The best farms made surpluses of 670 DM/ha]. LMS-Arbeitskreisbericht Marktfruchtbau 1995: Die besten erzielten Ueberschuesse von 670 DM/ha.** *Top agrar / Spezial fuer Mecklenburg-Vorpommern, Brandenburg, Sachsen-Anhalt, Sachsen, Thueringen (Germany) (no.3) p. 26-25.* German. (AGRIS 97-015426).

Daten aus insgesamt 119 Betrieben wurden fuer den Arbeitskreisbericht Marktfruchtbau 1995 ausgewertet. Besonders auffaellig sind die nach wie vor eklatanten Ertragsunterschiede bei allen ausgewerteten Fruechten. Dies ergaben die Deckungsbeitragsrechnungen fuer die Fruechte Winterweizen, Wintergerste und Winterraps zur Ernte 1995 (Tabelle 1). Die Hoehe der Deckungsbeitraege wird in besonderem Masse beeinflusst durch produktionssteuernde Massnahmen, also Managemententscheidungen. Das wird besonders deutlich, wenn man die variablen Kosten fuer Saatgut, Pflanzenschutz und Duengung vergleicht. Der komplette "LMS-Marktfruchtbericht Mecklenburg-Vorpommern 1995"

ist fuer 25 DM erhaeltlich bei der LMS-Landwirtschaftsberatung Mecklenburg-Vorpommern, 18209 Bad Doberan, Telefon 038203/576, Fax 038203/57700.

1408 Lemaitre, G. (Institut Technique des Cereales et des Fourrages, Paris (France)); Honore, A. (1995) **[Soft wheat: mechanization, work and production cost]. Ble tendre: mecanisation, travail et cout de production.** *Perspectives Agricoles (France) (no 208) p. 24-29.* 7 tableaux. French. (AGRIS 97-015343).

Les nouvelles contraintes de production imposent aux agriculteurs d'ameliorer a la fois competitivite et revenu. Pour faciliter cette demarche economique, il apparait necessaire de faire evoluer les indicateurs de gestion utilises jusqu'alors. Sans vouloir proposer des solutions "cle en main", il est propose une reflexion et des points de repere afin d'abaisser les couts de production en agissant notamment sur les charges de mecanisation.

1409 Murphy, M.C. (Agricultural Economics Unit, Department of Land Economy, 16 21 Silver Street, Cambridge CB3 9EP, UK) (1995) **Report on farming in the Eastern counties of England 1994/95.** Agricultural Economics Unit, Department of Land Economy, University of Cambridge. 236 p. English. (AGRIS 97-000673).

E40 COOPERATIVES

1410 Cummins, D.E. (USDA/Rural Business Cooperative Service.) (1996) **How does your wheat-barley cooperative measure up?** *Rural cooperatives (USA) v. 63(3) p. 39.* English. (AGRIS 97-015551).

E70 TRADE, MARKETING AND DISTRIBUTION

1411 **To plant or not to plant?** (1996) Standard Bank, Johannesburg (South Africa). *Agri Review (South Africa) p. 8-11.* 10 fig. English. (AGRIS 97-015822).

1412 Babula, R.A. (USITC, Washington, DC.); Jabara, C.L.; Reeder, J. (1996) **Role of empirical evidence in US/Canadian dispute on US imports of wheat, wheat flour, and semolina.** *Agribusiness : an international journal (USA) v. 12(2) p. 183-199.* references. English. (AGRIS 97-000996).

This article summarizes the 1994 US/Canadian wheat dispute, and critically compares the analyses of the USDA and Canadian Wheat Board (CWB), with the analysis done by the staff of the US International Trade Commission (USITC staff). The USDA and CWB studies are shown to have primarily relied on "expert opinion, " with the result that data and evidence were not given adequate analytical roles in the analyses. The USDA and CWB studies provided a range of estimates of US wheat program cost effects from Canadian imports that was excessively wide. The USITC staff's empirical model is shown to be a more balanced mix of theory and evidence than the other two analyses, and suggests that such program cost effect estimates fell well between the extreme USDA and CWB estimates.

1413 Cochrane, N.J. (1996) **CEE markets slow to react to world grain price surge.** *Agricultural outlook (Washington, D.C. : 1975) (USA) (no. 230) p. 22-25.* English. (AGRIS 97-015794).

E71 INTERNATIONAL TRADE

1414 Braga, F. (University of Guelph.); Raffaelli, R. (1995) **Implications of a changing commodity quality definition: the case of Canadian durum wheat exports to Italy.** *Agribusiness : an international journal (USA) v. 11(5) p. 463-472.* references. English. (AGRIS 97-001052).

1415 Morancho, J. (Comercial Gallo, S.A., Barcelona (Spain)) (1995) **[World durum wheat trade]. Le commerce mondial du ble dur.** Seminar on Durum Wheat Quality in the Mediterranean Region. Zaragoza (Spain). 17-19 Nov 1993. Durum Wheat Quality in the Mediterranean Region. La Qualite du Ble Dur dans la Region Mediterraneenne. Fonzo, N. di (Istituto Sperimentale per la Cerealicoltura, Foggia (Italy). Sezione Operativa di Foggia); Kaan, F. (INRA, Institut National de la Recherche Agronomique, Mauguio (France). Station de Genetique et d'Amelioration des Plantes. Domaine de Melgueil); Nachit, M. (ICARDA, International Center for Agricultural Research in the Dry Areas, Aleppo (Syria)). *Options Mediterraneennes. Serie A: Seminaires mediterraneens (CIHEAM); no. 22 p. 213-219.* CIHEAM-IAMZ. 7 tables. English. (AGRIS 97-001034).

La commercialisation du ble dur dans le monde est tres intimement associee a sa production. Le ble dur est traditionnellement produit dans des zones limitees de la planete, qui sont generalement situees dans des regions a faible pluviometrie et, par consequent, sujettes a des situations climatiques adverses. C'est pour cette raison que la culture du ble dur est etroitement liee au climat de la region ou on le cultive. Pour la campagne de commercialisation 1993-94 on prevoit que la secheresse touchera tant les zones du Sud de l'Europe que celles de l'Amerique du Nord et s'il y a penurie cela obligera les Etats producteurs a vendre les stocks de securite, qui pourront donc se reduire sensiblement. Le manque d'offre va toucher les prix mondiaux qui pourront atteindre des niveaux inconnus pendant ces 20 dernieres annees. La terre emblavee par les agriculteurs americains a ete inferieure a celle de la derniere campagne en raison des bas prix par rapport aux autres campagnes et a cause des programmes etablis par leur Gouvernement concernant le gel des terres. La campagne canadienne suivra un chemin semblable en reduisant aussi sa production et celle de l'UE egalement, en raison de la reforme de la PAC et de la secheresse du Sud de l'Europe. L'estimation de perte de recolte a cause des deux raisons citees ci-dessus est de : 15 pour cent pour les Etats Unis; 9 pour cent pour l'Union Europeenne; 6 pour cent pour le Canada. La situation sera plus critique pour les pays non producteurs car ils devront affronter le manque de cette cereale et en plus des prix tres eleves.

1416 Webb, A. (University of Arkansas.); Haley, S.L.; Leetmaa, S. (1995) **Enhancing US wheat export performance: the implications of wheat cleaning.** *Agribusiness : an international journal (USA) v. 11(4) p. 317-332.* references. English. (AGRIS 97-001070).

This analysis shows that there could be net gains to the US wheat industry if all US export wheat were to be cleaned to a dockage level between 0.35 and 0.40. These results are based on interviews with major importers of US wheat, and a model of world wheat trade. Larger benefits to the US wheat industry would be possible from cleaning only wheat destined to countries that demand higher quality US wheat. However, these gains in export revenue from selling cleaner wheat could be offset if other exporters, especially Canada, responded in ways that would maintain their market share.

E73 CONSUMER ECONOMICS

1417 Grider, J. (AACC, St. Paul, MN.) (1996) **Breakfast cereals in the U.S.** *Cereal foods world (USA) v. 41(6) p. 484-487.* references. English. (AGRIS 97-015952).

F01 CROP HUSBANDRY

1418 **CSIRO CRACKS BARLEY** (1996) *Outlook on Agriculture. 25(4):275.* English.

1419 Aassveen, M.; Gunnarstorp, T. (Planteforsk Norsk Inst. for Planteforskning, Apelsvoll Forskingssenter, Kapp (Norway)) (1996) **[Effects of a barley cultivar mixture on certain agronomically important characteristics]. Virkningen av sortsblanding i bygg paa visse agronomisk viktige egenskaper.** *Norsk Landbruksforsking (Norway). Norwegian Agricultural Research v. 10(2) p. 149-158.* 2 tables, 1 figure; 27 ref. Norwegian. (AGRIS 97-001399).

1420 Afzal, C.M.; Rafi, M.; Aslam, M.; Chashti, S.A.S. (Regional Agricultural Research Inst., Bahawalpur (Pakistan)) (1995) **Effect of sowing methods on wheat grain yield under saline sodic soil.** *Journal of Agricultural Research (Pakistan) v. 33(2-3) p. 109-112.* 1 table, 6 ref. English. (AGRIS 97-016680).

Eight different sowing methods mainly consisting of "drill", "hand kera" and "broadcast" with different irrigation and soil management regimes were compared for grain yield and yield components of wheat (cv. Bahawalpur-79) grown in a saline soil during 1986 to 1988 at Regional Agricultural Research Institute, Bahawalpur. Dry sowing with drill followed by irrigation gave higher yield (3116 kg/ha) followed by seed dropped in furrows by hand kera followed by irrigation (2833 kg/ha) compared with the existing practised method (1950 kg/ha) i.e. planking followed by irrigation and seed broadcast.

1421 Ameha Sebsibe (Sheno Research Center, Sheno (Ethiopia)); Alemu Tadese (1996) **Establishment of forage crops under barley. 1.** Proceedings of the Conference of the Agronomy and Crop Physiology Society of Ethiopia. Addis Abeba (Ethiopia). 30-31 May 1995. *Increasing food production through improved crop management. Woldeyesus Sinebo; Zerihun Tadele; Nigusie Alemayehu (IAR, Addis Abeba (Ethiopia)) (eds.) p. 64-68.* ACPSE. 4 tables; 3 ref. English. (AGRIS 97-001403).

Feed shortage is the major problem in the highlands of North Shewa, Ethiopia. On the other hand, farmers in these areas practice fallowing to restore the fertility of crop land. Experiments were undertaken in 1989, 1990 and 1992 to observe the establishment of forage crops underbarley and to assess the effect of the undersown forages on the yield of barley. Five forage crops were separately under sown to barley and none of these species significantly (P greater than 0.05) reduced either barley grain or straw yield. Moreover, due to undersowing of forages the total crop residue yield increased by 60 percent compared with straw produced from the sole barley. The forage plots were maintained and evaluated the following years and the results revealed that Lolium perenne, trefoil and tall fescue were more productive and persistent than others and could be produced in place of weedy fallows if they are intercropped with barley during the last phase of cropping.

1422 Andersen, B. (1996) **[Survey 1995, D: Soil treatment]. Oversigt 1995, D: Kulturteknik.** Landsudvalget for Planteavl, Aarhus (Denmark). *Oversigt over Landsforsoegene (Denmark) (no.1995) p. 76-80.* 5 tables. Danish. (AGRIS 97-001248).

1423 Bagulho, F.; Macas, B.; Coutinho, J.; Goncalves, M.J.; Brites, C. (National Plant Breeding Station, Elvas (Portugal)) (1995) **[Durum wheat in Portugal: Status and potentialities]. Le ble dur au Portugal : Situation et perspectives.** Seminar on Durum Wheat Quality in the Mediterranean Region. Zaragoza (Spain). 17-19 Nov 1993. Durum Wheat Quality in the Mediterranean Region. La Qualite du Ble Dur dans la Region Mediterraneenne. Fonzo, N. di (Istituto Sperimentale per la Cerealicoltura, Foggia (Italy). Sezione Operativa di Foggia); Kaan, F. (INRA, Institut National de la Recherche Agronomique, Mauguio (France). Station de Genetique et d'Amelioration des Plantes. Domaine de Melgueil); Nachit, M. (ICARDA, International Center for Agricultural Research in the Dry Areas, Aleppo (Syria)). *Options Mediterraneennes. Serie A: Seminaires mediterraneens (CIHEAM); no. 22 p. 109-115.* CIHEAM-IAMZ. 1 ill.; 3 graphs.; 1 table; 17 ref. English. (AGRIS 97-001184).

Le ble dur est une culture traditionnelle dans les systemes agricoles du Centre et Sud du Portugal. Dans la flore indigene les types tetraploides representent 80, 0 pour cent. Apres la fin des annees 60 son importance a diminue ceci etant du a une difference considerable entre le germoplasme de ble dur et de ble tendre. Dans cette etude on demontre que la performance des bles tendres, dans les environnements moins favorables, est meilleure que celle des bles durs. Toutefois, dans les sols les plus productifs (le pourcentage le plus bas) le ble dur en general depasse les bles tendres. Il est egalement fait mention de l'evolution apportee par l'amelioration dans les deux especes et de l'importance des efforts de recherche pour resoudre les differents problemes qui se posent. La cooperation doit etre intensifiee entre toutes les institutions de recherche qui travaillent dans la zone d'influence mediterraneenne.

1424 Bazykina, G.S.; Frid, A.S. (1995) **[Summer wheat yields as related to meteorological conditions in rain-fed farming on solonetzic complex in Zavolzh'ie semideserts [Russian Federation]]. Zavisimost' urozhajnosti yarovoj pshenitsy ot meteorologicheskikh uslovij v sistemakh bogarnogo zemledeliya na pochvakh solontsovogo kompleksa polupustynnogo Zavolzh'ya.** *Pochvovedenie (Russian Federation) (no.4) p. 480-485.* Russian. (AGRIS 97-016681).

Statistical methods and empiric mathematical models have been applied to assess the reliability of correlations between the meteorological parameters and yields of summer wheat in Zavolzh'ie semidesertic solonetz microcatenas; data have been collected since 1954. The reliability of the increment in water reserves in snow and soils, as well as in the wheat yields, in case of forest shelter belts as compared to traditional farming system is considered. The risk is shown to be lower in the first case, and it decreases in case of adaptive systems of individual farming.

1425 Ben Salem, M. (INRAT, Institut National de la Recherche Agronomique de Tunisie, Ariana (Tunisia)); Daaloul, A. (Ministere de l'Agriculture de Tunisie, Tunis (Tunisie). IRESA, Institution de la Recherche et de l'Enseignement Superieur Agricoles); Ayadi, A. (INRAT, Institut National de la Recherche Agronomique de Tunisie, Ariana (Tunisie). Laboratoire de Technologie des Cereales) (1995) **[Durum wheat in Tunisia]. Le ble dur en Tunisie.** Seminar on Durum Wheat Quality in the Mediterranean Region. Zaragoza (Spain). 17-19 Nov 1993. Durum Wheat Quality in the Mediterranean Region. La Qualite du Ble Dur dans la Region Mediterraneenne. Fonzo, N. di (Istituto Sperimentale per la Cerealicoltura, Foggia (Italy). Sezione Operativa di Foggia); Kaan, F. (INRA, Institut National de la Recherche Agronomique, Mauguio (France). Station de Genetique et d'Amelioration des Plantes. Domaine de Melgueil); Nachit, M. (ICARDA, International Center for Agricultural Research in the Dry Areas, Aleppo (Syria)). *Options Mediterraneennes. Serie A: Seminaires mediterraneens (CIHEAM); no. 22 p. 81-91.* CIHEAM-IAMZ. 3 graphs.; 8 tables; 16 ref. French. (AGRIS 97-001181).

Dans ce travail nous avons procede a une analyse de la culture du ble dur en Tunisie. Nous nous sommes interesses a l'historique de la selection varietale, aux divers aspects de la production, a la qualite du grain des principales varietes cultivees, a l'utilisation et aux besoins nationaux. La derniere partie a ete reservee a l'etude de la commercialisation et des prix.

1426 Benbelkacem, A.; Sadli, F.; Brinis, L. (Universite d'Annaba, Annaba (Algerie). Institut des Sciences Biologiques) (1995) **[Research on durum wheat quality in Algeria]. La recherche pour la qualite des bles durs en Algerie.** Seminar on Durum Wheat Quality in the Mediterranean Region. Zaragoza (Spain). 17-19 Nov 1993. Durum Wheat Quality in the Mediterranean Region. La Qualite du Ble Dur dans la Region Mediterraneenne. Fonzo, N. di (Istituto Sperimentale per la Cerealicoltura, Foggia (Italy). Sezione Operativa di Foggia); Kaan, F. (INRA, Institut National de la Recherche Agronomique, Mauguio (France). Station de Genetique et d'Amelioration des Plantes. Domaine de Melgueil); Nachit, M. (ICARDA, International Center for Agricultural Research in the Dry Areas, Aleppo (Syria)). *Options Mediterraneennes. Serie A: Seminaires mediterraneens (CIHEAM); no. 22 p. 61-65.* CIHEAM-IAMZ. French. (AGRIS 97-001179).

L'Algerie, pays exportateur de ble durant l'ere romaine et francaise, est devenu l'un des plus gros importateurs au monde de cette cereale. Les habitudes alimentaires de l'Algerien (couscous, pates, pain et frik) font de lui un grand consommateur de cette denree. Les premiers travaux qui ont vise la creation de nouvelles varietes, ont commence par l'amelioration de la qualite et du rendement. L'amelioration de la qualite et du rendement ont toujours ete les objectifs les plus recherches pour le developpement des cultivars. Durant cette derniere decennie, le fruit de ces travaux fait ressortir, a partir des essais nationaux, une gamme varietale a haut rendement, combinant une bonne qualite technologique et une bonne resistance aux stress biotiques et abiotiques. Des gains genetiques de 35 pour cent et de 43 pour cent en terme de rendement et de qualite respectivement ont ete obtenus, par rapport aux temoins locaux. L'electrophorese, utilisee comme outil de selection, nous a permis de classer les differentes varietes de ble dur en trois grands groupes distincts.

1427 Bianchi, A. (Istituto Sperimentale per la Cerealicoltura, Roma (Italy)) (1995) **[Durum wheat crop in Italy]. La production de ble dur en Italie.** Seminar on Durum Wheat Quality in the Mediterranean Region. Zaragoza (Spain). 17-19 Nov 1993. Durum Wheat Quality in the Mediterranean Region. La Qualite du Ble Dur dans la Region Mediterraneenne. Fonzo, N. di (Istituto Sperimentale per la Cerealicoltura, Foggia (Italy). Sezione Operativa di Foggia); Kaan, F. (INRA, Institut National de la Recherche Agronomique, Mauguio (France). Station de Genetique et d'Amelioration des Plantes. Domaine de Melgueil); Nachit, M. (ICARDA, International Center for Agricultural Research in the Dry Areas, Aleppo (Syria)). *Options Mediterraneennes. Serie A: Seminaires mediterraneens (CIHEAM); no. 22 p. 103-108.* CIHEAM-IAMZ. 2 graphs.; 2 tables. English. (AGRIS 97-001183).

Actuellement en Italie on cultive 1, 5 millions d'hectares en ble dur qui donnent une production moyenne de 4 millions de tonnes. Cette production, 66 pour cent du produit total, est localisee pour 75 pour cent dans le midi de l'Italie et dans les iles. Au Nord, la production est majeure ceci etant du aux differentes conditions climatiques et de sol. Toutefois, on peut signaler que la moyenne de la production est augmentee grace a l'amelioration genetique. Suit une liste des varietes qui ont ete majoritairement cultivees, ainsi que le resultat d'une nouvelle politique de la Communaute Europeenne en matiere de ble dur et les initiatives du Ministere de l'Agriculture interesse au secteur. Pour ce qui est des objectifs de l'amelioration genetique, on essaye de favoriser une meilleure resistance aux maladies, d'elever la qualite et la quantite de la production

afin de la rendre la plus stable possible dans le temps et de diversifier l'utilisation du ble dur. Pour terminer, la qualite de la production de 1993 est illustree en rapport avec celle des deux (2) annees precedentes.

1428 Braun, P. (ITCF, Institut Technique des Cereales et des Fourrages, Nimes (France)) (1995) **[Durum wheat in France]. Le ble dur en France.** Seminar on Durum Wheat Quality in the Mediterranean Region. Zaragoza (Spain). 17-19 Nov 1993. Durum Wheat Quality in the Mediterranean Region. La Qualite du Ble Dur dans la Region Mediterraneenne. Fonzo, N. di (Istituto Sperimentale per la Cerealicoltura, Foggia (Italy). Sezione Operativa di Foggia); Kaan, F. (INRA, Institut National de la Recherche Agronomique, Mauguio (France). Station de Genetique et d'Amelioration des Plantes. Domaine de Melgueil); Nachit, M. (ICARDA, International Center for Agricultural Research in the Dry Areas, Aleppo (Syria)). *Options Mediterraneennes. Serie A: Seminaires mediterraneens (CIHEAM); no. 22 p. 93-102.* CIHEAM-IAMZ. 1 ill.; 7 graphs.; 2 tables. French. (AGRIS 97-001182).

Le programme francais pour le ble dur est un partenariat entre une organisation privee d'amelioration et l'INRA. Les principaux objectifs sont l'amelioration de la productivite, des pigments jaunes, de la qualite culinaire, et de la resistance aux maladies et a la verse. De futurs progres genetiques sont attendus par reduction de l'incidence des points noirs, augmentation de la clarte de la semoule et des pates, et rendement semoulier. Le programme francais fait porter ses efforts de recherche surtout sur la physiologie du developpement afin d'eviter les degats dus au froid, a la secheresse et a la chaleur, l'adaptation a l'environnement, la protection des cultures, la fertilisation azotee et la production du ble dur.

1429 Chattha, A.A.; Akram, M.; Ali, A.; Yar, A.; Shahzad, M.A. (Ayub Agricultural Research Inst., Faisalabad (Pakistan). Agronomy Section) (1995) **Yield performance of new wheat genotypes at different planting dates.** *Journal of Agricultural Research (Pakistan) v. 33(2-3) p. 97-101.* 1 table, 14 ref. English. (AGRIS 97-016678).

To find out the best sowing time for four wheat cultivars viz. 86369, 85060, 84133-6 and 87094 alongwith one standard variety viz. Pak81, a trial in a split plot design replicated thrice was conducted at Agronomic Research Farm, Ayub Agricultural Research Institute (AARI), Faisalabad during 1990-1992. Results revealed that varieties viz. 85060 and 84133-6 gave greater grain yield (5892 and 5241 kg/ha) when grown on 5th November. Whereas 86369 and 87094 gave maximum yield (5100 and 4696.50 kg/ha) when planted on 15th and 25th November, respectively. On an average, higher grain yield (5203 kg/ha) was obtained from wheat planted on November 5. Later plantings gave lesser yields.

1430 Chaudhry, M.H.; Anwar, J.; Hussain, F.; Khan, F.A. (Wheat Research Inst., AARI, Faisalabad (Pakistan)) (1995) **Effect of planting time on grain yield of different wheat varieties.** *Journal of Agricultural Research (Pakistan) v. 33(2-3) p. 103-108.* 2 tables, 10 ref. English. (AGRIS 97-016679).

The investigations were conducted at Wheat Research Institute, Faisalabad to determine the yield response of nine wheat cultivars at six different sowing dates for three consecutive years i.e. 1990-91 to 1992-93. Maximum average grain yield (5244 kg/ha) was obtained from November 10 sowings which was significantly different from all other sowing dates. From pooled analysis, an advance line V-87094 gave higher grain yield (4075 kg/ha) closely followed by Inqalab91 (4055 kg/ha), V-87210 (4028 kg/ha) and V-87189 (3972 kg/ha). The minimum average grain yield (3503 kg/ha) was produced by variety Pak81. General decrease in wheat grain yield was estimated at 44 kg per hectare per day sown after November 25. However, November 10 to December 10 sowings were the most optimum time for obtaining good wheat yields.

1431 Cho, C.H.; Han, O.K. (Dankook University, Chonan (Korea Republic). College of Agriculture) (1996) **Effect of daylength on growth and yield of wheat and barley.** *Korean Journal of Breeding (Korea Republic) v. 28(3) p. 262-268.* 4 illus.; 2 tables; 11 ref. Korean. (AGRIS 97-016674).

1432 Clare, R.W.; Spink, J.H.; Scott, R.K.; Foulkes, J.; Stokes, D.; Berry, P.; Griffin, J.M.; Sylvester Bradley, R.; Bryson, R.J.; Paveley, N.D. (ADAS Rosemaund, Preston Wynne, Hereford HR1 3PG (United Kingdom)) (1996) **Expert input management for cereals.** *Farm Management (United Kingdom) v. 9(6) p. 287-304.* 8 ref. English. (AGRIS 97-016211).

1433 Collins, BA.; Fowler, DB. (1996) **EFFECT OF SOIL CHARACTERISTICS, SEEDING DEPTH, OPERATING SPEED, AND OPENER DESIGN ON DRAFT FORCE DURING DIRECT SEEDING.** *Soil & Tillage Research. 39(3-4):199-211.* English. [UNIV SASKATCHEWAN CTR CROP DEV SASKATOON SK S7N 5A8 CANADA].

Direct seeding practices that promote soil and water conservation and reduce input costs have become an increasingly accepted alternative to conventional tillage systems in western Canada. The objective of the present study was to determine the relative importance of soil characteristics, seeding depth, operating speed, and opener design on draft forces during direct seeding in central Saskatchewan. Draft was measured for nine different openers operated at 1-5 cm seeding depths and three ground speeds in four untilled Chernozemic soils that differed in soil moisture and/or texture. The average increase in opener draft for all fields was 4% for each km h(-1) increase in speed. Although the range in soil consistency was small, there was a 24% increase in draft in heavy clay compared to sandy loam soil. Draft force of the average opener increased by nearly 20% for each centimeter increase in seeding depth. However, highly significant interactions among most of the variables investigated indicated that the relative performance of openers was not consistent for the range of conditions evaluated. Large differences among the draft forces of different openers operated at different depths in soils with different consistencies were particularly noteworthy. For example, a 4.5-fold increase in the draft of a low versus a high draft opener operated at 1.25 versus 5.0 cm seeding depth at 7.5 km h(-1) in moist, heavy clay soil emphasized the large influence that opener design and seeding depth have on tractor power requirements and direct seeding input costs. [References: 16].

1434 Cranstoun, D.A.S. (SAC Crop Systems Department, Bush Estate, Penicuik, Midlothian EH26 0PH (United Kingdom)) (1996) **The effect of harvest date on crop selection.** *Aspects of Applied Biology (United Kingdom) (no.45) p. 55-61.* Implications of 'Global environmental change' for crops in Europe, 1-3 April 1996, Churchill College, Cambridge (United Kingdom). English. (AGRIS 97-001272).

1435 De Giorgio, D.; Maiorana, M.; Rizzo, V.; Ferri, D.; Convertini, G. (1995) **[Evaluation of the main bio-agronomic and qualitative characteristics of emmer (Triticum dicoccum Shubler) at different sowing times and nitrogen fertilizing levels]. Systemes sylvopastoraux. Pour un environnement, une agriculture et une economie durables.** Reunion du Groupe de Travail Mediterraneen du Reseau Interregional FAO/CIHEAM de Recherche et Developpement sur les Paturages et les Cultures Fourrageres. Avignon (France). 29 May - 2 Jun 1995. Sylvopastoral systems. Environmental, agricultural and economic sustainability. *Cahiers Options Mediterraneennes (CIHEAM); v. 12 p. 75-78. Centre International de Hautes Etudes Agronomiques Mediterraneennes, Paris (France); FAO, Roma (Italy); INRA, Institut National de la Recherche Agronomique, Paris (France).* CIHEAM-IAMZ. 2 graphs.; 2 tables; 15 ref. English. (AGRIS 97-001195).

The research was carried out in Foggia (Southern Italy) in 1991 and 1992 with the aim of determining the effects of three sowing times (the first in the second half of November and the following ones every fifteen days) and three nitrogen fertilizing treatments (0, 60 and 120 kg N.ha-1) on the main quantitative and qualitative parameters in emmer (cv. Luna). Results were greatly influenced by seasonal weather, mostly by rainfall, which was higher and more regular in the first year; as a consequence, grain yields ranged between 3.3 t.ha-1 in 1991 and 1.2 t.ha-1 in 1992. As to planting dates, the best yield results were obtained in most cases with the earliest one. The effects of nitrogen, instead, were less evident; actually, the straw production only increased with the highest N dose. With reference to the grain quality, the increase in N doses would seem to produce a positive effect on protein and a reduction of fibre (NDF) content, while the increase in yield seems to get worse qualitative parameters.

1436 Debaeke, P.; Aussenac, T.; Fabre, JL.; Hilaire, A.; Pujol, B.; Thuries, L. (1996) **GRAIN NITROGEN CONTENT OF WINTER BREAD WHEAT (TRITICUM AESTIVUM L) AS RELATED TO CROP MANAGEMENT AND TO THE PREVIOUS CROP.** *European Journal of Agronomy. 5(3-4):273-286.* English. [INRA STN AGRON BP 27 F-31326 CASTANET TOLOSAN FRANCE].

Low-input management for wheat production (less fungicide, low nitrogen rate) could affect grain protein content. The impact of the previous crop could also be a determining factor for wheat quality. A long-term field experiment located near Toulouse (southwestern France), comparing different rotations and management schemes from 1984 to

1993, was used to assess the effect of N availability and diseases on grain nitrogen concentration (GNC) of wheat. GNC ranged from 1.6 to 2.8%, increasing with the input level in 5 years out of 10, as the result of higher nitrogen levels and crop protection with fungicides. Leaf brown rust, high temperatures and water shortage, which affected dry matter accumulation during grain filling, were responsible for high GNC. GNC was generally correlated with N uptake when nitrogen availability was the main limiting factor and to the nitrogen harvest index (NHI) when foliar diseases or drought limited grain production. N uptake in the absence of N fertiliser ranged from 20 to 200 kg ha(-1) depending on the previous crop. GNC was closely related to the nitrogen nutrition index (NNI) at anthesis. [References: 38].

1437 Deneken, G.; Boesen, B. (1996) **[Varieties of cereals, pulse crops and oil seed crops 1996]. Sorter af korn, baelgsaed og olieplanter 1996.** Statens Planteavlsforsoeg, Foulum (Denmark).. *Groen Viden. Landbrug (Denmark); no. 168 88 p.* SP. 45 tables. Danish. (AGRIS 97-001557).

1438 Deutschmann, M.; Ellmer, F.; Wirth, S. (1996) **[Microbiological studies under winter wheat in differently intensive cropping systems on a loamy sand]. Mikrobiologische Untersuchungen unter Winterweizen in verschieden intensiven Bodennutzungssystemen auf einem lehmigen Sandboden. 2.** Wissenschaftliche Jahrestagung. Berlin (Germany). 1-2 Nov 1995. *[Contributions to the ecology of agricultural landscapes in Brandenburg - problems and approaches. Second scientific annual conference of the Faculty's focus Ecology of Agricultural Landscapes, 1-2 Nov 1995]. Hoffmann, H. (ed.). Beitraege zur Oekologie der Agrarlandschaften in Brandenburg - Probleme und Loesungsansaetze. 2. Wissenschaftliche Jahrestagung des Fakultaetsschwerpunktes Oekologie der Agrarlandschaften, 1. und 2. November 1995Oekologische Hefte der Landwirtschaftlich-Gaertnerischen Fakultaet, Humboldt-Universitaet (Germany); no. 4. Humboldt-Universitaet, Berlin (Germany). Landwirtschaftlich-Gaertnerische Fakultaet. Fachgebiet Pflanzenbau; Zentrum fuer Agrarlandschafts- und Landnutzungsforschung, Muencheberg (Germany). Inst. fuer Mikrobielle Oekologie und Bodenbiologie p. 95-100.* Humboldt-Universitaet zu Berlin. German. (AGRIS 97-016669).

1439 Elias, E.M. (North Dakota State University, Fargo (USA). Crop and Weed sciences Dep.) (1995) **[Durum wheat products]. Produits a base de ble dur.** Seminar on Durum Wheat Quality in the Mediterranean Region. Zaragoza (Spain). 17-19 Nov 1993. Durum Wheat Quality in the Mediterranean Region. La Qualite du Ble Dur dans la Region Mediterraneenne. Fonzo, N. di (Istituto Sperimentale per la Cerealicoltura, Foggia (Italy). Sezione Operativa di Foggia); Kaan, F. (INRA, Institut National de la Recherche Agronomique, Mauguio (France). Station de Genetique et d'Amelioration des Plantes. Domaine de Melgueil); Nachit, M. (ICARDA, International Center for Agricultural Research in the Dry Areas, Aleppo (Syria)). *Options Mediterraneennes. Serie A: Seminaires mediterraneens (CIHEAM); no. 22 p. 23-31.* CIHEAM-IAMZ. 1 ill.; 4 tables; 26 ref. English. (AGRIS 97-001175).

Le ble dur, qui est parmi les cereales les plus importantes, se cultive dans des regions semi-arides du monde telles que l'Afrique du Nord, l'Europe Meridionale, les plaines de l'Amerique du Nord et le Moyen-Orient. Grace a la taille de son grain, sa vigueur et sa couleur d'ambre, le ble dur se prete a une gamme de produits alimentaires uniques et divers dont les pates et le couscous sont les plus connus. Les pates sont en effet l'un des produits alimentaires de base pour une grande partie du monde, de meme pour les couscous en Afrique du Nord. Le bulgur et le frekeh, produits du ble dur mais pas des pates, sont des produits essentiels au Moyen-Orient et en Afrique du Nord. On utilise aussi le ble dur dans la production de farine, surtout en Europe et au Moyen-Orient. Le ble dur s'adapte aussi aux cereales en flocons (celles du petit-dejeuner) et aux desserts tels que mamuneih, mushabak, hariseh, halva et kugel. Dans cette etude on parle brievement des produits a base de ble dur pates et non-pates afin de recapituler pour le lecteur.

1440 Eusterschulte, B.; Kahnt, G. (Hohenheim Univ., Stuttgart (Germany)) (1996) **[Spelt is unpretentious - Spelt, rye and wheat under extensive conditions]. Dinkel ist anspruchslos - Dinkel, Roggen und Weizen unter extensiven Bedingungen.** *Landwirtschaftliches Wochenblatt. Organ des Landesbauernverbandes in Baden-Wuerttemberg. Ausg. WWL (Germany) v. 163(34) p.* 23-24. German. (AGRIS 97-001567).

Winterroggen kann nicht uneingeschraenkt als eine fuer den Standort Ensmad besonders geeignete Art bewertet werden (Schneeschimmel). Relativ sicherer, aber niedriger Ertrag mit stabiler Qualitaet (TKG, N-Gehalt) kann mit Dinkel bei niedriger Anbauintensitaet erreicht werden. Winterweizen bedarf einer ausreichenden N-Versorgung, insbesondere auch zur Unkrautunterdrueckung.

1441 Farack, M. (Thueringer Landesanstalt fuer Landwirtschaft, Domburg (Germany)) (1996) **[Malting barley: especially attractive in 1996]. Braugerste: 1996 besonders attraktiv.** *Top agrar / Spezial fuer Mecklenburg-Vorpommern, Brandenburg, Sachsen-Anhalt, Sachsen, Thueringen (Germany) (no.2) p. 26-28.* German. (AGRIS 97-016332).

Die Nachfrage nach qualitativ hochwertiger Braugerste konnte im vergangenen Jahr nicht durch inlaendische Ware gedeckt werden. Es bestehen also noch Absatzchancen fuer heimische Anbauer. Durch welche Anbaumassnahmen hohe Qualitaet erreicht wird, wird erlaeutert.

1442 Ferri, C.M.; Hernandez, O.A.; Frecentese, M.A. (1995) **[Behaviours of winter forage in Santa Rosa, La Pampa. I. Seasonal distribution and accumulated yield of dry matter]. Comportamientos de verdeos invernales en Santa Rosa, La Pampa. I. Distribucion estacional y rendimientos acumulados de materia seca.** *Revista de la Facultad de Agonomia Universidad Nacional de La Pampa (Argentina) v. 8(2) p. 1-9.* Spanish. (AGRIS 97-015991).

1443 Fischbeck, G. (Technische Univ. Muenchen, Freising (Germany). Inst. fuer Pflanzenbau und Pflanzenzuechtung) (1995) **[Better management of cereal stands by using certificated seeds]. Mit Z-Saatgut laesst sich Getreide besser fuehren.** *Bayerisches Landwirtschaftliches Wochenblatt (Germany) v. 185(41) p. 22-23.* German. (AGRIS 97-016667).

Trotz der stark gesunkenen Getreidepreise ist die Erfolgsquote im Getreidebau von nachhaltiger Bedeutung fuer die wirtschaftliche Situation vieler Ackerbaubetriebe. Allerdings spielt die Ertragsleistung in Relation zu dem dafuer eingesetzten Aufwand an Betriebsmitteln keine so grosse Rolle mehr. Groessere Bedeutung kommt heute dem Z-Saatgut zu, denn mit ihm laesst sich ein Getreidebestand einfacher und kostenguenstiger fuehren.

1444 Flood, RG.; Martin, PJ.; Panozzo, JF. (1996) **INFLUENCE OF SOWING TIME ON GRAIN QUALITY CHARACTERS OF WHEAT GROWN IN NORTH-WESTERN VICTORIA.** *Australian Journal of Experimental Agriculture. 36(7):831-837.* English. [VICTORIAN INST DRYLAND AGR PMB 260 HORSHAM VIC 3401 AUSTRALIA].

Grain from sowing time experiments at 1 site in 1984 and 2 sites in 1986 and 1987 in northwestern Victoria were tested for several grain and flour characters. The tests included grain protein percentage, sodium dodecyl sulfate (SDS) sedimentation volume, particle size index, milling yield, test weight and Pelshenke wholemeal fermentation time, although not all tests were carried out in all years at both sites. The findings are reported without analysis of the underlying processes involved. The effect of sowing time on grain protein percentage was variable; at Dooen in 1984 there was a slight decrease, at Dooen and Walpeup in 1986 there was an increase but there was no change at Dooen in 1987, as sowing time was delayed. Sowing time had a significant effect on SDS at Dooen in 1984 and Dooen and Walpeup in 1986. There were no marked trends at Dooen in 1984, but significant differences between individual sowing times, and in 1986 there was an inconsistent increase as sowing time was delayed. At Walpeup in 1986 there was a substantial increase in values as sowing time was delayed. Partial correlation coefficients, however, indicated that at Dooen in both years and Walpeup in 1986, variation for SDS was due almost entirely to differences in grain protein percentage, although at Walpeup in 1986 there was a slight additional effect of sowing time. Particle size index was significantly affected by sowing time at both sites in 1986; at Dooen there was a decrease as sowing time was delayed and then an increase for the last sowing time, and at Walpeup there was an increase as sowing time was delayed. Although some effects of sowing time on milling yield and test weight were statistically significant, only one had commercial significance-milling yield at Walpeup in 1986. Pelshenke time was affected by sowing time at Dooen in 1984 and Walpeup in 1986, but there were no obvious trends. Sowing time x cultivar interactions have implications for quality testing of wheat crossbreds. Grain growers can be reassured that sowing crops over an extended period appears to have little or no detrimental effect on grain quality with respect to bread baking properties. In some seasons, however, there may be substantial increases in grain protein percentage in later sown crops, although this would generally be associated with lower yields. [References: 19].

1445 Gelderman, R. (South Dakota State University.); Gerwing, J.; Stymiest, C.; Haley, S. (1996) **Correlation of phosphorus soil tests for winter wheat.** *Plant science pamphlet (USA) (no. 84) p. 15-20.* English. (AGRIS 97-016618).

1446 Goltermann, S.; Broschewitz, B. (Landespflanzenschutzamt Mecklenburg Vorpommern, Rostock (Germany)) (1996) **[Management of plant growth regulators: What should be considered?]. Wachstumsregler: Was Sie beim Einsatz beachten sollten.** *Top agrar / Spezial fuer Mecklenburg-Vorpommern, Brandenburg, Sachsen-Anhalt, Sachsen, Thueringen (Germany) (no.2) p. 22-23.* German. (AGRIS 97-016193).

Neben den bekannten Mitteln steht 1996 der neue Wachstumsregler Moddus zur Verfuegung. Das neue Mittel zeichnet sich unter anderem dadurch aus, dass es in allen vier Getreidearten bevorzugte Einsatztermine hat.

1447 Hostrup, S.B.; Moeller, E. (1996) **SP report, 10: Fodder galega (Galega orientalis Lam.) and lucerne (Medicago sativa L.) sown without and with barley (Hordeum vulgare L.) as cover crop.** Statens Planteavlsforsoeg, Foulum (Denmark). *SP rapport, 10: Foderstregbaelg (Galega orientalis Lam.) og lucerne (Medicago sativa L.) saaet uden og med byg (Hordeum vulgare L.) som daekafgroede 22 p.* SP. 11 tables; 19 ref. Danish. (AGRIS 97-001364).

1448 Jarman, RJ. (1996) **BERE BARLEY - A LIVING LINK WITH 8TH CENTURY.** *Plant Varieties & Seeds. 9(3):191-196.* English. [NATL INST AGR BIOL CAMBRIDGE CB3 0LE ENGLAND].

Bere barley, grown in northern Scotland and the Orkney Isles, is milled for flour. Grains from the 1995 harvest were compared by visual examination and by acid-polyacrylamide gel electrophoresis with gene bank accessions and historical specimens found at the NIAB. Visual and electrophoretic similarities were found. The geographical isolation of Bere barley from other barley varieties has probably helped maintain it as a discrete "variety". Bere barley is probably directly related to "beare-barley" grown in the 16th century. The author speculates that Bere barley can trace its direct ancestry back to the 8th century making it one of the oldest varieties in the world that is still grown. [References: 14].

1449 Jimenez Gonz lez, A.T. (IFES, Instituto de Molineria e Industrias Cerealistas, Madrid (Spain)) (1995) **[Milling process of durum wheat]. Processus de mouture du ble dur.** Seminar on Durum Wheat Quality in the Mediterranean Region. Zaragoza (Spain). 17-19 Nov 1993. Durum Wheat Quality in the Mediterranean Region. La Qualite du Ble Dur dans la Region Mediterraneenne. Fonzo, N. di (Istituto Sperimentale per la Cerealicoltura, Foggia (Italy). Sezione Operativa di Foggia); Kaan, F. (INRA, Institut National de la Recherche Agronomique, Mauguio (France). Station de Genetique et d'Amelioration des Plantes. Domaine de Melgueil); Nachit, M. (ICARDA, International Center for Agricultural Research in the Dry Areas, Aleppo (Syria)). *Options Mediterraneennes. Serie A: Seminaires mediterraneens (CIHEAM); no. 22 p. 43-51.* CIHEAM-IAMZ. 5 ill.; 11 ref. English. (AGRIS 97-001177).

La mouture de ble dur a des caracteristiques specifiques. Certaines conditions ont une influence dans l'extraction des semoules, selon la proportion de semoules de qualite et le ble dur utilise : (i) les caracteristiques genetiques et physiologiques de Triticum durum (ii) les proprietes physiques et chimiques du ble (iii) les qualites technologiques des produits de mouture : semoules (iv) les conditions economiques; (v) les facteurs de l'environnement et les conditions hygieniques du travail. En accord avec ces conditions requises la mouture changera selon les semouleries et les utilisations finales, bien qu'il y ait sections et processus communs. Le processus de mouture de ble dur pourrait etre defini comme suit : "Le grain, avec une texture d'amande peu friable, est nettoye avec beaucoup d'attention, ensuite prepare pour la mouture apres mouillage pendant trois etapes et les repos correspondants et en dernier lieu broye peu a peu en grandes particules de dimensions similaires qui sont separees des enveloppes par differentes operations".

1450 Jones, N.H.; Chaney, K.; Wilcox, A.; Boatman, N.D. (Crop and Environment Research Centre, Harper Adams, Newport, Shropshire TF10 8NB (United Kingdom)) (1995) **The implications of improving the conservation value of field margins on crop production.** *Integrated crop protection: towards sustainability? Proceedings of a symposium, Edinburgh, UK, 11-14 September 1995 [chaired by McKinley, R. G.; Atkinson, G.J. p. 131-138.* British Crop Protection Council. 14 ref., BCPC Symposium Proceedings No. 63. English. (AGRIS 97-001594).

1451 Juan Aracil, J. (Servicio de Investigaciones Agrarias, Jerez de la Frontera (Spain)); Michelena, A. (Universidad de Lerida, Lerida (Spain). Instituto de Investigacion y Tecnologia Agroalimentarias) (1995) **[Durum wheat in Spain]. Le ble dur a l'Espagne.** Seminar on Durum Wheat Quality in the Mediterranean Region. Zaragoza (Spain). 17-19 Nov 1993. Durum Wheat Quality in the Mediterranean Region. La Qualite du Ble Dur dans la Region Mediterraneenne. Fonzo, N. di (Istituto Sperimentale per la Cerealicoltura, Foggia (Italy). Sezione Operativa di Foggia); Kaan, F. (INRA, Institut National de la Recherche Agronomique, Mauguio (France). Station de Genetique et d'Amelioration des Plantes. Domaine de Melgueil); Nachit, M. (ICARDA, International Center for Agricultural Research in the Dry Areas, Aleppo (Syria)). *Options Mediterraneennes. Serie A: Seminaires mediterraneens (CIHEAM); no. 22 p. 117-121.* CIHEAM-IAMZ. 1 ill.; 3 graphs.; 1 table. English. (AGRIS 97-001185).

La surface emblavee en ble dur en Espagne a ete multipliee par six et est passee de 100.000 ha a plus de 600.000 ha en moins de cinq ans. La production a augmente, passant de 400.000 a plus de 1.200.000 tonnes metriques. Les varietes traditionnelles de haute taille ont ete remplacees par d'autres plus productives. La variete qui vient en tete est Vitron, qui represente 46 pour cent de la surface totale. La qualite du grain est dependante des variations environnementales. Les pluies tardives affectent la vitrosite et le nombre de chutes, et la secheresse affecte le poids moyen des grains. Le pigment jaune et le test de sedimentation ont montre un effet genetique important, tandis que le poids moyen des grains, la teneur en proteine, et le rendement en grain comportent des effets saisonniers importants.

1452 Kallas, E. (Jogeva Plant Breeding Inst., Jogeva (Estonia)) (1996) **[Yield and quality of winter wheat varieties]. Talinisusortide saagist ja kvaliteedist.** Estonian Academic Agricultural Society, Tartu (Estonia). *Transactions of the Estonian Academic Agricultural Society (Estonia) (no.1) p. 49-50.* Estonian. (AGRIS 97-001556).

Wheat has been bred from the very beginning of the process of winter wheat breeding in Estonia for human consumption. During 1990.1995 the average grain yield of the control variety was exceeded by the varieties 'Joni', 'Sani', 'Eka' and by selection numbers 'Carsten VIII' x 'Minovskaja jubileinaja' and 'Severokubanskaja'. Varieties 'Joni', 'Sani', 'Eka' and 'Kalvi' had 7.8.23 per cent shorter straw and 18.23 per cent better lodging resistance than the control variety. The speed of forming CO2 and the volume of dough in the control variety were exceeded by 'Joni' and by selection numbers 'Carsten VIII' x 'Mironovskaja jubileinaja' and 'Russard' x 'Yuva' 5.2.5. (10.2 per cent). Content and quality of gluten of different winter wheat depended more on the sites of production than on the genetic properties.

1453 Kayyal, H. (University of Damascus, Damascus (Syria). Agronomic Faculty); Abu Hamze, H. (Directorate of Agricultural Research, Douma (Syria)); Jarrah, M.; Nachit, M.M. (CIMMYT, Centro Internacional de Mejoramiento de Maiz y Trigo, Mexico D.C. (Mexico)) (1995) **[Durum wheat production and quality in Syria]. Production et qualite du ble dur en Syrie.** Seminar on Durum Wheat Quality in the Mediterranean Region. Zaragoza (Spain). 17-19 Nov 1993. Durum Wheat Quality in the Mediterranean Region. La Qualite du Ble Dur dans la Region Mediterraneenne. Fonzo, N. di (Istituto Sperimentale per la Cerealicoltura, Foggia (Italy). Sezione Operativa di Foggia); Kaan, F. (INRA, Institut National de la Recherche Agronomique, Mauguio (France). Station de Genetique et d'Amelioration des Plantes. Domaine de Melgueil); Nachit, M. (ICARDA, International Center for Agricultural Research in the Dry Areas, Aleppo (Syria)). *Options Mediterraneennes. Serie A: Seminaires mediterraneens (CIHEAM); no. 22 p. 127-132.* CIHEAM-IAMZ. 7 tables. English. (AGRIS 97-001187).

Une etude morphophysiologique a ete menee sur des especes autochtones syriennes de ble dur et des cultivars ameliores. De grandes variations ont ete trouvees pour la plupart des caracteres etudies. Les correlations entre le rendement en grain et les autres caracteres ont montre l'importance de la precocite et de la vigueur pendant la croissance precoce. Des varietes nouvellement mises au point ont montre de meilleures aptitudes au rendement que la race autochtone ("Haurani") et que la variete commerciale ("Gezira 17"). Le ble dur d'une facon generale avait une plus forte teneur en proteine, un poids de 1000 grains plus eleve, et une meilleure absorption de l'eau par la farine que le ble de printemps. Par contre, le ble de printemps avait une stabilite plus longue, ainsi qu'une meilleure fermete de la pate, que le ble dur. La qualite du grain chez le ble

dur etait meilleure lorsque celui-ci etait seme dans des zones semi-arides (specialement pour cent de proteine, degre d'absorption, et stabilite, fermete de la pate), tandis que les composantes de productivite etaient meilleures lorsqu'il etait seme dans des zones irriguees et favorables (poids d'un hectolitre, poids de 1000 graines). Les resultats ont souligne l'importance d'une selection pour la tolerance au stress en zones semi-arides, et pour la qualite du grain en zones irriguees et favorables.

1454 Khadi Raad, M. (Grodno Agricultural Research Institute (Belarus)) (1996) **[Influence of phytoregulators to growth process of spring wheat in drought conditions]. Vliyanie fitoregulyatorov na rostovye protsessy rastenij yarovoj pshenitsy v usloviyakh zasukhi.** *Vestsi Akadehmii Agrarnykh Navuk Belarusi (Belarus) (no.2) p. 42-44.* 2 tables; 9 ref. Russian. (AGRIS 97-001553).

It is defined that "Leningradka" variety reacted more to treatment by the growth regulators which positively influence its physiological process and increase its drought resistance as compared to other varieties of spring wheat.

1455 Krenzer, E.G. Jr. (Oklahoma State Univ., Stillwater, OK.); Tarrant, A.R.; Bernardo, D.J.; Horn, G.W. (1996) **An economic evaluation of wheat cultivars based on grain and forage production.** *Journal of production agriculture (USA) v. 9(1) p. 66-73.* references. English. (AGRIS 97-001565).

Wheat (Triticum aestivum L.) is extensively used for both forage for cattle (Bos taurus L.) and grain from the same planting in the southern Great Plains. Little information on the impact of cultivar selection on the economic return in such a wheat production system is available. Forage and grain yield data from 12 hard red winter wheat cultivars grown in nine environments were evaluated to assess the economic impact of cultivar selection. Trials in each environment were a randomized complete block design with four to six replications. Forage data were collected until the early joint stage of growth, and grain yield was obtained from the same plots. Forage data were converted into pounds of beef and then return from beef using three conversion procedures, since tested conversion ratios were not available. Returns from beef and grain were summed and cultivars were ranked in each environment. Rank statistics were used to evaluate cultivar stability across environments. Environmental mean forage and grain yields varied widely, 367 to 2450 for forage and 13.8 to 52.2 bu/acre for grain, resulting in average net returns across environments ranging from $2.29 to $164.78/acre. Higher grain yielding cultivars were not among the highest forage yielding cultivars, emphasizing the need to use the combined economic return in decisionmaking. Net return by cultivar across environments ranged from $51.18 to $78.47/acre. Cultivar rankings were consistent across environments, across methods of calculating conversion of forage into beef, and across price scenarios for both beef and grain. Producers interested in using wheat for both forage and grain can effectively choose cultivars based upon net return per acre, but choosing based on forage or grain yield alone seldom resulted in greatest economic return.

1456 Kueuets, H.; Kueuets, I.; Tamm, Ue. (Estonian Agricultural Univ., Tartu (Estonia)) (1996) **[Agronomic and quality characteristics of recommended barley varieties]. Kasvatamiseks soovitatud odrasortide majanduslik-bioloogilisi omadusi.** Estonian Academic Agricultural Society, Tartu (Estonia). *Transactions of the Estonian Academic Agricultural Society (Estonia) (no.1) p. 6-9.* 4 tables. Estonian. (AGRIS 97-001398).

There are 12 barley varieties on the Official List of Recommended Varieties in Estonia in 1996. This article does not deal with 3 earley six-row ones. Of 8 two-row barley varieties 'Elo', 'Goldie' and 'Apex' are suitable for malting, the others for food and feed. The most widely cultivated are 'Elo', 'Roland', 'Mette' and 'Anni'. The varieties 'Goldie', 'Kinnan', 'Marina' and 'Meltan' have been on the List since 1995 and therefore their seed production has only recently been started.

1457 Landi, A. (Barilla G. e R.lli Societa per Azioni, Parma (Italy)) (1995) **[Durum Wheat, semolina and pasta quality characteristics for an Italian food company]. Caracteristiques de qualite du ble dur, de la semoule et des pates pour une societe alimentaire italienne.** Seminar on Durum Wheat Quality in the Mediterranean Region. Zaragoza (Spain). 17-19 Nov 1993. Durum Wheat Quality in the Mediterranean Region. La Qualite du Ble Dur dans la Region Mediterraneenne. Fonzo, N. di (Istituto Sperimentale per la Cerealicoltura, Foggia (Italy). Sezione Operativa di Foggia); Kaan, F. (INRA, Institut National de la Recherche Agronomique, Mauguio (France). Station de Genetique et d'Amelioration des Plantes. Domaine de Melgueil); Nachit, M. (ICARDA, International Center for Agricultural Research in the Dry Areas, Aleppo (Syria)). *Options Mediterraneennes. Serie A: Seminaires mediterraneens (CIHEAM); no. 22 p. 33-42.* CIHEAM-IAMZ. 3 ill.; 1 table; 1 ref. English. (AGRIS 97-001176).

Barilla, la premiere societe en Europe et dans le monde pour la production de pates de ble dur, dresse une liste des plus importants parametres pour la definition de la qualite des bles, des semoules et des pates, et des methodes analytiques pour les determiner. Ensuite elle decrit les technologies des moulins modernes, l'influence de la mouture sur la qualite des semoules, les technologies les plus avancees dans les processus de sechage des pates et leur influence sur la qualite du produit fini. Enfin, l'auteur illustre les caracteristiques nutritionnelles des pates et leur contribution a l'alimentation moderne.

1458 Le Bail, M. (Institut National Agronomique Paris Grignon, Paris (France)) (1995) **[Linking yield and quality in spring malting barley]. Associer rendement et qualite en orge de printemps brassicole.** *BIOS BOISSONS (France) v. 26(255) p. 91-95.* 5 graph. English. (AGRIS 97-001153).

1459 Malienko, A.; Golodny, I. (Ukrainian Academy of Agrarian Sciences, Chabany, Kiev (Ukraine)) (1994) **Two-step cultivation system for optimization of physical regime on loamy-sand sod-podzoling soils.** Soil Tillage for Crop Production and Protection of the Environment. Aalborg (Denmark). 24-29 Jul 1994. *ISTRO: Proceedings of the 13th international conference, 2: Soil tillage for crop production and protection of the environment. Jensen, H.E.; Schjoenning, P.; Mikkelsen, S.A.; Madsen, K.B. (eds.). International Soil Tillage Research Organization, ISTRO, Ohio (USA) p. 877-882.* Kongelige Veterinaer- og Landbohoejskole. 2 ill., 2 tables. English. (AGRIS 97-001528).

1460 Malik, A.; Sahi, F.; Abbasi, K. (University of Wales, Aberystwyth SY23 3DD (United Kingdom)) (1995) **The influence of phosphorus on the components of yield of irrigated wheat in Pakistan.** *Journal of the Agricultural Society - University of Wales (United Kingdom) v. 75 p. 41-49.* 12 ref. English. (AGRIS 97-001483).

1461 Manandhar, D.N.; Shakya, D.M. (Nepal Agricultural Research Council, Khumaltar, Lalitpur (Nepal)) (1996) **Climate and crops of Nepal.** Nepal Agricultural Research Council/Swiss Agency for Development and Cooperation, Nepal. 100 tables; 24 figs.; 34 maps. 111 p. English. (AGRIS 97-016214).

1462 Martin, CR.; Steele, JL. (1996) **EVALUATION OF ROTOR-CRESCENT DESIGN FOR SENSING WHEAT KERNELS HARDNESS.** *Transactions of the ASAE. 39(6):2223-2227.* English. [USDA ARS N CENT REG US GRAIN MKT RES LAB 1515 COLL AVE MANHATTAN, KS 66502 USA].

Alternative designs of an experiential hardness tester were studied to evaluate its ability to classify single wheat kernels as hard or soft. Test variables included the effect of adding guide channels to control kernel orientation, five rotor speeds and five rotor tooth designs. In the first study, the addition of guide channels to the crescent had the greatest benefit, increasing the Classing Index (CI) from 1.2 to 1.6. The second study showed that the system was not sensitive to rotor speeds in the range between 15 and 480 rpm with the CI remaining about 1.6 for all but the highest speed. A sawtooth and shallow tooth pattern had similar CI close to 1.6. The sawtooth pattern was selected for two reasons; first, the hardness sensitivity was more uniform; second, the sawtooth pattern was the least complicated machining operation. [References: 14].

1463 Mastel, K.; Ott, J. (Landesanstalt fuer Pflanzenschutz Forchheim, Rheinstetten (Germany)) (1996) **[To reduce additional profits of yield by using fungicides - Results of the LSV winter barley 1996]. Geringere Mehrertraege bei Fungizideinsatz - Ergebnisse der LSV Wintergerste 1996.** *Landwirtschaftliches Wochenblatt. Organ des Landesbauernverbandes in Baden-Wuerttemberg. Ausg. WWL (Germany) v. 163(34) p. 17-19.* German. (AGRIS 97-001400).

1996 wurden >95.000 ha Wintergerste gedroschen. Rangfolge u. Ertraege von zweizeiligen u. mehrzeiligen Sorten bei extensiver (reduz. N-Duengung, keine Fungizide) (I) und ordnungsgemaesser Bewirtschaftung (II). Bei II wurden 8.1 und 9.5 dt/ha mehr als bei I gedroschen. Die Mehrertraege bei II schwankten in Abhaengigkeit vom Standort sehr stark. Zur Herbstaussaat werden die zweizeiligen Sorten Hanna, Jasmin, Gunda

sowie Regina u. Duet empfohlen, im mehrzeiligen Sortiment die Sorte Lorena.

1464 Minale Liben; Alemayehu Asefa; Yeshanew Ashagrie (Adet Research Center, Bahir Dar (Ethiopia)) (1996) **Effect of sowing date on the grain yield of food barley at Adet. 1.** Proceddings of the conference of the Agronomy and Crop Physiology Society of Ethiopia. Addis Abeba (Ethiopia). 30-31 May 1995. *Increasing food production through improved crop management. Woldeyesus Sinebo; Zerihun Tadele; Nigusie Alemayehu (IAR, Addis Abeba (Ethiopia)) (eds.) p. 127-130.* ACPSE. 3 tab;es' 3 ref. English. (AGRIS 97-001404).

The experiment was conducted during the main cropping seasons of 1990, 1992 and 1993 on Nitosols of Adet Research Center to determine optimum sowing date for barley varieties HB-100, HB-99 and adet local. The sowing dates were set from 26 May to 15 July in an interval of ten days. The treatments were arranged in split-plot design where varieties were assigned to the main plots and sowing dates to the sub-plots. Among seasons the highest mean grain yield (28.67 q/ha) was obtained in 1992. There were significant grain yield differences (P less than 0.01) due to varieties and sowing dates. Interactions of sowing date and variety were significant in 1990 and 1992. Averaged over seasons, higher mean grain yields were obtained from 26 May and 5 June plantings. A linear decline of grain yield was observed with delay in planting. The results indicate that the optimum time of planting barley in Adet area is late May to mid June.

1465 Moore, M. (1995) **Precision farming at Shuttleworth farms.** Site Specific Farming. Aarhus (Denmark). 20-21 Mar 1995. *SP Report, 26: Proceedings of the seminar on site specific farming. Olesen, S.E. (ed.). Statens Planteavlsforsoeg, Foulum (Denmark) p. 123-136.* SP. 11 ill. English. (AGRIS 97-001555).

1466 Morison, J.I.L. (Dept of Biological and Chemical Sciences, Wivenhoe Park, University of Essex, Colchester CO4 3SQ (United Kingdom)) (1996) **Global environmental change impacts on crop growth and production in Europe.** *Aspects of Applied Biology (United Kingdom) (no.45) p. 15-29.* 62 ref. Implications of 'Global environmental change' for crops in Europe, 1-3 April 1996, Churchill College, Cambridge, UK. English. (AGRIS 97-001491).

1467 Nielsen, K.A.; Mikkelsen, M. (1996) **[Survey 1995, K: Forage production]. Oversigt 1995, K: Grovfoderproduktion.** Landsudvalget for Planteavl, Aarhus (Denmark). *Oversigt over Landsforsoegene (Denmark) (no.1995) p. 235-274.* 3 ill., 61 tables. Danish. (AGRIS 97-001243).

1468 Nilsdotter Linde, Nilla; Bergkvist, Goeran; Ohlander, Lars (1995) **Species and varieties of undersown catch crops in spring barley.** *NJF-utredning/rapport (Finland) (no. 99) p. 236-241.* 12 ref. English. (AGRIS 97-016335).

1469 Novikov, N.N.; Vojessa, B.V. (1995) **[Effect of phytoregulators on composition of proteins and quality of wheat grain]. Dejstvie fitoregulyatorov na sintez belkov i kachestvo zerna pshenitsy.** *Izvestiya Timiryazevskoj sel'skokhozyajstvennoj akademii (Russian Federation) (no.1) p. 65-75.* 24 ref. Russian. (AGRIS 97-001564).

It has been found in small-plot field experiments that treating the plants with phytoregulators (maleic hydrazide, brassinolide, gibberellin A3, abscinic acid, 6-BAP) in the phase of early grain maturing causes substantial shifts in the processes of synthesis of freely soluble and spirit soluble proteins, but subindividual and component composition of each protein fraction does not change. Some of these phytoregulators had specific effect on accumulation of gluten proteins in grain, gluten quality, sedimentation properties of flour and the level of hydrolytic enzyme activity.

1470 Ouassou, A. (Institut Agronomique et Veterinaire Hassan II, Rabat (Morocco). Dep. d'Agronomie et d'Amelioration des Plantes) (1995) **[Durum wheat cropping in Morocco: current status, improvement and future research and development prospects]. La culture du ble dur au Maroc : Situation actuelle acquis et possibilites de recherche et de developpements futurs.** Seminar on Durum Wheat Quality in the Mediterranean Region. Zaragoza (Spain). 17-19 Nov 1993. Durum Wheat Quality in the Mediterranean Region. La Qualite du Ble Dur dans la Region Mediterraneenne. Fonzo, N. di (Istituto Sperimentale per la Cerealicoltura, Foggia (Italy). Sezione Operativa di Foggia); Kaan, F. (INRA, Institut National de la Recherche Agronomique, Mauguio (France). Station de Genetique et d'Amelioration des Plantes. Domaine de Melgueil); Nachit, M. (ICARDA, International Center for Agricultural Research in the Dry Areas, Aleppo (Syria)). *Options Mediterraneennes. Serie A: Seminaires mediterraneens (CIHEAM); no. 22 p. 67-79.* CIHEAM-IAMZ. 1 graph.; 11 tables. French. (AGRIS 97-001180).

La cerealiculture occupe une place importante dans l'agriculture marocaine (5 millions d'hectares, environ 70 pour cent de la surface agricole utile). La culture du ble dur, avec 1, 165 million d'hectares occupe la troisieme place apres l'orge et le ble tendre. Environ 95 pour cent de sa sole se trouve localise dans la zone pluviale non irriguee. Quoique sa superficie ait diminue ces dix dernieres annees, sa production s'est maintenue au meme niveau par l'amelioration des rendements. Avec une demande toujours croissante, la production nationale de ble dur, a 98 pour cent autoconsommee, n'arrive pas a couvrir tous les besoins. Malgre les progres substantiels au niveau de la selection et de l'amelioration genetique (14 varietes inscrites depuis 1988), la multiplication et le transfert des facteurs de production (nouvelles varietes et technologies adaptees) sont tres lents. Des axes de recherche nouveaux pour le developpement du ble dur et la cooperation avec les pays en zone mediterraneenne sont suggeres.

1471 Pal, SK.; Kaur, J.; Thakur, R.; Verma, UN.; Singh, MK. (1996) **EFFECT OF IRRIGATION, SEEDING DATE AND FERTILIZER ON GROWTH AND YIELD OF WHEAT (TRITICUM AESTIVUM).** *Indian Journal of Agronomy. 41(3):386-389.* English. [BIRSA AGR UNIV DEPT AGRON RANCHI 834006 BIHAR INDIA].

A field experiment was conducted during the winter season of 1992-93 and 1993-94 on sandy loam soil of Ranchi, to study the effect of irrigation, seeding date and fertilizer on growth and yield of wheat (Triticum aestivum L. emend. Fiori & Paol.). Wheat crop receiving 4 irrigation maintaining higher leaf-area index (LAI), dry matter, crop-growth rate (CGR) and net assimilation rate (NAR) resulted in 43 and 14% more grain yield than 2 (22.32 q/ha) and 3 irrigations (27.86 q/ha) respectively. Timely-seeded crop (24 November) also recorded higher LAI, dry matter and CGR and gave 39% more grain yield than late seeding 18 December (22.85 q/ha). Seeding beyond 24 November reduced the grain yield by 37.5 kg/ha/day. Similarly, crop grown with 100% recommended fertilizer having higher LAI, NAR and dry-matter accumulation rate gave 35% more grain yield than 50% recommended fertilizer (23.31 q/ha). [References: 5].

1472 Pecio, A. (1995) **[Studies on the spring barley plant and canopy model]. Studia naad modelem rosliny i lanu jeczmienia jarego.** Instytut Uprawy Nawozenia i Gleboznawstwa, Pulawy (Poland). Zaklad Uprawy Roslin Zbozowych.. *Instytut Uprawy Nawozenia i Gleboznawstwa. Seria R (Poland); no. 325 84 p.* Instytut Uprawy Nawozenia i Gleboznawstwa. 19 fig., 22 tables; 91 ref. Polish. (AGRIS 97-001406).

The purpose of the study was to estimate the range of yield components, canopy architecture traits and productivity of 2-row spring barley varieties Apex and Bielik, cultivated under various light conditions, caused by sowing time and sowing rate and to define the optimal plant and canopy model for the conditions. The seeds were sown in both optimal and 3 weeks delayed sowing dates with four different sowing rates 200, 300, 400 and 500 seeds per one sq. meter.

1473 Pedersen, J.B. (1996) **[Survey 1995, B: Cultivation and varieties of cereals]. Oversigt 1995, B: Kornsorter og korndyrkning.** Landsudvalget for Planteavl, Aarhus (Denmark). *Oversigt over Landsforsoegene (Denmark) (no.1995) p. 17-61.* 4 ill., 63 tables. Danish. (AGRIS 97-001558).

1474 Peterson, CJ.; Moffatt, JM.; Erickson, JR. (1997) **YIELD STABILITY OF HYBRID VS PURELINE HARD WINTER WHEATS IN REGIONAL PERFORMANCE TRIALS.** *Crop Science. 37(1):116-120.* English. [UNIV NEBRASKA USDA ARS DEPT AGRON LINCOLN, NE 68583 USA].

Hybrid hard winter wheats (Triticum aestivum L.) have shown superior grain yield potential in regional performance trials during the last decade. Evidence for enhanced yield stability, combined with enhanced yield potential, would facilitate wider acceptance of hybrid wheat by growers. Hybrid and pureline yield stability and environmental responsiveness were compared with the use of data from the Southern Regional Performance Nursery (SRPN), 1990 through 1995, and Agripro Standard Variety Trial (SVT), 1993 and 1994. Hybrid and pureline yields were regressed on an environmental index based on location mean yields for purelines, and response slope and deviations were calculated. Analyses

were conducted separately for each nursery, as hybrid and pureline entries varied. Hybrids showed significantly higher mean yields compared with purelines and the yield advantage generally increased with increasing environmental yield potential. Average regression slope for hybrids was significantly higher (1.09-1.12) than for purelines (1.0) in the 1994 and 1995 SRPN and 1993 and 1994 SVT. Hybrid slopes were not significantly different from those for purelines in the 1990 through 1993 SRPN, where they ranged from 1.0 to 1.07. There was no crossover in yield response between hybrids and purelines at lower yield levels. Deviations from regression were of similar magnitude for hybrids and purelines. Confidence intervals for hybrid and pureline regressions generally overlapped throughout the observed yield ranges in the SRPN. In the 1993 and 1994 SVT, hybrid and pureline confidence intervals diverged as environmental yield potential increased. Compared with pureline cultivars, hybrid wheats have potential for enhanced mean yield and greater yield response to favorable environmental conditions with similar deviations from expected response. [References: 10].

1475 Porceddu, E. (University of Tuscia, Viterbo (Italy). Dep. of Agrobiology and Agrochemistry) (1995) **[Durum wheat quality in the Mediterranean countries]. La qualite du ble dur dans les pays mediterraneens.** Seminar on Durum Wheat Quality in the Mediterranean Region. Zaragoza (Spain). 17-19 Nov 1993. Durum Wheat Quality in the Mediterranean Region. La Qualite du Ble Dur dans la Region Mediterraneenne. Fonzo, N. di (Istituto Sperimentale per la Cerealicoltura, Foggia (Italy). Sezione Operativa di Foggia); Kaan, F. (INRA, Institut National de la Recherche Agronomique, Mauguio (France). Station de Genetique et d'Amelioration des Plantes. Domaine de Melgueil); Nachit, M. (ICARDA, International Center for Agricultural Research in the Dry Areas, Aleppo (Syria)). *Options Mediterraneennes. Serie A: Seminaires, mediterraneens (CIHEAM); no. 22 p. 11-21.* CIHEAM-IAMZ. 75 ref. English. (AGRIS 97-001174).

La qualite technologique du ble dur englobe toute une serie de caracteristiques qui vont du rendement semoulier jusqu'a l'aptitude a la transformation de la semoule en pates. Le propos de cet article est de definir les caracteristiques du grain qui influent sur ces aspects. Le rendement semoulier est une combinaison du calibre, des proprietes intrinseques et de la teneur en cendres. La qualite pastiere peut etre consideree du point de vue soit visuel soit culinaire. L'aspect visuel tient compte de la couleur de la pate, qui est due a la combinaison de deux composantes : les couleurs jaune et brune. La couleur jaune est une fonction de la teneur en carotenoides et de l'activite de lipoxygenase, tandis que la couleur brune est attribuee a la peroxydase et a la polyphenoxydase. La qualite culinaire est associee aux proprietes du gluten. La teneur en proteines peut expliquer 30-40 pour cent de la variabilite de la qualite culinaire, mais le type de proteine a un fort effet sur la qualite. Cet article passe egalement en revue les composants de la proteine, les composantes gliadine et glutenine, et l'association de gamma 42 et 45, et deux des hauts poids moleculaires (HMW) et des composantes amylacees est egalement discute.

1476 Ruzha, A. (Latvian University of Agriculture, Jelgava (Latvia)) (1996) **[Grain quality standards]. Graudu kvalitates standarti.** *Latvijas Lauksaimnieks (Latvia) (no.7) p. 6-8.* Latvian. (AGRIS 97-001374).

The recently introduced new normative and methodical grain standards including the determination of grain quality indices, equipment and working methods are discussed. The normative standards determining quality requirements for each grain crop on the market are analysed for rye, wheat, barley and oats. The requirements of the Social Welfare Ministry relating to the content toxic and radioactive elements, micotoxins and pesticides in grain are emphasized.

1477 Sandhu, K.S. (Punjab Agricultural Univ., Ludhiana (India). Dept. of Soils); Benbi, D.K.; Prihar, S.S. (1996) **Dryland wheat yields in relation to soil organic carbon, applied nitrogen, stored water and rainfall distribution.** *Fertilizer Research (Netherlands) v. 44(1) p. 9-15.* 28 ref. English. (AGRIS 97-016672).

1478 Sayre, KD.; Rajaram, S.; Fischer, RA. (1997) **YIELD POTENTIAL PROGRESS IN SHORT BREAD WHEATS IN NORTHWEST MEXICO.** *Crop Science. 37(1):36-42.* English. [ACIAR GPO BOX 1571 CANBERRA ACT 2601 AUSTRALIA].

Germplasm from the spring wheat (Triticum aestivum L.) breeding program at the International Center for Improvement of Maize and Wheat (CIMMYT) has had a major impact on the yield of irrigated spring wheats in most developing countries in the past 30 yr. The rate and nature of yield potential progress in this germplasm was measured comparing eight outstanding short cultivars released in northwest Mexico between 1962 and 1988. They were grown under irrigation and optimal management, including disease and lodging protection, in each of six winter growing seasons (1989-1990 to 1994-1995) at the CIANO (Centro de Investigaciones Agricolas del Noroeste) experiment station in Sonora, Mexico. There were highly significant effects of cultivar on grain yield, and, although cultivar x year interaction was significant, there were Few significant crossover interactions between pairs of genotypes and years in the grain yield data set. Yield averaged across the 6 yr increased linearly from 6680 kg ha(-1) for the earliest cultivar, Pitic 62, to 8475 kg ha(-1) for Bacanora 88, the latest. The rate of progress against year of release was 67 kg ha(-1) yr(-1) ($r = 0.99$, $P < 0.001$), or 0.88% per year. Grain yield progress was correlated with kernel number per square meter ($r = 0.84$, $P < 0.01$) and harvest index ($r = 0.81$, $P < 0.02$), but not with total biomass production, kernel weight, days to anthesis, spikes per square meter, or kernels per spike. Thus linear progress in yield within short germplasm has continued at least until the late 1980s, and the yield components studied did not indicate any clear direction for future progress, apart from that suggested by the strong relationships between grain yield and harvest index and grain yield and kernels per square meter, as has been seen in most studies of yield progress in cereals. [References: 19].

1479 Sharma, BD.; Kar, S.; Sarkar, S. (1997) **CALIBRATION OF A WATER UPTAKE SIMULATION MODEL UNDER VARYING SOIL MOISTURE REGIME AND NITROGEN LEVEL FOR WHEAT CROP.** *Agricultural & Forest Meteorology. 83(1-2):135-146.* English. [PUNJAB AGR UNIV DEPT SOIL SCI LUDHIANA 141004 PUNJAB INDIA].

Crop production is directly related to the time-depth status of soil water which is often predicted with the help of a simulation model avoiding time-consuming deterministic procedures. In the present study, the accuracy of a mathematical simulation model has been tested by comparing the simulated profile water content with its measured counterpart in a field experiment conducted with winter wheat on a sandy loam soil (Typic Ustipsamment). Wheat crop was grown under two soil water regimes, monitored by applying irrigation at 1.2 (wet, W) and 0.6 (dry, D) ratios of irrigation water to cumulative pan evaporation and at two levels of nitrogen: high, (120 kg ha(-1), N) and low (60 kg ha(-1), N). The calibration studies indicated high dependency of the simulation model on the depth of rooting used as an input parameter. The matching between simulated and measured profile water content was better when penetration depth of wheat roots was less than 0.6 m. Predictability of the model was found to be high under wet soil moisture regime and at low level of fertilizer nitrogen. [References: 26].

1480 Sharma, V.; Angiras, NN. (1996) **EFFECT OF ROW ORIENTATIONS, ROW SPACINGS AND WEED-CONTROL METHODS ON LIGHT INTERCEPTION, CANOPY TEMPERATURE AND PRODUCTIVITY OF WHEAT (TRITICUM AESTIVUM).** *Indian Journal of Agronomy. 41(3):390-396.* English. [HIMACHAL PRADESH KRISHI VISHVAVIDYALAYA DEPT AGRON PALAMPUR 176062 HIMACHAL PRADES INDIA].

A field experiment was conducted during winter (rabi) season of 1988-89 and 1989-90 to study the effect of row orientations, row spacings and weed-control methods on light interception, canopy temperature and productivity of wheat (Triticum aestivum L. emend. Fiori & Paol.) It was laid out in split-plot design with 3 replications by keeping the combinations of 3 row orientations (N-S, E-W acid bi-directional) and 2 row specings (15 and 20 cm)+ broadcast sowing in main plots and 4 weed-control, treatments (unweeded check, isoproturon 0.75 kg/ha, isoproturon 1.50 kg/ha and hand-weeding twice) in sub-plots. Bi-directional row orientation resulted in increased light interception which increased the crop yields because of higher photosynthetic activity. Between spacings, 15 cm spacing was found superior to 20 cm spacing in intercepting light, decreasing canopy temperature and increasing the grain yield of wheat. Control of weeds with chemical and physical methods increased the canopy temperature than unweeded check at bottom of canopy, but reverse was the trend at top of canopy. The canopy temperature below middle of canopy was higher by 4.43-5.40 degrees C over the air temperature in effective weed-control treatments. The canopy temperature in bidirectional row orientation was higher at top and middle and was lower at the bottom the crop canopy in comparison to the unidirectional

row orientations. The total light interception and light interception below middle of canopy was higher in unweeded than other weed-control treatments. [References: 5].

1481 Shatilov, I.S.; Borisov, V.M.; Silin, A.D. (1995) **[Specific features in yield formation of spring barley with different sowing dates in northern regions of Chernozem zone [Russian Federation]]. Osobennosti formirovaniya urozhaya yarovogo yachmenya pri raznykh srokakh seva v severnykh rajonakh chernozemnoj zony.** *Izvestiya Timiryazevskoj sel'skokhozyajstvennoj akademii (Russian Federation) (no.1) p. 34-39.* Russian. (AGRIS 97-001407).

Experiments with the new barley variety Zazersky 85 were conducted in 1991-1993 on the fields of Turgenev collective farm and of SC Borisoglebskoje, Sverdlovsky region, Orlovsky district. Barley was sown 8 times with 5 days' interval. If sowing was 24 hours late, the yield of barley was lower by 0.59-1.52 centners/ha. On the basis of the data obtained mathematical models which may be used in forecasting the yield of barley sown in different time have been developed. The models identify the real yield to better than 95 accuracy.

1482 Siddique, M. (University of Agriculture, Faisalabad (Pakistan)); Musa, M. (Barani Agricultural Research Inst., Chakwal (Pakistan)); Nazir, M.S.; Ali, A. (1995) **Effect of planting techniques on growth and yield of wheat.** *Journal of Agricultural Research (Pakistan) v. 33(1) p. 1-5.* 2 tables, 7 ref. English. (AGRIS 97-016677).

A field study comprising different planting techniques viz. 30 and 40 cm apart single rows, 30 and 40 cm apart bi-directional rows, 45 and 60 cm spaced double-row strips, 60 and 80 cm triple-row strips, 75 and 100 cm spaced quadruple-row strips, was conducted at University of Agriculture, Faisalabad during 1986-87 and 1987-88. Uniform seed rate (100 kg/ha) was used in all the treatments. Significantly higher grain yield (4379 kg/ha) was recorded in 30 cm spaced bi-directional planting system followed by 40 cm spaced bi-directional (4090 kg) and 45 cm spaced double-row strip planting techniques (4074 kg/ha). Whereas, triple and quadruple-row strip planting techniques produced significantly lower grain yield than single row planting technique.

1483 Simmelsgaard, S.E.; Andersen, M.N. (1995) **The influence of nitrogen and water availability on crop yield variation.** Site Specific Farming. Aarhus (Denmark). 20-21 Mar 1995. *SP Report, 26: Proceedings of the seminar on site specific farming. Olesen, S.E. (ed.). Statens Planteavlsforsoeg, Foulum (Denmark) p. 99-109.* SP. 7 ill., 2 tables; 15 ref. English. (AGRIS 97-001554).

1484 Sinclair, TR.; Bai, Q. (1997) **ANALYSIS OF HIGH WHEAT YIELDS IN NORTHWEST CHINA.** *Agricultural Systems. 53(4):373-385.* English. [UNIV FLORIDA USDA ARS DEPT AGRON AGRON PHYSIOL LAB IFAS BLDG 164 POB 110840 GAINESVILLE, FL 32611 USA].

Grain yields of over 14 Mg ha(-1) were reported in 1978 for spring wheat (Triticum aestivum L.) grown in Northwest China. Understanding the circumstances under which this record yield was achieved may be useful in defining the key factors that lead to high grain yields and in determining the limits to wheat yield. A relatively simple, mechanistic model was used in an effort to simulate the record yield. The model was used as a framework in which various crop traits could be adjusted to match the observed crop growth. The weather that was characterized by cool temperatures and high levels of solar radiation, proved to be especially important in allowing a full-season crop to achieve record yields. Variables defining plant development in the model also had to be set to describe the high yielding cultivar grown in China. Leaf development was defined by the length of a phyllochron, which was set equal to 78 TU (thermal units, base temperature equal to 0 degrees C) based on independent data. The description of grain fill had to be defined to match simulation results with the observations. Two variables, length of the grain-fill period and the grain growth rate, were set in response to the unique traits of this cultivar and the low temperatures during grain development. These simulations led to important suggestions for examining the interaction between cool temperature regimes and developmental traits of wheat cultivars. (C) 1997 Published by Elsevier Science Ltd. [References: 7].

1485 Singh, B.; Jadhav, Capt. K.L.; Paljor, E. (Diffence Research and Development Organization, C/O 56 APO (India)) (1995) **Huskless barley: steps to improve productivity in colddesert of Ladakh.** *Indian Farming (India) v. 45(5) p. 15-17.* 1 table; 1 ill. English. (AGRIS 97-001405).

1486 Singh, JP.; Sharma, SK.; Singh, N. (1996) **EFFECT OF TIME, GEOMETRY, WHEAT (TRITICUM AESTIVUM) AND LEGUME INCORPORATION ON YIELD OF PLANTED CROP OF SUGARCANE (SACCHARUM OFFICINARUM).** *Indian Journal of Agronomy. 41(3):507-509.* English. [PROJECT DIRECTORATE CROPPING SYST RES MEERUT 250110 UTTAR PRADESH INDIA].

1487 Smit, N.S. (Eastern Cape Department of Agriculture and Land Affairs, Cradock (South Africa). Agricultural Development Centre) (1996) **[Cultivation of Triticum durum in the Fish River Valley [South Africa]]. Verbouing van durumkoring in die Visriviervallei.** *Dohne Bulletin (South Africa) v. 5(1) p. 6-8.* Afrikaans. (AGRIS 97-001566).

1488 Stefanic, J.; Stefanic, E. (Josip Juraj Strossmayer Univ., Osijek (Croatia). College of Agriculture); Pavlovic, M. (Ljubljana Univ. (Slovenia). Biotechnical Fac., Agronomy Dept.) (1996) **Economic effect of buckwheat production in eastern Croatia.** *Zbornik Biotehniske fakultete Univerze v Ljubljani (Slovenia). Kmetijstvo (no.67) p. 253-258.* 4 tables; 1 ill., 12 ref. English. (AGRIS 97-001340).

Buckwheat production is currently of marginal significance in Croatian agriculture. Current practice in financial analysis on collective farms in Croatia takes into consideration physical indicators of production and financial results based on total costs calculation. Results of such analysis can generate a distorted picture of the impact of buckwheat production. However, double cropping buckwheat with wheat has the potential to improve the aggregate farm financial result. Taking into consideration the importance of weed management, buckwheat's low fertilizer requirements, crop rotation and proper financial analysis, buckwheat production can be successfully adopted into a farm enterprise portfolio. An example of "PP FERICANCI" illustrates that buckwheat production can generate positive gross margins in Eastern Croatia.

1489 Stein, M.; Kuehne, S. (1996) **[Replanting of border structures by initial seeding of wild flower species and natural regreening under the aspect of fostering beneficial organisms]. Neuanlage von Saumstrukturen durch Wildkraeuteransaat und Selbstbegruenung unter dem Aspekt der Nuetzlingsfoerderung. 2.** Wissenschaftliche Jahrestagung. Berlin (Germany). 1-2 Nov 1995. *[Contributions to the ecology of agricultural landscapes in Brandenburg - problems and approaches. Second scientific annual conference of the Faculty's focus Ecology of Agricultural Landscapes, 1-2 Nov 1995]. Hoffmann, H. (ed.). Beitraege zur Oekologie der Agrarlandschaften in Brandenburg - Probleme und Loesungsansaetze. 2. Wissenschaftliche Jahrestagung des Fakultaetsschwerpunktes Oekologie der Agrarlandschaften, 1. und 2. November 1995Oekologische Hefte der Landwirtschaftlich-Gaertnerischen Fakultaet, Humboldt-Universitaet (Germany); no. 4. Biologische Bundesanstalt fuer Land- und Forstwirtschaft, Kleinmachnow (Germany). Inst. fuer Integrierten Pflanzenschutz p. 101-105.* Humboldt-Universitaet zu Berlin. German. (AGRIS 97-016670).

1490 Subedi, K.D.; Budhathoki, C.B.; Subedi, M. (Lumle Agricultural Research Centre, Pokhara, Kaski (Nepal)) (1996) **Overview of the wheat sterility problem and research findings in the western hills of Nepal.** *LARC Seminar Paper (Nepal); no. 96/4 13 p.* Lumle Agricultural Research Centre. 3 tables; 27 ref. English. (AGRIS 97-001563).

The extent of wheat sterility in the western hills of Nepal, and possible causes of sterility, are reviewed. The sterility problem has been increasingly observed both in the rice-wheat system in irrigated lands, and the rainfed maize-wheat system in the uplands. Losses can be as high as 98 percent under severe conditions. Although the problem is caused by several environmental factors in various combinations, low available boron, and low temperatures during the flowering period, have been established as the two most important factors. Boron availability is thought to be affected by several other factors such as water stress, and low nutrition, particularly nitrogen. Great genotypic variation in tolerance of boron deficiency and cool temperatures has been found. However, none of the tested genotypes were suitable under both conditions. Genotypes tolerant to cool temperatures were highly susceptible to boron deficiency and vice versa. Understanding the critical low temperatures that cause sterility, and the interactions between various factors affecting boron availability, are suggested as new avenues for researching this problem. Development of variety tolerant to low boron and low temperature could be one option to overcome the problem.

1491 Tatnell, J.A. (Ciba Agriculture, Whittlesford, Cambridge CB2 4QT (United Kingdom)) (1995) **The relationship between height reduction, lodging control and yield in winter barley following use of trinexapac-ethyl. vol. 2.** *Brighton crop protection conference: weeds. Proceedings of an international conference, Brighton, UK, 20-23 November 1995. p. 635-640.* British Crop Protection Council. 6 ref. English. (AGRIS 97-001488).

1492 Tesema Zewdu; Getnet Asefa; Yohanes Terefe (IAR, Addis Abeba (Ethiopia)) (1995) **Effect of undersowing of annual forage legumes and fertilization on wheat grain, straw and forage production at Adet.** 3. National Conference of the Ethiopian Society of Animal Production. Addis Abeba (Ethiopia). 27-29 Apr 1995. *Third National Conference of the Ethiopian Society of Animal Production. Ethiopian Society of Animal Production, Addis Abeba (Ethiopia) p. 245-249.* ESAP. 5 tables; 6 ref. English. (AGRIS 97-001559).

Annual forage legumes were undersown with cereals to assess the effect of legumes on the yield of cereals straw and grain. This paper summarizes results of this undersowing trial conducted at Adet in 1992 and 1993. Three Trifolium spp. (T. quartinianum, T. rueppellianum, T. steudinari) and Medicago tracatula were successfully established when undersown at the booting stage of wheat (i.e., 50-55 days after planting wheat) without affecting the wheat grain and straw yield and gave substantial herbage yield. There was highly significant difference (p less than 0.01) among fertilizer levels on the grain and straw yield of wheat. However, a significant effect (p greater than 0.05) was not responded on the grain and straw yield of wheat by the undersown legumes. Forage legumes grown in association with improved wheat variety did not cause a reduction in wheat grain yield, but the system significantly increased total fodder yield compared with wheat grown in a pure stand. The results indicated that grain and straw yield of wheat responded significantly to fertilizer levels and the highest yield of 34.8 and 45.9 q ha-1, respectively, were obtained using 92/46 kg ha-1 of N/P2O5 for a period of two years.

1493 Tokes, G. (Fovarosi Novenyegeszsegugyi Allomas, Budapest (Hungary)); Bagyinka, T. (Bekes Megyei Novenyegeszsegugyi es Talajvedelmi All., Bekescsaba (Hungary)) (1996) **[Sensitivity to etephon-ccc regulators of cereal varieties grown in Hungary. 1. Part Winter wheat]. Magyarorszagon termesztett kalaszos gabonafajtak erzekenysege az etefon-ccc alapu regulatoros beavatkozasra 1. resz Oszi buza.** *Novenyvedelem (Hungary) v. 32(2) p. 57-65.* Hungarian. (AGRIS 97-001562).

In a three-year-study 70-80 winter wheat varieties were evaluated for their response to treatment with Flordimex T. Extra (600g/l etephon) + Bercema CCC (500 g/l chloromequat) at rates of 0, 8 + 0, 4 l/ha were found to be the best for the purpose. The weather in the years of the trial was very different from each other, so during 1990 with favourable, 1991 with average rainfall conditions, and in the very drought of 1992 the response of varieties could be compared under different ecological conditions. A new assessment system was worked out for the determination of efficacy and sensitivity, taking changes in plant height, lodging and yield into consideration: the "regulator effect index" and the "relative sensitivity". Values in points of each variety are shown in the tables, from which responses observed in the particular years can be seen. In the favourable, rainy season of 1990 plant height and lodging were decreased by the treatments with the majority of wheat varieties. Yields increased by 5 percent in the average of all the varieties. At about the half of the varieties yields were significantly higher, by 850 kg/ha (13, 4 percent). Under unfavourable, though not dry weather conditions of 1991 no lodging was observed, but even in this case yields increased by 7, 7 percent with almost the half of the varieties, however, in the average of all the varieties, yields were higher only by 2.1 percent. In the drought of 1992 yields increased with a quarter of the varieties, among them the durum ones responded very well this time, too, as in the other years. Under such conditions frequency of sensitivity classes moved from medium values to extreme ones (unsensitive and extremely sensitive). Yields decreased only with 12 varieties being unimportant comparing to the total number of varieties. It was concluded that treatments with the above regulators can be introduced in Hungary from 1996 at a low risk and expecting good results, taking response of varieties into consideration.

1494 Tonev, T.; Shchereva, L. (Institut po Pshenitsata i Sl"nchogleda "Dobrudzha", General Toshevo (Bulgaria)) (1996) **[Results of growing wheat in long-term monoculture and two-field in 1983-1992 period]. Rezultati ot otglezhdane na pshenitsa v prod"lzhitelna monokultura i dvupolka za perioda 1983-1992 godina.** Selskostopanska Akademiya, Sofia (Bulgaria). *Pochvoznanie, Agrokhimiya i Ekologiya (Bulgaria). Soil Science, Agrochemistry and Ecology v. 31(1) p. 29-33.* 1 ill., 5 tables; 17 ref. Bulgarian. (AGRIS 97-016668).

1495 Tongoona, P. (The University of Zimbabwe, Harare (Zimbabwe). Dept. of Crop Science) (1993) **A note on the effects of awn removal on seed yields and seed weight of four wheat (Triticum aestivum L.) cultivars grown at three levels of moisture potential.** The University of Zimbabwe, Harare (Zimbabwe). Dept. of Crop Science. *The Zimbabwe Journal of Agricultural Research (Zimbabwe) v. 31(1) p. 23-26.* 2 tables; 9 ref. English. (AGRIS 97-016288).

1496 Trentesaux, E. (BSN Groupe, Marseille (France). CRECERPAL, Centre de Recherche Europeen Cereales, Riz et Pates alimentaires) (1995) **[Evaluation of durum wheat quality]. Evaluation de la qualite du ble dur.** Seminar on Durum Wheat Quality in the Mediterranean Region. Zaragoza (Spain). 17-19 Nov 1993. Durum Wheat Quality in the Mediterranean Region. La Qualite du Ble Dur dans la Region Mediterraneenne. Fonzo, N. di (Istituto Sperimentale per la Cerealicoltura, Foggia (Italy). Sezione Operativa di Foggia); Kaan, F. (INRA, Institut National de la Recherche Agronomique, Mauguio (France). Station de Genetique et d'Amelioration des Plantes. Domaine de Melgueil); Nachit, M. (ICARDA, International Center for Agricultural Research in the Dry Areas, Aleppo (Syria)). *Options Mediterraneennes. Serie A: Seminaires mediterraneens (CIHEAM); no. 22 p. 53-59.* CIHEAM-IAMZ. Annexes; 2 tables; 26 ref. French. (AGRIS 97-001178).

Les methodes d'evaluation de la qualite du ble dur ont ete considerees du point de vue organoleptique par le consommateur final de la pate alimentaire qui est issue du ble, c'est-a-dire l'aspect avant cuisson et la tenue apres cuisson. Apres avoir recense les principales methodes utilisees, l'auteur a effectue une etude critique. Il apparait que la couleur d'une pate est essentiellement une composante phenotypique du ble mis en oeuvre, tandis que la qualite culinaire est une composante varietale et de la contenance en proteines.

1497 Vandenboogaard, R.; Veneklaas, EJ.; Lambers, H. (1996) **THE ASSOCIATION OF BIOMASS ALLOCATION WITH GROWTH AND WATER USE EFFICIENCY OF TWO TRITICUM AESTIVUM CULTIVARS.** *Australian Journal of Plant Physiology. 23(6):751-761.* English. [UNIV UTRECHT DEPT PLANT ECOL & EVOLUTIONARY BIOL NL-3508 TB UTRECHT NETHERLANDS].

We investigated traits that might improve performance of wheat (Triticum aestivum L.) in a dry environment, and examined if the response to drought is different for cultivars with a contrasting biomass allocation pattern, using two cultivars with either a high (Katya) or small (Mexipak) proportion of biomass allocated to the leaves. Plants were grown in pots placed in the field, under well-watered conditions and under intermittent drought. Katya allocated a greater proportion of its biomass to both leaves and roots, and a smaller proportion to stems than Mexipak did. The growth rate of Katya was not higher despite a higher investment in leaf area and a slightly higher rate of photosynthesis, possibly due to concomitantly higher respiratory losses. Under well-watered conditions, the efficiency of water use for growth was higher for Katya than for Mexipak, due to a lower water use at a similar growth rate. Differences in water use per plant were determined by the rate of water loss or uptake, rather than by the amount of roots or leaves. A high water use efficiency was independent of growth rate. We conclude that a lower rate of water use due to a lower transpiration per unit leaf area linked with a high leaf area can contribute to improve the performance of wheat cultivars in a water-limited environment. [References: 44].

1498 Vietinghoff, J. (Landesforschungsanstalt fuer Landwirtschaft und Fischerei Mecklenburg Vorpommern, Guelzow (Germany)) (1996) **[Winter-planted malting barley - what has to be observed in spring?]. Winterbraugerste - was ist im Fruehjahr zu beachten?** *Top agrar / Spezial fuer Mecklenburg-Vorpommern, Brandenburg, Sachsen-Anhalt, Sachsen, Thueringen (Germany) (no.3) p. 30-32.* German. (AGRIS 97-016331).

Wird Winterbraugerste auf geeigneten Standorten angebaut und die N-Duengung qualitaetsorientiert bemessen, laesst sich das Produktionsrisiko deutlich eingrenzen. Schon mit durchschnittlichen Ertraegen von ca. 60 dt/ha lassen sich bei niedrigen Kosten ansprechende Deckungsbeitraege erwirtschaften. Fuer Betriebe mit guenstigen Anbauvoraussetzungen ist Winterbraugerste eine empfehlenswerte Alternative. Abbildungen und

Tabellen: 1. Einfluss der N-Duengung auf die Bestandesdichte; 2. Einfluss der N-Duengung auf Ertrag und Rohproteingehalt; 3. Vertikaler Fruchtartenvergleich - Maehdruschfruechte (Ernteertrag, Marktleistung, variable Kosten, Deckungsbeitrag).

1499 Wechsung, F.; Wechsung, G.; Kimball, B.; Pinter, P.; Wall, G.W.; Garcia, R. (1995) **[CO2 fertilizing effects in field trials: Results of a wheat experiment in Maricopa, Arizona, U.S.A.]. CO2- (Duengungs-) effekte im Freilandversuch: Ergebnisse eines Weizenexperiments in Maricopa, Arizona, U.S.A.** Symposium. Berlin (Germany). 31 Mar 1995. *[Climatic changes and agriculture - Interactions, possible developments and the need to act]. Luetteken, A.; Hagedorn, K.; Hoffmann, H. (comps.). Klimaveraenderung und Landwirtschaft - Wechselwirkungen, moegliche Entwicklungen und HandlungserfordernisseOekologische Hefte der Landwirtschaftlich-Gaertnerischen Fakultaet, Humboldt-Universitaet (Germany); . 3. Institut fuer Klimafolgenforschung, Potsdam (Germany); Humboldt-Universitaet, Berlin (Germany). Landwirtschaftlich-Gaertnerische Fakultaet. Inst. fuer Grundlagen der Pflanzenbauwissenschaften. Fachgebiet Bodenkunde und Standortlehre p. 19-35.* Humboldt-Universitaet zu Berlin. German. (AGRIS 97-016671).

1500 Wheeler, T.R.; Ellis, R.H.; Hadley, P.; Morison, J.I.L.; Batts, G.R.; Daymond, A.J. (Department of Agriculture, University of Reading, Earley Gate, Reading RG6 2AT (United Kingdom)) (1996) **Assessing the effects of climate change on field crop production.** *Aspects of Applied Biology (United Kingdom) (no.45) p. 49-54.* 23 ref. Implications of 'Global environmental change' for crops in Europe, 1-3 April 1996, Churchill College, Cambridge, UK. English. (AGRIS 97-001561).

1501 Witt, M.D. (Kansas State University, Garden City, KS.) (1996) **Delayed planting opportunities with winter wheat in the Central Great Plains.** *Journal of production agriculture (USA) v. 9(1) p. 74-78.* references. English. (AGRIS 97-001415).

Winter wheat (Triticum aestivum L.) in the Great Plains is not always planted at the optimum time for a variety of reasons. In order to identify wheat yield and related responses to delayed establishment, sequential monthly plantings from 1 October to 1 April were undertaken during 7 yr, 1985 to 1991, at Garden City, KS. 'TAM 107' was seeded at a constant heavy rate in bordered drill-strip plots in a randomized complete block design. Although considerable variability occurred among years relative grain yield declined with progressive planting dates as follows: 1 October = 100, 1 November = 77, 1 December - 59, 1 January = 57, 1 February = 41, 1 March = 16, 1 April = 0. Wheat planted on 1 April did not joint or form heads due to lack of a 6 wk period with temperatures below 51 degrees F as required for vernalization. Relative to the optimum planting date on 1 October, the wheat planted on 1 March was the last to produce heads and grain and the lowest yielding; had the most delay in heading (26 d later); was the latest to ripen (17 d later) and the shortest statured (5 in. less); produced the smallest seed weight (43 less) and the lowest test weight (21 less); produced the fewest heads per plant (58 fewer), the fewest kernels per head (33 fewer), and the fewest kernels per plant (73 fewer); and had the shortest grain-filling period (9 fewer d). Little variation in stand emergence or number of spikelets per head occurred through the range of planting-opportunity dates. These results provide quantitative criteria to help make cropping decisions relative to delayed planting situations for winter wheat in the Central Great Plains.

1502 Zayas, IY.; Martin, CR.; Steele, JL.; Katsevich, A. (1996) **WHEAT CLASSIFICATION USING IMAGE ANALYSIS AND CRUSH-FORCE PARAMETERS.** *Transactions of the ASAE. 39(6):2199-2204.* English. [USDA ARS GRAIN MKT RES & PROD CTR 1515 COLL AVE MANHATTAN, KS 66502 USA].

A study was conducted to develop methodology for wheat classes and variety identification by combination of image analysis techniques with wheat hardness physical measurements. Wheat kernel morphometrical parameters were extracted from digitized images and hardness parameters were obtained from force-deformation curves from a single kernel wheat characterization system which also provided a kernel weight. Pattern recognition methods were applied to the data base of combined parameters for wheat kernels of six classes and seventeen varieties of soft and hard wheat. Recognition rates for parameter combinations of shape, size, and hardness scores were higher than hardness or imaging alone or when combined with weight. Hard and soft recognition rates of 94% was achieved with shape and hardness of the wheat kernels A PC version of the developed algorithm was written and tested with the same data set. Satisfactory performance in the PC version confirmed the practicality of the method developed. [References: 14].

1503 Zencirci, N.; Aktan, B. (Field Crops Central Research Institute, Ankara (Turkey)) (1995) **[A report on durum wheat quality in Turkey]. Rapport sur la qualite du ble dur en Turquie.** Seminar on Durum Wheat Quality in the Mediterranean Region. Zaragoza (Spain). 17-19 Nov 1993. Durum Wheat Quality in the Mediterranean Region. La Qualite du Ble Dur dans la Region Mediterraneenne. Fonzo, N. di (Istituto Sperimentale per la Cerealicoltura, Foggia (Italy). Sezione Operativa di Foggia); Kaan, F. (INRA, Institut National de la Recherche Agronomique, Mauguio (France). Station de Genetique et d'Amelioration des Plantes. Domaine de Melgueil); Nachit, M. (ICARDA, International Center for Agricultural Research in the Dry Areas, Aleppo (Syria)). *Options Mediterraneennes. Serie A: Seminaires mediterraneens (CIHEAM); no. 22 p. 123-125.* CIHEAM-IAMZ. 3 tables; 1 ref. English. (AGRIS 97-001186).

Le ble dur, en raison de son potentiel de production et d'exportation, est une culture importante en Turquie. La Turquie produit 2, 1-4, 8 millions de tonnes de ble dur; elle consomme 839.000 tonnes de bulghur et 346.000 tonnes de pates; elle exporte 700 tonnes de bulghur et 12.802 tonnes de pates. Pendant ces dernieres annees, la recherche portant sur le ble dur a connu un essor visant a obtenir des cultivars a haut rendement, de bonne qualite, et resistants aux stress biotiques et abiotiques. Le Laboratoire de Qualite a l'Institut Central de Recherches sur les Grandes Cultures agit en tant que laboratoire national et figure comme membre au sein du Reseau Europeen pour le Ble Dur. Ce laboratoire participe aux activites de recherche en identifiant le germoplasme de qualite, en analysant du materiel pour la selection, et en determinant les zones pour la production de ble dur de qualite.

1504 Zencirci, N.; Kun, E. (1996) **VARIATION IN LANDRACES OF DURUM WHEAT (T-TURGIDUM L CONV DURUM (DESF) M K) FROM TURKEY.** *Euphytica. 92(3):333-339.* English. [CENT RES INST FIELD CROPS POB 226 ULUS ANKARA TURKEY].

Durum wheat is historically an important crop in Turkey. Diverse durum wheat germplasm has been recorded many times in Turkish collections. 812 single plant genotypes from 190 durum wheat populations of 23 provinces in Turkey have been studied for number of days to germination, tillering, shooting, heading, maturity, and yield per plant. Variation in samples for traits studied was large enough and subsamples with different characteristics were identified. Grouping samples into provinces and altitudes of origin have revealed that variation in samples existed for some traits depending on province and altitude of origin. Yield per plant were not correlated with any of the developmental stages: but developmental stages were correlated with each other in varying magnitudes. Variation in yield per plant was not explained as well by developmental stages studied under a dry-cold environment. Further studies on samples needed to explore genetic variation more for other traits of economic importance. [References: 7].

F02 PLANT PROPAGATION

1505 Fellers, J.P.; Guenzi, A.C.; Taliaferro, C.M. (Oklahoma State Univ., Stillwater (USA). Dept. of Agronomy) (1995) **Factors affecting the establishment and maintenance of embryogenic callus and suspension cultures of wheat (Triticum aestivum L.).** *Plant Cell Reports (Germany) v. 15(3-4) p. 232-237.* 5 ill., 5 tables; 31 ref. English. (AGRIS 97-016870).

1506 Fischer, C.; Neuhaus, G. (Eidgenoessische Technische Hochschule, Zuerich (Switzerland). Swiss Federal Inst. of Technology, Inst. for Plant Sciences) (1995) **In vitro development of globular zygotic wheat embryos.** *Plant Cell Reports (Germany) v. 15(3-4) p. 186-191.* i ill., 6 tables; 17 ref. English. (AGRIS 97-016868).

1507 Immonen, A.S.T. (International Maize and Wheat Improvement Center, Mexico, D.F. (Mexico)) (1996) **Influence of media and growth regulators on somatic embryogenesis and plant regeneration for production of primary triticales.** *Plant Cell, Tissue and Organ Culture (Netherlands) v. 44(1) p. 45-52.* 37 ref. English. (AGRIS 97-016871).

1508 Kovacs, M.; Barnabas, B.; Kranz, E. (Hungarian Academy of Sciences, Martonvasar (Hungary). Agricultural Research Inst., Cell Biology Dept.) (1995) **Electro-fused isolated wheat (Triticum aestivum L.) gametes**

develop into multicellular structures. *Plant Cell Reports (Germany) v. 15(3-4) p. 178-180.* 1 ill., 1 table; 18 ref. English. (AGRIS 97-016867).

1509 Nobre, J.; Davey, MR.; Lazzeri, PA. (1996) **BARLEY SCUTELLUM PROTOPLASTS - ISOLATION, CULTURE AND PLANT REGENERATION.** *Physiologia Plantarum. 98(4):868-874.* English. [IACR ROTHAMSTED DEPT BIOCHEM & PHYSIOL HARPENDEN AL5 2JQ HERTS ENGLAND].

Many applications of cereal protoplast culture systems are still limited by the difficulties of regeneration from suspension cells which are the usual protoplast source. The objective of the present study therefore was to investigate the conditions for the development of a culture system for protoplasts capable of plant regeneration isolated directly from immmature scutella of barley The procedure developed involves a two-stage pre-culture of scutellar tissue, followed by vacuum infiltration with cell wall degrading enzymes and the culture of alginate-embedded protoplasts. The pre-culture of the scutella and the co-cultivation of protoplasts with nurse cells were the most important factors for the success of the culture system, but several other parameters affecting protoplast yield, viability and sustained division were identified including the developmental stage of the embryo, the use of cold conditioning periods during preculture, the composition of the pre-culture and protoplast culture medium, and the embedding matrix. Protoplasts isolated from scutellar tissues of barley cvs Dissa, Clipper, Derkado and Puffin were capable of sustained division in culture. Macroscopic protoplast-derived tissues were obtained in an cultivars, except cv. Puffin, and fertile plants were regenerated from cvs Dissa and Clipper 3-4 months after protoplast isolation. The procedure described provides a never approach for the isolation of totipotent protoplasts in barley which avoids the need for suspension cultures. [References: 26].

1510 Sharma, V.K.; Rao, A.; Varshney, A.; Kothari, S.L. (Rajasthan Univ., Jaipur (India). Dept. of Botany) (1995) **Comparison of developmental stages of inflorescence for high frequency plant regeneration in Triticum aestivum L. and T. durum Desf.** *Plant Cell Reports (Germany) v. 15(3-4) p. 227-231.* 5 ill., 3 tables; 28 ref. English. (AGRIS 97-016869).

1511 Uppal, S.; Behl, RK.; Mixwagner, G.; Elbassam, N. (1996) **CALLUS INDUCTION AND PLANT REGENERATION FROM EMBRYOS IN BREAD WHEAT (TRITICUM AESTIVUM L) [Review].** *Landbauforschung Volkenrode. 46(4):157-165.* English. [HARYANA AGR UNIV DEPT PLANT BREEDING HISAR HARYANA INDIA].

Plant regeneration through callus cultures obtained using immature embryos in interspecific/intergeneric (Ushiyame et al. 1991, Chen et al. 1992, Girko et al. 1992) and mature embryos in intervarietal crosses (Girko and Voloshehuk, 1991) has far reaching implication in wheat improvement programmes. This is rather pertinent when wheat breeders are confronted with gene flow barriers or limitations of time and space. The success of plant regeneration through embryo cultures is apparently influenced by culture medium and manipulateable genetic factors which can be controlled and environmental factors which can not be controlled. Fortunately a strong inherent interaction among these factors exists which warrants for defining effective embryo culture protocols for accelerating the pace of wheat improvement programme aimed at enlargement of genetic variability (Larkin et al. 1984, Bajaj 1986, Ryan and Scowcroft 1987, Bannikova et al. 1990, Mohmand and Nabors 1990, Sharma et al. 1992, Oberthur et al. 1993), enhancing gene flow from one genetic background to the other and development of wheat genotypes tolerant to abiotic and biotic stresses. This review has provided comprehensive information on plant regeneration through embryo culture and warrants a closer interaction between biotechnologists, plant physiologists, geneticists and wheat breeders. [References: 101].

F03 SEED PRODUCTION

1512 Cockerell, V.; Rennie, W.J. (Official Seed Testing Station for Scotland, Scottish Agricultural Science Agency, East Craigs, Edinburgh EH12 8NJ (United Kingdom)) (1996) **Survey of seed-borne pathogens in certified and farm-saved cereal seed in Britain between 1992 and 1994.** *HGCA Project Report (United Kingdom); no. 124 40 p.* Home Grown Cereals Authority. 34 ref. English. (AGRIS 97-001706).

1513 Milosevic, M. (Naucni institut za ratarstvo i povrtarstvo, Novi Sad (Yugoslavia)) (1995) **[Mycoflora of wheat, barley and corn seeds].** **Mikoflora semena psenice, jecma i kukuruza.** *Zastita bilja (Yugoslavia) v. 46(3) p. 221-227.* 2 graphs; 3 tables; 18 ref. Serbian. (AGRIS 97-001721).

Approximately 1000 samples of wheat, 100 samples of barley and 600 samples of corn seeds were tested for fungi presence. Filter paper method was used for development of genera to which fungi belonged, and nutritive PDA medium for growth and identification of their species. According to the obtained results 21 fungal species from wheat and barley seeds, and 34 from corn seeds were isolated. Fungi belonging to Fusarium genus dominated on wheat and corn seed, and those belonging to Helminthosporium genus dominated on barley seed. So-called "storage fungi" belonging to Penicillium, Aspergillus, Rhizopus and Mucor genera were also present on seeds of all three plant species.

1514 Thiel, W.; Ravekes, J. (Landwirtschaftskammer Weser Ems, Oldenburg (Germany). Inst. fuerPflanzenbau und Pflanzenschutz) (1995) **[Seed quality - requirements rised]. Saatgutqualitaet - Anforderungen weiter erhoeht.** *Landwirtschaftsblatt Weser-Ems (Germany) v. 142(33) p. 23-25.* 3 ill., 1 table. German. (AGRIS 97-016882).

Nach dem bisherigen Kenntnisstand wird der Saatgutverbraucher vermutlich nach wie vor ueberwiegend das mit blauem Etikett gekennzeichnete Z-Saatgut antreffen. Das nach den neuengesetzlichen Regelungen nun moegliche Anerkennung von zertifiziertem Saatgut zweiter Generation (Z2, rotes Etikett) wird wahrscheinlich nur in Ausnahmefaellen in Anspruch genommen werden. Fuer den Saatgutverbraucher bedeutet dies, dass er im Regelfall eine qualitativ etwas verbesserte Ware bekommt. Fuer den Saatgutproduzenten bedeutet dies, dass nicht nur in Einzelfaellender Bereinigungs- und Aufbereitungsaufwand noch gesteigert werden muss.

F04 FERTILIZING

1515 Andrade E, Ricardo Augusto; Hernandez S, Tomas Ignacio (1995) **[Response to agroeconomical parameters and industrial quality of five wheat genotypes of durum wheat (Triticum turgidum var durum) to nitrogen fertilization and water regime]. Respuesta de parametros agroeconomicos y de calidad industrial de cinco genotipos de trigo candeal (Triticum turgidum var durum) a la fertilizacion nitrogenada y regimen hidrico.** Universidad Catolica de Chile, Santiago (Chile). Fac. de Agronomia. 39 ref. 123 p. Spanish. (AGRIS 97-001725).

El objetivo de esta tesis fue evaluar el efecto del N y de dos regimenes hidricos en parametros agronomicos y de calidad industrial en cinco genotipos de trigo candeal (Triticum turgidum var durum), Ambra, Ucaro 1, Chagual, UC 21-D y UC 24-D. Se evaluo: altura de planta, componentes de rendimiento, rendimiento, peso especifico, contenido de proteina, porcentaje de amarengamiento y porcentaje de granos vitreos. El diseno experimental fue de parcelas divididas, en bloques completos al azar, con 4 repeticiones. Las parcelas principales fueron 5 niveles de fertilizacion nitrogenada, 0; 50; 100; 150 y 200 kg.ha-1 de N, aplicados en forma de urea. Cinco genotipos de trigo candeal fueron asignados a las subparcelas. El experimento se realizo bajo dos regimenes de riego: 40 y 80 H.A. La maxima altura promedio se alcanzo con 200 kg.ha-1 de N y criterio de 40 de H.A. Hubo efecto del riego sobre este parametro. La respuesta promedio a la fertilizacion nitrogenada, en ambos regimenes hidricos, de la altura de planta adulta se presento hasta los 100 kg.ha-1 de N. El aumento de espigas por ha, desde 0 a 200 kg.ha-1 de N fue de 25, 3 para 40 de H.A. y de 28, 4 para 80 de H.A. La respuesta promedio a la fertilizacion nitrogenada del numero de espigas por ha fue afectada por el regimen hidrico. El numero de granos por espiga aumenta hasta la dosis de 100 kg.ha-1 de N. La respuesta de este parametro a la fertilizacion nitrogenada esta influenciada por el regimen hidrico. Bajo el criterio de riego de 40 de H.A, solo los primeros 50 kg.ha-1 de N aumentaron el peso de mil granos. Al disminuir la frecuencia de riego no hay efecto del N sobre el peso de mil granos. El rendimiento presento un efecto significativo a la fertilizacion nitrogenada. En cuanto al regimen hidrico, el mayor rendimiento se obtuvo con el criterio de riego de 80 de H.A. Los porcentajes de granos amarengados disminuyo notoriamente al aumentar la fertilizacion nitrogenada. Bajo ambas frecuencias, los menores valores se obtuvieron con 200 kg.ha-1 de N. En todas las dosis de nitrogeno se observaron los menores porcentajes de granos amarengados al regar con un criterio de riego de 80 de H.A. El mejoramiento de la calidad industrial del trigo candeal esta ligado a la disminucion de la frecuencia de riego y al aumento de la fertilizacion nitrogenada.

1516 Ayuso, M.; Hernandez, T.; Garcia, C. (1996) **EFFECT OF HUMIC FRACTIONS FROM URBAN WASTES AND OTHER MORE EVOLVED ORGANIC MATERIALS ON SEED GERMINATION.** *Journal of the Science of Food & Agriculture. 72(4):461-468.* English. [CSIC CEBAS DEPT SOIL & WATER CONSERVAT & ORGAN EASTE MANAGEM POB 4195 MURCIA 30080 SPAIN].

The effect of different amounts of humic fractions obtained from urban wastes (sewage sludge and compost) on seed germination (barley, watercress and tobacco) has been compared with that of humic derived from more evolved organic materials (leonardite and peat) and a commercial humic acid fractions. Results demonstrated that the humic fractions from urban wastes had a more irregular effect on seed germination than those proceeding from more humified organic materials. Humic substances had a more positive effect on germination than humic acids, those effects depending on the nature of the original organic materials. The stability of the original organic materials (urban wastes or evolved organic materials) was a determinant factor of the behaviour of humic fractions on the germination process. [References: 14].

1517 Ayuso, M.; Hernandez, T.; Garcia, C.; Pascual, JA. (1996) **A COMPARATIVE STUDY OF THE EFFECT ON BARLEY GROWTH OF HUMIC SUBSTANCES EXTRACTED FROM MUNICIPAL WASTES AND FROM TRADITIONAL ORGANIC MATERIALS.** *Journal of the Science of Food & Agriculture. 72(4):493-500.* English. [CSIC CEBAS DEPT SOIL & WATER CONSERVAT & ORGAN WASTE MANAGEM POB 4195 MURCIA SPAIN].

The effect on barley growth of humic substances extracted from municipal wastes with different degree of stability was studied. This effect was compared with that of the humic substances extracted from organic materials used in industry to obtain humic acids (peat and leonardite). The humic substances extracted from municipal wastes had higher aliphatic character, lower oxygen group content and a more heterogeneous composition than the humic substances from peat and leonardite. All humic substances, regardless of their origin, nature and characteristics increased plant yields (from 38 to 62% of the increase) and macronutrient absorption with respect to the control when they were added at different amounts (5, 100 and 200 mg C kg(-1)) to a calcareous soil. This increase was highest with the humic substances from municipal wastes, which in turn had the greatest positive effect on the absorption of nitrogen and phosphorus up to 74% increase of N and 72% increase P with sewage sludge HS at 200 mg C kg(-1) by barley plants. [References: 29].

1518 Balyan, JS. (1996) **RESPONSE OF PEARL MILLET (PENNISETUM GLAUCUM) TO APPLIED NITROGEN AND STOVER MANAGEMENT ON SUCCEEDING WHEAT (TRITICUM AESTIVUM).** *Indian Journal of Agronomy. 41(3):364-367.* English. [INDIAN AGR RES INST DIV AGRON NEW DELHI 110012 INDIA].

The data of a 2-year field experiment showed that grain yield of pearl millet [Pennisetum glaucum (L.) R. Br. emend. Stuntz] was increased by 5.3 q/ha owing to increasing N level by 120 kg/ha, whereas grain yield of succeeding wheat (Triticum aestivum L. emend. Fiori & Paol.) was increased by 4.9 and 3.6 q/ha owing to higher dose of N applied to pearl millet and incorporation of pearl millet stover 10 tonnes/ha respectively. All the growth parameters responded to residual effect of applied N and pearl millet stover management. [References: 6].

1519 Becker, KW.; Bruss, A. (1996) **EFFECTS OF LONG-TERM FERTILIZER N REDUCTION ON WINTER GRAIN AND SUGAR BEET YIELDS.** *Journal of Agronomy & Crop Science-Zeitschrift fur Acker und Pflanzenbau. 177(5):339-354.* English. [INST BODENWISSENSCH VON SIEBOLD STR 4 D-37075 GOTTINGEN GERMANY].

The results of recent filed experiments concerning the effect of long-term N-reduction on the yield and quality of sugar beet, winter wheat and winter barley on plots which had previously had received ample amounts of N are studied in this paper. The yield and quality of crops harvested on plots where N-dressings had been reduced for 6-8 years were similar to those of crops grown on plots where N-application had been reduced for only 1 year. Grain yield of winter wheat and winter barley grown without any N-application decreased to about 60% of amounts normally harvested under local conditions with recommended N dressing, whereas the white sugar yield still remained at 90%. The yields decreased slightly with an increase in the duration of the experiments. Yields of both cereals and beets remained constant within each level of fertilization, even 6 years after inition of trials with 50, 75 and 125% of locally recommended N dressings. On plots that did not receive nitrogen fertilization, N-contents of grain were between 1.5 and 1.7% for winter wheat and 1.0 and 1.6% N for winter barley. These contents remained constant over a trial period of 6 years. The amount of annual export of 55-91 kg N/ha also remained constant. Limited N availability causes a decrease in grain protein content rather that in grain yield. Compared to winter grain species, sugar beet (with 74-117 kg N/ha in the beet body) could realize the highest annual export of nitrogen for the plot. Differences in annual N export existing between the various locations of the plots cannot be explained by differences in soil quality. Continuous high yields that were found even without any N-dressings may be explained by asymbiotic N-fixation, deposition of atmospheric N and a progressive decrease in soil N with 17-56 kg N/ha removed from soil resources annually. [References: 22].

1520 Bhogal, A. (Nottingham Univ., Loughborough, Leics. (United Kingdom). Dept. of Physiology and Environmental Science); Young, S.D.; Ralph, R.; Bradley, S.; Craigon, J. (1996) **Modelling the residual effects of phosphate fertilizer in the Ropsley (United Kingdom) field trial 1978-1990.** *Fertilizer Research (Netherlands) v. 44(1) p. 27-36.* 16 ref. English. (AGRIS 97-017141).

1521 Bobrzecka, D.; Krauze, A. (Akademia Rolniczo Techniczna, Olsztyn (Poland). Katedra Chemii Rolnej) (1995) **[Research concerning optimization of foliar fertilization of winter wheat with nitrogen and copper]. Badania nad optymalizacja dolistnego zywienia pszenicy ozimej azotem i miedzia.** *Acta Academiae Agriculturae ac Technicae Olstenensis. Agricultura (Poland) (no.61) p. 75-83.* 4 tables; 12 ref. Polish. (AGRIS 97-001924).

It was found that in the case of optimum weather conditions, the dose equal to 0.4 kg of copper/ha resulted in highest yield level. It was applied in the form of a foliar fertilizer, at the stage of culm emergence, together with 50 kg of N/ha in 10 percent solution of urea, e.i. maintaining the ratio: 4 g Cu per 1 kg N and nitrogen dose amounting to 125 kg of N/ha. The improvement in soil fertility, as far as the content of available copper is concerned, was achieved only by means of its pre-sowing application in the dose of 5.0 kg/ha.

1522 Chaudhry, R.A.; Gill, K.H.; Hussain, G.; Chaudhry, E.H. (Soil Fertility Survey and Soil Testing Inst., Lahore (Pakistan)) (1995) **Wheat response to fertilizer application in rice tract.** *Journal of Agricultural Research (Pakistan) v. 33(1) p. 15-22.* 8 tables, 12 ref. English. (AGRIS 97-017145).

To update the technology package for wheat in rice tract, 37 single replicated dispersed trials on farmers' fields were conducted from 1988-89 to 1990-91. Levels of nutrients tried were 0, 75, 150, 225 and 300 kg N; 0, 75, 150 and 225 kg P and 0, 50 and 100 kg K per hectare. The pooled data revealed significant response to all the nutrients applied. Higher agronomic efficiency (GNR) was recorded from canal rather than canal + tubewell and tubewell irrigation and substantial residual effect of P was noted. Optimum dose of N, P and K as computed from regression analysis was 182, 144 and 48 kg per hectare, respectively. It was concluded on the basis of marginal rate of return that 142-108 kg NP was appropriate dose for progressive and 102-71 kg NP per hectare for common farmers.

1523 Das, JC.; Choudhury, AK. (1996) **EFFECT OF SEED HARDENING, POTASSIUM FERTILIZER AND PARAQUAT AS ANTI-TRANSPIRANT ON RAINFED WHEAT (TRITICUM AESTIVUM).** *Indian Journal of Agronomy. 41(3):397-400.* English. [ASSAM AGR UNIV JORHAT 785013 ASSAM INDIA].

An experiment was conducted during 1988-89 and 1989-90 at Jorhat, to study the effect of 2 seed hardening (normal and hardened seed with 1% KH2PO4, soaking for 18 hr), 4 levels of potassium (0, 30, 60 and 90 kg K2O/ha) and application of paraquat as anti-transpirant at 4 different growth stages (control, tillering, boot-leaf and tillering + boot-leaft) on rainfed 'Sonalika' wheat (Triticum aestivum L. emend. Fiori & Paol) hardened seed proved better than normal seed and 30 kg K2O/ha significantly increased the yield over the control. The paraquat application did not show any significant effect. Seed hardening, 30 kg K2O/ha and application of paraquat were found viable proposition for rainfed wheat. [References: 4].

1524 Duivenbooden, N. van (Landbouwuniversiteit Wageningen (Netherlands). Vakgroep Agronomie); Wit, C.T. de; Keulen, H. van (1996) **Nitrogen, phosphorus and potassium relations in five major cereals reviewed in respect to fertilizer recommendations using simulation**

modelling. *Fertilizer Research (Netherlands) v. 44(1) p. 37-49.* Bibliography (75 ref.). English. (AGRIS 97-017078).

1525 Easson, D.L. (Agricultural Research Institute of Northern Ireland, Large Park, Hillsborough, Co. Down, BT26 6DR (United Kingdom)) (1995) **A dataset for validating the Rothamsted model of the soil nitrogen supply to cereals.** *HGCA Project Report (United Kingdom); no. 114 102 p.* Home Grown Cereals Authority. 3 ref. English. (AGRIS 97-001870).

1526 Gavi, F.; Basta, NT.; Raun, WR. (1997) **WHEAT GRAIN CADMIUM AS AFFECTED BY LONG-TERM FERTILIZATION AND SOIL ACIDITY.** *Journal of Environmental Quality. 26(1):265-271.* English. [COLE GIO POSTGRAD MONTICELLO 56230 MEXICO].

Several studies have reported increases in grain Cd from long-term continuous wheat (Triticum aestivum L.) systems. Increases in grain Cd have been associated with commercial fertilizer use, but information on long-term use of N and P fertilizers on wheat grain Cd is limited. The objective of this study was to evaluate the impact of fertilization on wheat grain Cd from eight long-term experiments that received 15 to 63 yr of N, P, and K fertilizer. Total Cd and Zn in soil and grain and soil properties including pH were determined. In general, long-term N or P fertilization did not increase grain Cd, grain Zn, or soil Cd. In part, N and P fertilizer did not increase grain Cd because fertilizer did not increase soil Cd or Zn. Nitrogen fertilizer decreased soil pH in two experiments but these decreases were small (less than or equal to 0.5) and did not affect grain Cd or Zn. Grain Cd and Zn were inversely related to soil pH, but not related to N or P fertilization. The relationship between soil pH (3.8 to 6.8) and grain Cd (9.7 to 45.2 mu g kg(-1)) was described by a plateau-linear-plateau model with a negative slope from soil pH 5.0 to 6.4. The largest soil Cd and Zn contents were associated with high pH values, but grain Cd and Zn were inversely related to soil Cd and Zn. The maximum grain Cd content (45 mu g kg(-1)) determined in this study was less than maximum limits of 50 to 100 mu g Cd kg(-1) in wheat grain established in other countries. [References: 37].

1527 Gelderman, R. (South Dakota State University.); Gerwing, J.; Stymiest, C.; Haley, S. (1996) **Effect of added chloride to winter wheat.** *Plant science pamphlet (USA) (no. 84) p. 24-27.* English. (AGRIS 97-017124).

1528 Giri, G.S. (Regional Agricultural Research Station, Bhairahawa (Nepal)) (1996) **Response of surface seeded wheat to nitrogen applied at different growth stages of the crop.** National Winter Crops Research Workshop. Siddharthanagar, Bhairahawa (Nepal). 12-15 Sep 1996. *Summary of the wheat research reports. National Wheat Research Programme (Nepal) p. 92-97.* National Wheat Research Programme. 4 tables; 4 ref. English. (AGRIS 97-017028).

1529 Haahr, V.; Jensen, A. (1995) **Site specific nitrogen fertilization.** Site Specific Farming. Aarhus (Denmark). 20-21 Mar 1995. *SP Report, 26: Proceedings of the seminar on site specific farming. Olesen, S.E. (ed.). Statens Planteavlsforsoeg, Foulum (Denmark) p. 146-150.* SP. 2 ill. English. (AGRIS 97-001921).

1530 Hansen, EM.; Djurhuus, J. (1996) **NITRATE LEACHING AS AFFECTED BY LONG-TERM N FERTILIZATION ON A COARSE SAND.** *Soil Use & Management. 12(4):199-204.* English. [DANISH INST PLANT & SOIL SCI DEPT SOIL SCI RES CTR FOULUM POB 23 DK-8830 TJELE DENMARK].

A field experiment on a coarse sand (1987-92) was conducted with spring barley (Hordeum vulgare L), in order to evaluate the effects of increasing N fertilization on nitrate leaching under temperate coastal climate conditions. The N fertilizer levels were 60 and 120 kg N/ha. The experiment was conducted on a 19-year old permanent field trial with continuous spring barley, initiated in 1968, and included treatments with ploughing in autumn or spring, with or without perennial ryegrass (Lolium perenne L.) as a catch crop undersown in spring. Prior to 1987, the low and high levels of N fertilizer were 70 and 150 kg N/ha, respectively. To calculate nitrate leaching, soil water samples were taken from a depth of 0.8 m using ceramic cups. The average annual nitrate leaching from plots with 60 and 120 kg N/ha was 38 and 52 kg N/ha/y, respectively. The increased leaching associated with increasing fertilizer application was not caused by inorganic N in the soil at harvest, but rather by greater mineralization, mainly in autumn. Growing of a catch crop was relatively more efficient for reducing nitrate leaching than a long-term low fertilizer application. A 50% reduction in N application decreased average yield by 26%, while nitrate leaching decreased by 27%. [References: 39].

1531 Hegde, DM. (1996) **LONG-TERM SUSTAINABILITY OF PRODUCTIVITY IN AN IRRIGATED SORGHUM-WHEAT SYSTEM THROUGH INTEGRATED NUTRIENT SUPPLY.** *Field Crops Research. 48(2-3):167-175.* English. [AGR SCH COMPOUND 91 BHAVANI PETH POB 199 SOLAPUR 413002 MAHARASHTRA INDIA].

Integrated nutrient supply of inorganic and organic sources is of great importance for maintenance of productivity in intensive cropping systems. This study evaluated the integrated use of chemical fertilizers and the organic sources of farm yard manure (FYM), wheat straw, and green manure on the long-term productivity of an irrigated sorghum (Sorghum-bicolor (L.) Moench)-wheat (Triticum aestivum (L.) emend. Fiori & Paol) system at three semiarid sites. The results showed the possibility of substituting 50% of the N requirement for sorghum by FYM without adverse effect on productivity. Substitution of N fertilizer by wheat straw and green manure generally reduced yields of both sorghum and wheat. Integrated nutrient supply increased soil organic carbon and available N compared to application of all nutrients through fertilizers. It had a variable effect on available P status and reduced the decline in available K. Available soil S, Nln, and Fe increased, while available Cu and Zn remained unaffected. Because the integrated nutrient supply increased soil fertility, it is suggested for use in an irrigated sorghum-wheat system in order to maintain productivity. [References: 16].

1532 Hughes, D.F. (University of Missouri, Columbia.); Kitchen, N.R. (1993) **Suitability of slow release nitrogen fertilizers for maximizing fertilizer use efficiency in wheat and corn.** *Agricultural research to protect water quality : proceedings of the conference February 21-24, 1993 Minneapolis, Minnesota, USA p. 421-426.* The Society. references. English. (AGRIS 97-017183).

1533 Hussain, K.; Mehdi, S.M.; Niazi, M.H.K. (Soil Salinity Research Inst., Pindi Bhattian (Pakistan)); Ismat, N. (University of Agriculture, Faisalabad (Pakistan)) (1994) **Response of rice and wheat to phosphorus at different ESP [exchangeable sodium percentage] levels.** *Journal of Agricultural Research (Pakistan) v. 32(3) p. 273-280.* 5 tables, 16 ref. English. (AGRIS 97-017143).

A pot study was conducted on rice and wheat crops to see their responses to P application at two ESP levels (18 and 34). Phosphorus as SSP was applied at the rate of 0, 13, 20, 26 and 0, 11, 22, 33 mg per kg soil to rice and wheat, respectively. A basal dose of N and K was also applied. Grain/ straw yields and productive tillers in rice and straw yield and productive tillers in wheat were increased significantly with P application. Wheat grain yield was not changed. With increasing ESP wheat straw yield and productive tillers in both the crops were not affected. However, rice straw yield and grain yield of both the crops decreased by increasing ESP. Phosphorus content and its uptake by both the crops (grain and straw) increased significantly with P application. ESP did not affect P concentration. But P uptake decreased with increasing ESP significantly. Interaction between ESP and P application affected straw yield of wheat and P uptake by rice and wheat. The most economical dose both for rice and wheat was recorded as 20 to 22 mg P per kg soil, respectively.

1534 Ibrahim, M.; Ahmad, N.; Ishaq, M.; Khan, A. (Ayub Agricultural Research Inst., Faisalabad (Pakistan)) (1993) **Effects of wheat straw and wheat straw plus fungus inoculum on crop productivity.** *Journal of Agricultural Research (Pakistan) v. 31(3) p. 301-306.* 8 tables, 10 ref. English. (AGRIS 97-017176).

This investigation aimed to see the effect of saprophytic fungus (Arachniotus sp.) and organic matter (wheat straw) at four N levels (0, 40, 80 and 120 mg/kg soil) under greenhouse conditions. The treatments were tested on maize fodder and their residual effect was also seen on two subsequent crops (wheat and maize). Nitrogen (4 levels) was applied to all three crops. Maize fodder yield of first crop was not affected by nitrogen, wheat straw or fungus plus wheat straw applications. Wheat straw and fungus plus straw had no residual effects on wheat grain yield as well as protein contents. Higher N application improved grain/straw yields, protein content and tillering of wheat. When residual effect was tested on second crop (maize), its fodder yield and protein contents were not affected. Rather they were decreased. The data concluded that results were very inconsistent and fungus inoculum did not enhance N-use efficiency alone or in combination with N application.

1535 Jensen, ES. (1996) **NITROGEN ACQUISITION BY PEA AND BARLEY AND THE EFFECT OF THEIR CROP RESIDUES ON AVAILABLE NITROGEN FOR SUBSEQUENT CROPS.** *Biology & Fertility of Soils. 23(4):459-464.* English. [RISO NATL LAB PLANT NUTR ENVIRONM SCI & TECHNOL DEPT DK-4000 ROSKILDE DENMARK].

Nitrogen acquisition by field pea (Pisum sativum L.) and spring barley (Hordeum vulgare L.) grown on a sandy loam soil and availability of N in three subsequent sequences of a cropping system were studied in an outdoor pot experiment. The effect of crop residues on the N availability was evaluated using N-15-labelled residues. Field pea fixed 75% of its N requirement and the N-2 fixation almost balanced the N removed with the seeds. The barley crop recovered 80% of the N-15-labelled fertilizer N supplied and the N in the barley grain corresponded to 80% of the fertilizer N taken up by the crop. The uptake of soil-derived N by a test crop (N catch crop) of white mustard (Sinapis alba L.) grown in the autumn was higher after pea than after barley. The N uptake in the test crop was reduced by 27% and 34% after pea and barley residue incorporation, respectively, probably due to N immobilization. The dry matter production and total N uptake of a spring barley crop following pea or barley, with a period of unplanted soil in the autumn/winter, were significantly higher after pea than after barley. The barley crop following pea and barley recovered 11% of the pea and 8% of the barley residue N. The pea and barley residue N recovered constituted only 2.5% and <1%, respectively, of total N in the N-fertilized barley. The total N uptake in a test crop of mustard grown in the second autumn following pea and barley cultivation was not significantly influenced by pre-precrop and residue treatment. In the short term, the incorporation of crop residues was not important in terms of contributing N to the subsequent crop compared to soil and fertilizer N sources, but residues improved the conservation of soil N in the autumn. In the long-term, crop residues are an important factor in maintaining soil fertility and supplying plant-available N via mineralization. [References: 35].

1536 Kernich, GC.; Halloran, GM. (1996) **NITROGEN FERTILIZER EFFECTS ON THE DURATION OF THE PRE-ANTHESIS PERIOD AND SPIKELET NUMBER PER SPIKE IN BARLEY.** *Journal of Agronomy & Crop Science-Zeitschrift fur Acker und Pflanzenbau. 177(5):289-293.* English. [UNIV MELBOURNE DEPT AGR & RESOURCE MANAGEMENT CTR CROP IMPROVEMENT PARKVILLE VIC 3052 AUSTRALIA].

The effects of increased yield and grain number per unit area in barley in response to nitrogen application are well known. However, the influence of applied nitrogen on the rates and durations of developmental phases in barley are less well understood. Our objective was to investigate the effects of applied nitrogen on the duration of pre-anthesis development in barley and the number of spikelets per spike in two barley cultivars, Franklin and Schooner, in two studies. We found no effect of nitrogen on the duration of the pre-anthesis period in Schooner, when applied to pots at a rate of 0 or 55 kg N ha(-1), or when applied in the field at 0, 40 or 160 kg N ha(-1). However, this duration was extended in Franklin in the first study by an application of 55 kg N ha(-1). Both plant biomass and grain yield at maturity were increased between 0 and 55 kg N ha(-1), and 0 and 160 kg N ha(-1). Yield increase largely associated with an increase in the number of tillers per plant. [References: 8].

1537 Knudsen, L.; Oestergaard, H.S. (1996) **[Survey 1995, E: Fertilizing and liming]. Oversigt 1995, E: Goedskning og kalkning.** Landsudvalget for Planteavl, Aarhus (Denmark). *Oversigt over Landsforsoegene (Denmark) (no.1995) p. 81-133.* 9 ill., 59 tables. Danish. (AGRIS 97-001847).

1538 Krauze, A. (Akademia Rolniczo Techniczna, Olsztyn (Poland). Katedra Chemii Rolnej) (1995) **[Effect of differentiated technology of phosphorus fertilization on yield and quality of winter wheat grain]. Wplyw zroznicowanej technologii nawozenia fosforem na plony i jakosc ziarna pszenicy ozimej.** *Acta Academiae Agriculturae ac Technicae Olstenensis. Agricultura (Poland) (no.61) p. 115-122.* 7 tables; 6 ref. Polish. (AGRIS 97-001925).

The results obtained confirmed high yielding efficiency of phosphorus, applied in 2 percent water solution of H3PO4, both in case of soil with high and low content of this element.

1539 Lozek, O.; Fecenko, J.; Mazur, B.; Mazur, K. (1997) **THE EFFECT OF FOLIAR APPLICATION OF HUMATE ON WHEAT GRAIN YIELD AND QUALITY.** *Rostlinna Vyroba. 43(1):37-41.* Czech. [UNIV AGR NITRA SLOVAKIA].

Three-year small-plot trial (1993/1994 to 1995/1996) was carried out on loam chernozem at the Breeding Station Sladkovicovo-Novy Dvor to study in the model crop, winter wheat, the stimulative effect of foliar application of sodium humate together with the fertilizer DAM 390 during production and qualitative fertilization. Experimental site is characterized by average temperature 10.6 degrees C and annual sum of precipitation 495 mm. The soil on the experimental site has an alkaline reaction, medium content of available phosphorus, good content of potassium and high content of magnesium. More significant yield effect was obtained at common application of sodium humate with DAM 390 on production dressing (yield increase by 7.7%) compared with the use for qualitative dressing (yield increase by 4.0%). Stimulation effect on the production was positively manifested in economic evaluation of the crop, that is in increase of economic and natural efficiency of nitrogen nutrition. The use of sodium humate had a good impact also on the uptake of macronutrients by wheat grain, namely with nitrogen 7.2 to 13.4% increase, with phosphorus 7.7 to 13.9% increase, with potassium 4.2 to 5.6%, with calcium 12.2 to 26.3% and with magnesium 5.0 to 9.1% increase. Stimulative yield effect of humates is explained by greater usage of nutrients from applied fertilizers or from soil supply, respectively. The use of sodium humate had a good impact on an increase of the crude protein content (by 2.8 to 4.9%) and wet gluten content (by 1.3 to 2.8%). 1000-kernel weight (TKW), bulk density of grain and proportion of first grade was not affected by sodium humate. [References: 6].

1540 Maidl, FX.; Panse, A.; Dennert, J.; Ruser, R.; Fischbeck, G. (1996) **EFFECT OF VARIED N RATES AND N TIMINGS ON YIELD, N UPTAKE AND FERTILIZER N USE EFFICIENCY OF A SIX-ROW AND A TWO-ROW WINTER BARLEY.** *European Journal of Agronomy. 5(3-4):247-257.* English. [TECH UNIV MUNICH INST AGRON & PLANT BREEDING D-85350 FREISING GERMANY].

The effects of N rates and N timings on yield formation, N uptake at five growth stages and fertilizer N use efficiency of six-row and two-row winter barley were evaluated in field trials conducted from 1990/91 to 1992/93 at the TU Munich's research station Roggenstein. On average over 3 years the six-row cultivar yielded most at a total rate of 110 kg ha(-1) N including an early application of 40 kg ha(-1) N up to EC 30 (Zadoks scale). The two-row cultivar achieved maximum yield at a total rate of 140 kg ha(-1) N including early applications of 70 kg ha(-1) N up to EC 30. The highest yielding N-treatments of six-row barley regularly took up less nitrogen at EC 32 (95 kg ha(-1) N on average) than the non-optimally fertilized treatments, whereas full exploitation of the yield potential of two-row barley was associated with higher rates of N-uptake at EC 32 (113 kg ha(-1) N on average). Lodging did not occur in the trials conducted in 1991 and 1992 and no difference was detected between the two cultivars in fertilizer N use efficiency. With six-row barley the N treatment giving maximum yield also led to an optimum fertilizer N use efficiency. Full exploitation of the two-row barley yield potential was associated with suboptimal fertilizer N use efficiencies. [References: 20].

1541 McGrath, S.P.; Zhao, F.J.; Withers, P.J.A.; Sinclair, A.H.; Evans, E.J. (Soil Science Department, IACR Rothamsted, Harpenden, Herts. AL5 2JQ (United Kingdom)) (1995) **Sulphur nutrition of cereals in Britain: yield responses and prediction of likely deficiency.** *HGCA Project Report (United Kingdom); no. 115 55 p.* Home Grown Cereals Authority. 48 ref. English. (AGRIS 97-001890).

1542 Nankova, M.; Stoyanova, M. (Institut po Pshenitsata i Sl"nchogleda "Dobrudzha", General Toshevo (Bulgaria)) (1995) **[Effect of nitrogen fertilization on nitrogen intensity uptake and protein quantity and quality of wheat]. Vliyanie na azotnoto torene v"rkhu intenziteta na post"pvane na azota, kolichestvoto i kachestvoto na belt"ka pri pshenitsata.** Selskostopanska Akademiya, Sofia (Bulgaria). *Rasteniev"dni Nauki (Bulgaria). Plant Science v. 32(3) p. 11-14.* 1 ill., 2 tables; 9 ref. Bulgarian. (AGRIS 97-017139).

1543 Nankova, M.; Stoyanova, M. (Institut po Pshenitsata i Sl"nchogleda "Dobrudzha", General Toshevo (Bulgaria)) (1995) **[Effect of nitrogen fertilization on the structural elements of productivity, uptake and forms of nitrogen of wheat]. Vliyanie na azotnoto torene v"rkhu strukturnite elementi na produktivnostta, iznosa i formite na azota pri pshenitsata.** Selskostopanska Akademiya, Sofia (Bulgaria). *Rasteniev"dni*

Nauki (Bulgaria). Plant Science v. 32(3) p. 7-10. 3 tables; 12 ref. Bulgarian. (AGRIS 97-017142).

1544 Patil, EN.; Jawale, SM.; Deore, DD. (1996) **EFFECT OF IRRIGATION AND FERTILIZER ON THE PRODUCTIVITY OF CULTIVATED EMMER WHEAT (TRITICUM DICOCCUM).** *Indian Journal of Agronomy. 41(3):494-495.* English. [COLL AGR DHULE 424001 MAHARASHTRA INDIA].

1545 Petkova, M.; Tosheva, E. (Institut po Pochvoznanie i Agroekologiya "N. Pushkarov", Sofia (Bulgaria)) (1996) **[Fertilizer rates in wheat under leached-smolnitza nutritive regime]. Normi na torene na pshenitsata pri razlichni khranitelni rezhimi na izluzhena smolnitsa.** Selskostopanska Akademiya, Sofia (Bulgaria). *Pochvoznanie, Agrokhimiya i Ekologiya (Bulgaria). Soil Science, Agrochemistry and Ecology v. 31(1) p. 17-20.* 5 tables; 5 ref. Bulgarian. (AGRIS 97-016990).

1546 Ramamurthy, V. (Thapar Corporate Research and Development Centre, Patiala (India)); Sharma, R.K.; Yadav, K.R.; Kaur, J.; Vrat, D.; Kothari, R.M. (1996) **Volvariella-treated Eucalyptus sawdust stimulates wheat and onion growth.** *Biodegradation (Netherlands) v. 7(2) p. 121-127.* 13 ref. English. (AGRIS 97-017140).

1547 Rao, SC. (1996) **EVALUATION OF NITRIFICATION INHIBITORS AND UREA PLACEMENT IN NO-TILLAGE WINTER WHEAT.** *Agronomy Journal. 88(6):904-908.* English. [USDA ARS GRAZINGLANDS RES LAB POB 1199 EL RENO, OK 73036 USA].

Nitrification inhibitors (NIs) such as dicyandiamide (DCD) and nitrapyrin [2-chloro-6-(trichloromethyl)pyridine] (NP) slow the nitrification process, thus reducing N losses from leaching and denitrification. In field studies (1990-1994) on a Renfrow silt loam (fine-silty, mixed, thermic Udertic Paleustolls) near El Reno, OK, we evaluated these two NIs and their placement effects on nitrification of applied urea in soils and on wheat (Triticum aestivum L.) yields. Urea at 60 kg N ha(-1) treated with or without NIs was placed 3 to 4 cm below the seed (BL) at seeding or was broadcast (BR) after seeding on the day of seeding, with no N as control. Mineral N forms were determined in the 0- to 30-cm soil zone in fall and spring. Differences in soil mineral N concentration below the 10-cm depth were minimal (but higher than the control) in all N treatments. In the 0- to 10-cm depth, BL placement of NI-treated urea significantly reduced nitrification in the fall compared with BR urea with or without NIs, except in 1994. Soil mineral N content in spring was similar with either placement of NI-treated urea, but was significantly greater than untreated BR urea. Warm temperatures and dry soil in the fall tended to reduce the effectiveness of surface-applied NIs. The highest NH4+ percentage in total soil mineral N was observed with DCD BL or NP BL, followed by NP BR and DCD BR. Urea treated with NIs increased grain yield from 7 to 31% above untreated urea. Grain yield was highest with DCD BL (31%), followed by DCD BR (26%) and NP BR (24%), compared with the broadcast untreated urea. Grain N yield was 140 g kg(-1) greater with DCD-N than with untreated urea. Deep placement of DCD under no-till winter wheat in the southern Great Plains can reduce nitrification and increase N availability under varying year-to-year environmental conditions and can improve wheat grain yield and grain N compared with surface broadcast of urea with or without NI. [References: 28].

1548 Regmi, A.P. (Regional Agricultural Research Station, Bhairahawa (Nepal)) (1996) **Effects of phosphorus and potassium on wheat.** National Winter Crops Research Workshop. Siddharthanagar, Bhairahawa (Nepal). 12-15 Sep 1996. *Summary of the wheat research reports. National Wheat Research Programme (Nepal) p. 152-158.* National Wheat Research Programme. 7 tables; 3 ref. English. (AGRIS 97-017029).

1549 Sawarkar, SD.; Goydani, BM. (1996) **EFFECT OF FERTILIZER AND AZOSPIRILLUM ON GRAIN YIELD OF RAINFED WHEAT (TRITICUM AESTIVUM).** *Indian Journal of Agronomy. 41(3):409-411.* English. [JAWAHARLAL NEHRU KRISHI VISHWA VIDYALAYA ZONAL AGR RES STN CHHINDWARA 480001 MADHYA PRADESH INDIA].

An experiment was conducted during the winter season (rabi) of 1992-93 and 1993-94 on the effect of levels of fertilizer and biofertilizer (Azospirillum) inoculation on grain yield of rainfed wheat (Triticum aestivum L. emend. Fiori & Paol.). Number of tillers and yield attributes were improved on application of fertilizers and Azospirillum, Highest mean grain yield of 14.43 q/ha and cost: benefit ratio of 1 : 1.79 was found with full dose of N, P and K 30, 8.73 and 8.33 kg/ha. However, it was on par with 50% dose of NPK + biofertilizer giving 12.59 q/ha yield with a cost: benefit ratio of 1 : 1.54. [References: 3].

1550 Sharma, CM.; Kaul, S.; Bhardwaj, SK. (1996) **EFFECT OF UDAIPUR ROCK PHOSPHATE ALONE AND IN COMBINATION WITH ORGANICS ON MAIZE (ZEA MAYS) WHEAT (TRITICUM AESTIVUM) PRODUCTION UNDER ACID SOIL.** *Indian Journal of Agronomy. 41(3):505-506.* English. [HIMACHAL PRADESH KRISHI VISHVAVIDYALAYA DEPT SOIL SCI PALAMPUR 176062 HIMACHAL PRADES INDIA].

1551 Smith, GP.; Gooding, MJ. (1996) **RELATIONSHIPS OF WHEAT QUALITY WITH CLIMATE AND NITROGEN APPLICATION IN REGIONS OF ENGLAND (1974-1993).** *Annals of Applied Biology. 129(1):97-108.* English. [ROYAL AGR COLL CIRENCESTER GL7 6JS GLOS ENGLAND].

Region x year means for crude protein concentration (CP) and Hagberg falling number (HFN) from the Home Grown Cereals Authority (HGCA) surveys were modelled using mean daily temperature, rainfall and nitrogen application. A model accounting for 78.6% of the variation in CP incorporated positive coefficients for mean daily temperature (25 June to 15 July), nitrogen applied to the crop, and early summer rainfall (28 May to 8 July), and a negative coefficient for spring rainfall (5 March-27 May). For CP there was no statistical evidence that fitting one regression for all regions was significantly worse than fitting individual lines for each of the 10 regions. A model describing 67.1% of the variation in HFN incorporated a negative coefficient for August rainfall and positive coefficients for mean June temperature, mean August temperature and nitrogen applied to the crop. There was statistical evidence that fitting separate lines fbr certain regions was justified. [References: 31].

1552 Soni, ML.; Swarup, A.; Singh, M. (1996) **INFLUENCE OF RATES AND METHODS OF MANGANESE APPLICATION ON YIELD AND NUTRITION OF WHEAT IN A RECLAIMED SODIC SOIL.** *Journal of Agricultural Science. 127(Part 4):433-439.* English. [CENT SOIL SALIN RES INST DIV SOIL & CROP MANAGEMENT KARNAL 132001 HARYANA INDIA].

A field experiment was conducted at the experimental farm of the Central Soil Salinity Research Institute, Karnal, India during 1992/93 to evaluate the effects of rates and methods of manganese application on the yield and nutrition of wheat on a reclaimed and intensively cropped Mn-deficient sodic soil (pH = 8.7, exchangeable sodium percentage = 18 and DTPA-extractable Mn = 2.7 mg kg(-1)). There were eight treatments which consisted of a control (no Mn application), three rates of 25, 50 and 100 kg MnSO4.H2O ha(-1) each either as a basal or a top-dressing at first irrigation or a foliar spray of 1.0% MnSO4.H2O at crown root initiation (CRI), tillering and jointing stages. Grain and straw yield of wheat increased significantly with increasing rates of Mn application. A foliar spray of Mn produced a significantly higher yield than 25 and 50 kg MnSO4.H2O ha(-1) applied either as a basal or a top-dressing but similar to that from 100 kg MnSO4.H2O ha(-1). Efficiency of Mn was higher with a foliar spray (82.6 kg grain kg(-1) Mn) than with soil application (4.4-6.4 kg grain kg(-1) Mn). Application of Mn increased its concentration in the crop but decreased Fe and Cu crop concentrations. Grain yield had a significant positive correlation with the Mn content of the grain (r = 0.72) and straw (r = 0.78). Grain yield was positively correlated with 1000-grain weight (r = 0.90). Recovery of applied Mn ranged from 28.1 to 33.0%. [References: 30].

1553 Tanchev, D. (Kompleksna Opitna Stantsiya po Zemedelie, Grudovo (Bulgaria)) (1996) **[A study on the aftereffect of fertilizing of sorghum designed for grain on the wheat yield]. Prouchvane posledejstvieto ot toreneto na sorgoto za z"rno v"rkhu dobiva na pshenitsata.** Selskostopanska Akademiya, Sofia (Bulgaria). *Pochvoznanie, Agrokhimiya i Ekologiya (Bulgaria). Soil Science, Agrochemistry and Ecology v. 31(1) p. 27-28.* 2 tables; 2 ref. Bulgarian. (AGRIS 97-017123).

1554 Tanchev, D.; Antonov, D.; Ivanov, S. (Kompleksna Opitna Stantsiya po Zemedelie, Grudovo (Bulgaria)) (1996) **[A study on the rates and mode of applying nitrogen fertilizer to winter fodder barley]. Prouchvane v"rkhu normite i nachina na vnasyane na azotniya tor na zimniya furazhen echemik.** Selskostopanska Akademiya, Sofia (Bulgaria).

Pochvoznanie, Agrokhimiya i Ekologiya (Bulgaria). Soil Science, Agrochemistry and Ecology v. 31(1) p. 24-26. 3 tables; 7 ref. Bulgarian. (AGRIS 97-017047).

1555 Tilahun Geleto (Sinana Research Center, Robe (Ethiopia)); Tekalign Mamo; Getinet Gebeyehu; Tanner, D.G. (1996) **Response of wheat (Triticum aestivum and T. durum) to nitrogen source, rate and time of application.** 1. Proceedings of the Conference of the Agronomy and Crop Physiology Society of Ethiopia. Addis Abeba (Ethiopia). 30-31 May 1995. *Increasing food production through improved crop management. Woldeyesus Sinebo; Zerihun Tadele; Nigusie Alemayehu (IAR, Addis Abeba (Ethiopia)) (eds.) p. 85-97.* ACPSE. 8 tables; 12 ref. English. (AGRIS 97-001922).

The experiment was conducted on Vertisols of Akaki and Arsi-robe in the Central Highlands of Ethiopia in the years 1990 and 1991. The purpose of the trial was to study the effect of nitrogen source, rate and time of application on grain yield and yield components of wheat (Triticum aestivum and T. durum). A split-plot design with varieties (ET-13, a bread wheat; and Boohai, a durum wheat) in main plots, and factorial combinations of nitrogen fertilizer sources (urea, large granular urea and ammonium sulphate), rates (60 and 120 kg N/ha), and timings of application (all at sowing, all at mid tillering, and one-third at sowing plus two-thirds at mid-tillering) and a check (without nitrogen) in the sub-plots in three replications at each location was used. Results were highly affected by season and location. In three out of the four trials, nitrogen fertilizer source effect was similar for grain yield, grains per spike and per sq.m. and fertile spikes per sq.m. However, in 1991 under waterlogged condition of Akaki, large granular urea greater than ammonium suplhate greater than urea for grain yield, but large granular urea greater than ammonium sulphate = urea for grains per m square. The highest nitrogen rate, 120 kg N/ha, and split application were the most effective in increasing grain yield, 1000 kernel weight and grains per spike and per m square. The interaction effects of nitrogen source, rate and timing on grain yield and its components were significant. Grain yields of ET-13 and Boohai were most dependent on grains per m squared. In this study, nitrogen rate had the most effect followed by time of application, and both areas need more research-focus for better wheat production.

1556 Tiwari, H.C.; Gangwar, M.S.; Ram, N. (Govind Ballabh Pant University of Agriculture and Technology, Pantnagar (India)) (1996) **Long-term application of fertilizers on available sulphur status, wheat (Triticum aestivum) yield and S uptake on aquic hapludoll soil.** *Indian Journal of Agricultural Sciences (India) v. 66(4) p. 237-239.* 2 tables; 7 ref. English. (AGRIS 97-001923).

1557 Tosheva, E. (Nauchnoizsledovatelski Institut po Pochvoznanie i Agroekologiya "N. Pushkarov", Sofia (Bulgaria)) (1995) **[Fertilization of triticale on leached mediterranean black soil at different nutritive regime]. Torene na tritikale pri razlichen khranitelen rezhim na izluzhena smolnitsa.** Selskostopanska Akademiya, Sofia (Bulgaria). *Rasteniev"dni Nauki (Bulgaria). Plant Science v. 32(3) p. 29-32.* 5 tables; 21 ref. Bulgarian. (AGRIS 97-017138).

1558 Zair, M. (Institut Technique des Grandes Cultures, Alger (Algerie)) (1994) **[Supplementary irrigation and nitrogen fertilization of hard wheat]. L'Irrigation d'appoint et la fertilisation azotee du ble dur.** *Cerealiculture (Algerie). Revue technique et scientifique de l'I.T.G.C (no. 27) p. 2-7.* 5 tableaux; 8 graphs.; 6 ref. French. (AGRIS 97-016911).

F06 IRRIGATION

1559 Huzulak, J.; Matejka, F. (1996) **IRRIGATION TIMING BY MEANS OF SIMPLE MODEL OF CANOPY WATER REGIME.** *Rostlinna Vyroba. 42(12):559-562.* English. [RES INST PLANT PROD VRAKUNSKA 29 BRATISLAVA 82563 SLOVAKIA].

Irrigation timing is based on determining the plant water stress by means of canopy water regime model. This model, consisting of three non-linear algebraic equations, enables to quantify the effect of soil, hydrologic and atmospheric factors under winter wheat water regime. The input data are as follows: global radiation, air temperature, air humidity, wind speed and soil moisture. The model also enables to quantify the role of root system in irrigation scheduling. [References: 9].

1560 Iglesias, L. (Instituto Nacional de Ciencias Agricolas, Pinar del Rio (Cuba). Estacion Experimental del Arroz "Los Palacios") (1996) **[Germination dynamics of wheat (Triticum aestivum L.) seeds under different water managements]. Dinamica de la germinacion de la semilla de trigo (Triticum aestivum L.) con diferentes manejos del agua.** *Cultivos Tropicales (Cuba) v. 17(1) p. 13-15.* 1 ill., 1 tabla; 9 ref. Spanish. (AGRIS 97-017189).

F07 SOIL CULTIVATION

1561 Anken, T. (Eidg. Forschungsanstalt fuer Agrarwirtschaft und Landtechnik (FAT), Taenikon (Switzerland)); Hilfiker, T.; Sandri, R.; Sartori, L. (1996) **[Seedbed preparation. Fine seedbed: high energy requirements and field emergence, but no higher yields in winter wheat]. Saatbettbereitung. Feines Saatbett: Hoher Energiebedarf und Feldaufgang, aber kein Mehrertrag bei Winterweizen..** *FAT-Berichte (Switzerland); no. 484 12 p.* Eidg. Forschungsanstalt fuer Agrarwirtschaft und Landtechnik (FAT). 3 tables, 4 graphs, 2 ill., 11 photos; also available in French. German. (AGRIS 97-002063).

1562 Baumhardt, RL.; Lascano, RJ. (1996) **RAIN INFILTRATION AS AFFECTED BY WHEAT RESIDUE AMOUNT AND DISTRIBUTION IN RIDGED TILLAGE.** *Soil Science Society of America Journal. 60(6):1908-1913.* English. [TEXAS AGR EXPTL STN ROUTE 3 BOX 219 LUBBOCK, TX 79401 USA].

Texas South Plains production systems for conserving rainfall and reducing wind erosion in cotton (Gossypium hirsutum L.), a low-residue crop, include the spring chemical termination of winter wheat (Triticum aestivum L.) overseeded post-harvest into cotton. This practice often increases cotton lint yields under irrigation, but residues hinder weed control and increase production costs. This study characterized infiltration response to (i) residue weathering and soil consolidation with ridges, (ii) residue distribution on the ridge or in the furrow, and (iii) Bat or standing architectures and residue amounts. Simulated rain was applied at 65 mm h(-1) for 1 h into a bare Olton clay loam (fine, mixed, thermic Aridic Paleustoll). Mean cumulative infiltration was lowest for bare soil (28.7 mm), but increased curvilinearly with increasing residue amounts, leveling at 49.0 mm. Cumulative infiltration with residues distributed on the ridge (42 mm) or in the furrows (44 mm) were the same even though water in the furrow absorbed drop impact. A minimum amount of residue (0.7 Mg ha(-1)) to intercept raindrop impact was needed to increase rain infiltration, but increasing residue above a residue threshold of 2.4 Mg ha(-1) had no effect because of sufficient drop impact interception. Increases in infiltration were related to the residue amount rather than to the bed or furrow location. Partial residue cover and tillage operations that lodge crop residues may increase infiltration. [References: 26].

1563 Cassel, DK.; Wagger, MG. (1996) **RESIDUE MANAGEMENT FOR IRRIGATED MAIZE GRAIN AND SILAGE PRODUCTION.** *Soil & Tillage Research. 39(1-2):101-114.* English. [N CAROLINA STATE UNIV DEPT SOIL SCI RALEIGH, NC 27695 USA].

Certain farming systems limit the opportunity to leave crop residue on the soil surface which could conserve soil and water. The objectives of this study were to determine the effects of residue management, tillage, and irrigation regime on maize (Zea Mays L.) grain and silage yields and selected soil properties. The soil type was a Hiwassee clay loam (Rhodic Kanhapludults) and is representative of soils in the southern Piedmont region (USA). Two tillage treatments (no-tillage (NT) and conventional chisel plow/disk (CT)), in factorial combination with three sprinkler irrigation levels (none, full, and limited), were evaluated in 1988 and 1989. Each tillage/irrigation treatment was split to simulate maize stover removal (silage system) or maize stover left in place (grain system). Grain and silage yields for the 2 year period averaged 13% and 17% greater, respectively, for NT compared with CT. Residue removal decreased silage yield in 1989 from 18.9 to 17.5 Mg ha(-1). Total and irrigation water use efficiencies were slightly greater in NT plots when residue remained on the soil surface. In general, both sorptivity and cumulative infiltration were greater for CT compared with NT. These same parameters were at least 200% greater in the non-trafficked interrow compared with the trafficked interrow position. Residual nitrate concentrations in the soil profile were less under NT compared with CT, reflecting the higher maize yields because of improved water availability under NT. While only small differences in yields and water use efficiencies were affected by residue management, the differences likely will increase with time under these management systems. [References: 13].

1564 Castrignano, A.; Giorgio, D. De; Stelluti, M.; Rizzo, V. (1994) **A geostatistical approach to characterize spatial variability of yield in a durum wheat submitted to four tillage treatments.** Soil Tillage for Crop Production and Protection of the Environment. Aalborg (Denmark). 24-29 Jul 1994. *ISTRO: Proceedings of the 13th international conference, 2: Soil tillage for crop production and protection of the environment. Jensen, H.E.; Schjoenning, P.; Mikkelsen, S.A.; Madsen, K.B. (eds.). International Soil Tillage Research Organization, ISTRO, Ohio (USA) p. 997-1003.* Kongelige Veterinaer- og Landbohoejskole. 2 ill., 3 tables; 7 ref. English. (AGRIS 97-002068).

1565 Endrerud, H.C. (Norges Landbrugshoegskole, Aas (Norway)) (1994) **Tillage, coulter design and emergence of barley.** Soil Tillage for Crop Production and Protection of the Environment. Aalborg (Denmark). 24-29 Jul 1994. *ISTRO: Proceedings of the 13th international conference, 2: Soil tillage for crop production and protection of the environment. Jensen, H.E.; Schjoenning, P.; Mikkelsen, S.A.; Madsen, K.B. (eds.). International Soil Tillage Research Organization, ISTRO, Ohio (USA) p. 1307-1312.* Kongelige Veterinaer- og Landbohoejskole. 5 tables; 3 ref. English. (AGRIS 97-002036).

1566 Ganeshamurthy, AN.; Takkar, PN. (1997) **RESIDUAL MANAGEMENT OF SULFUR APPLIED TO SOYBEAN OR WHEAT IN A SOYBEAN-WHEAT SYSTEM ON VERTISOLS.** *Australian Journal of Soil Research. 35(1):199-208.* English. [INDIAN INST SOIL SCI BERASIA RD BHOPAL 462038 INDIA].

In a 3-year experiment on a typic Haplustert row in soil test sulfur (S), residual effects of S applied to either soybean or wheat in a soybean-wheat system were measured for seed yields, recoveries of added S, and changes in the soil test S. Sulfur as gypsum was applied at 5 rates (0-80 kg S/ha) to soybean and 4 rates (0-60 kg S/ha) to wheat during the first year. In subsequent years the residual effects were studied in relation to fresh application of 40 kg S/ha to each crop. Seed yields of soybean and wheat were increased significantly by the application of S to each crop. The rate 80 kg S/ha applied to soybean showed residual effects in 2 succeeding crops, while 60 kg S/ha applied to soybean or wheat showed residual effect in only 1 succeeding crop. The S applied to wheat was more efficiently utilised than that applied to soybean in rotation. The rates 53 and 70 kg S/ha (calculated via regression equations) applied to soybean gave 90% of the seed yield of freshly applied S at 40 kg/ha in the succeeding wheat and soybean crops, respectively, and 57 kg S/ha applied to the wheat crop gave 90% of the seed yield in the succeeding soybean crop. The recoveries of added S were greater with smaller rates of added S and were greater in the first 2 residual crops. Soil test S was adequate only in the first year and fell below critical level in the subsequent cropping period. Cumulative S uptake determined the levels of available S in the soil. [References: 26].

1567 Giorgio, D. De; Castrignano, A.; Rizzo, V. (1994) **A multivariate approach to assess the effects of different tillage systems on biometric parameters and weeds in durum wheat continuous cropping.** Soil Tillage for Crop Production and Protection of the Environment. Aalborg (Denmark). 24-29 Jul 1994. *ISTRO: Proceedings of the 13th international conference, 2: Soil tillage for crop production and protection of the environment. Jensen, H.E.; Schjoenning, P.; Mikkelsen, S.A.; Madsen, K.B. (eds.). International Soil Tillage Research Organization, ISTRO, Ohio (USA) p. 983-989.* Kongelige Veterinaer- og Landbohoejskole. 2 tables; 15 ref. English. (AGRIS 97-002067).

1568 Johnson, P.A.; Smith, P.N. (ADAS Arable Research Centre, Kirton, Boston, Lincolnshire PE20 1EJ (United Kingdom)) (1996) **The effects of nitrogen fertilizer rate, cultivation and straw disposal on the nitrate leaching from a shallow limestone soil cropped with winter barley.** *Soil Use and Management (United Kingdom) v. 12(2) p. 67-71.* 22 ref. English. (AGRIS 97-002037).

1569 Merrill, S.D. (USDA, ARS, Northern Great Plains Research Lab., Mandan, ND.); Black, A.L.; Bauer, A. (1996) **Conservation tillage affects roots growth of dryland spring wheat under drought.** *Soil Science Society of America (USA) v. 60(2) p. 575-583.* references. English. (AGRIS 97-002066).

In dryland cropping, no-tillage can increase small grain crop growth compared with conventional tillage. Because root systems develop ahead of aboveground growth and are affected by soil environment, observation of root growth will show the mechanisms by which no-till enhances crop growth. Wheat (Triticum aestivum L.) was grown in a spring wheat-winter wheat-sunflower (Helianthus anuus L.) rotation begun in 1984 on Temvik-Wilton silt loam (fine-loamy, mixed Typic and Pachic Haploborolls) under conventional till (CT: spring disking), minimal till (MT: spring undercutting) and no-till (NT). Root length growth (RLG) was measured by microvideo camera in pressurized-wall minirhizotrons, and soil water was measured by neutron moisture meter. Relative to CT, NT generally enhanced RLG more than aboveground growth; RLG averaged 65, 130, and 145 km/cm2 in 1988, 1989, and 1990, respectively. In 1988, RLG was 37 greater than MT ($P < 0.1$), with CT intermediate. In 1989, RLG was 40 greater in NT than in CT, with MT intermediate, and RLG in 1990 was 112 greater in NT than CT (no MT). Final biomass averaged 380, 1730, and 3090 kg/ha in 1988 through 1990, and was 36 greater, not significantly different, and 44 greater in NT than CT, respectively. Root penetration was shallow (1.1 m or less) in dry subsoil, but in each year roots penetrated to greater soil depths under NT than under MT or CT. Amounts of stored soil water were generally not significantly different among tillages, but more water was depleted in 1990 under NT than CT. Cooler soil under NT (measured in 1989) and superior soil water conservation in the near-surface zone appear to confer a root growth advantage to the NT treatment.

1570 Nyborg, M.; Solberg, E.D.; Malhi, S.S.; Izaurralde, R.C.; Molina Ayala, M. (1994) **Influence of long-term tillage, straw and N fertilizer on barley yield and on N uptake.** Soil Tillage for Crop Production and Protection of the Environment. Aalborg (Denmark). 24-29 Jul 1994. *ISTRO: Proceedings of the 13th international conference, 2: Soil tillage for crop production and protection of the environment. Jensen, H.E.; Schjoenning, P.; Mikkelsen, S.A.; Madsen, K.B. (eds.). International Soil Tillage Research Organization, ISTRO, Ohio (USA) p. 831-838.* Kongelige Veterinaer- og Landbohoejskole. 4 tables; 12 ref. English. (AGRIS 97-002035).

1571 Sharma, R.B.; Pandey, R. (Rajendra Agricultural Univ., Bihar (India)) (1994) **Tillage requirements for sustaining rice-wheat production in a sub-tropic calcareous sandy loam of North-Bihar, India.** Soil Tillage for Crop Production and Protection of the Environment. Aalborg (Denmark). 24-29 Jul 1994. *ISTRO: Proceedings of the 13th international conference, 2: Soil tillage for crop production and protection of the environment. Jensen, H.E.; Schjoenning, P.; Mikkelsen, S.A.; Madsen, K.B. (eds.). International Soil Tillage Research Organization, ISTRO, Ohio (USA) p. 1043-1048.* Kongelige Veterinaer- og Landbohoejskole. 4 tables; 9 ref. English. (AGRIS 97-002045).

1572 Torbert, H.A.; Reeves, D.W. (1994) **Traffic and tillage system effects on N fertilizer uptake and yield for cotton and wheat [traffic].** Soil Tillage for Crop Production and Protection of the Environment. Aalborg (Denmark). 24-29 Jul 1994. *ISTRO: Proceedings of the 13th international conference, 2: Soil tillage for crop production and protection of the environment. Jensen, H.E.; Schjoenning, P.; Mikkelsen, S.A.; Madsen, K.B. (eds.). International Soil Tillage Research Organization, ISTRO, Ohio (USA) p. 839-844.* Kongelige Veterinaer- og Landbohoejskole. 2 ill., 4 tables; 8 ref. English. (AGRIS 97-002064).

1573 Vyn, T.J.; Stewart, G.A. (Guelph Univ., Ontario (Canada)) (1994) **Cover crop nitrogen availability to corn with conservation tillage.** Soil Tillage for Crop Production and Protection of the Environment. Aalborg (Denmark). 24-29 Jul 1994. *ISTRO: Proceedings of the 13th international conference, 2: Soil tillage for crop production and protection of the environment. Jensen, H.E.; Schjoenning, P.; Mikkelsen, S.A.; Madsen, K.B. (eds.). International Soil Tillage Research Organization, ISTRO, Ohio (USA) p. 813-818.* Kongelige Veterinaer- og Landbohoejskole. 5 ill., 4 ref. English. (AGRIS 97-002062).

1574 Xixi, H.; Shiping, L.; Houqing, C.; Dasan, S. (Jiangsu Agricultural Coll., Yangzhou (China)) (1994) **A new rotation tillage system for rice-wheat multiple cropping in Jiangsu, China.** Soil Tillage for Crop Production and Protection of the Environment. Aalborg (Denmark). 24-29 Jul 1994. *ISTRO: Proceedings of the 13th international conference, 2: Soil tillage for crop production and protection of the environment. Jensen, H.E.; Schjoenning, P.; Mikkelsen, S.A.; Madsen, K.B. (eds.). International Soil Tillage Research Organization, ISTRO, Ohio (USA) p. 1049-1054.* Kongelige Veterinaer- og Landbohoejskole. 4 ill., 4 ref. English. (AGRIS 97-002046).

1575 **[Research proof benefits of rotational cropping]. Navorsing bewys nut van wisselbou** (1996) Landbouweekblad, Cape Town (South Africa). *Landbouweekblad (South Africa) (no.957) p. 10-13.* Afrikaans. (AGRIS 97-017462).

1576 Bergkvist, Goeran; Ohlander, Lars; Nilsdotter Linde, Nilla (1995) **Undersown catch crops in cereals : establishment methods and their effect on cereal yield and catch crop growth.** *NJF-utredning/rapport (Finland) (no. 99) p. 33-42.* 6 ref. English. (AGRIS 97-017383).

1577 Bujaki, G.; Guzli, P.; McKinlay, R.G. (Department of Crop Protection, Godollo Agricultural University, 2100 Godollo (Hungary)) (1995) **Comparisons of energy output/input of conventional and organic agriculture in Scotland and in Hungary.** *Integrated crop protection: towards sustainability? Proceedings of a symposium, Edinburgh, UK, 11-14 September 1995 [chaired by McKinlay, R. G.; Atkinson, D.]. p. 179-182.* British Crop Protection Council. 4 ref., BCPC Symposium Proceedings No. 63. English. (AGRIS 97-002134).

1578 Burgess, P.J.; Stephens, W.; Anderson, G.; Durston, J. (Silsoe College, Cranfield University, Bedfordshire MK45 4DT (United Kingdom)) (1996) **Water use by a poplar-wheat agroforestry system.** *Aspects of Applied Biology (United Kingdom) (no.44) p. 129-136.* 14 ref. Vegetation management in forestry, amenity and conservation areas: managing for multiple objectives, 19 and 20 March 1996, University of York, York, UK. English. (AGRIS 97-002188).

1579 Clements, R.O.; Kendall, D.A.; Purvis, G.; Thomas, T.; Koefoed, N. (Institute of Grassland and Environmental Research, North Wyke Research Station, Okehampton, Devon EX20 2SB (United Kingdom)) (1995) **Clover:cereal bi-cropping.** *Integrated crop protection: towards sustainability? Proceedings of a symposium, Edinburgh, UK, 11-14 September 1995 [chaired by McKinlay, R. G.; Atkinson, D.]. p. 75-78.* British Crop Protection Council. 3 ref., BCPC Symposium Proceedings No. 63. English. (AGRIS 97-002131).

1580 Dewes, T.; Schmitt, L. (Christian Albrechts Univ., Kiel (Germany). Inst. fuer Pflanzenbau und Pflanzenzuechtung Fachgebiet Oekologischer Landbau) (1996) **[Assessment of alternatives for plant growing methods to the production of bread wheat in organic farming]. Bewertung pflanzbaulicher Verfahrensalternativen zur Erzeugung von Backweizen im oekologischen Landbau.** *Schriftenreihe der Agrarwissenschaftlichen Fakultaet der Universitaet Kiel (Germany) (no.78) p. 47-53.* German. (AGRIS 97-017331).

Anhand aktueller Versuchsergebnisse wird diskutiert, inwieweit mit der Einbringung von Kleeuntersaaten in Weizenbestaenden, einer mechanischen Unkrautregulierung, sowie einer gezielten Wirtschaftsduengergabe das Stickstoffpotential erhoeht werden kann.

1581 Eltun, R. (Planteforsk Norsk Inst. for Planteforskning, Apelsvoll Forskingssenter, Kapp (Norway)) (1996) **The Apelsvoll [Norway] cropping system experiment III. Yield and grain quality of cereals.** *Norwegian Journal of Agricultural Sciences (Norway) v. 10(1) p. 7-21.* 6 tables, 3 figures; 25 ref. English. (AGRIS 97-002146).

1582 Gangwar, K.S.; Sharma, S.K. (Project Directorate forCropping System Research, Modipuram (India)) (1995) **Technology to step up productivity of late-planted sugarcane-wheat system in western Uttar Pradesh.** *Indian Farming (India) v. 45(3) p. 15-16.* 2 ill. English. (AGRIS 97-002177).

1583 Hauri, U. (Bioland Verband fuer organisch biologischen Landbau e. V., Goettingen (Germany)) (1995) **[Wheat: Biologically or conventionally produced]. Weizen: Biologisch oder konventionell erzeugt.** *bio-land (Germany) (no.6) p. 29.* Also: Diss., Basel Univ. (Switzerland). German. (AGRIS 97-017459).

Im Rahmen einer Dissertation wurden als musterbildende Inhaltsstoffe Proteine und Enzyme auf ihre Eignung als Unterschiedsmerkmal untersucht. Bezueglich der Esterasemuster von Weizen aus oekologischem und konventionellem Anbau ergaben sich signifikante Unterschiede.

1584 Heatherly, L.G. (USDA, ARS, Soybean Res. Unit, Stoneville, MS.); Elmore, C.D.; Wesley, R.A.; Spurlock, S.R. (1996) **Yield and net returns from monocrop winter wheat systems and a winter wheat-soybean doublecrop system.** *Journal of production agriculture (USA) v. 9(1) p. 61-65.* references. English. (AGRIS 97-002162).

Economic.evaluation of agronomic production practices is required to determine the feasibility of inputs used in cropping systems with two or more crops. The objectives of this study were to determine the effect of preplant tillage and seedbed type on subsequent monocrop wheat (Triticum aestivum L.) seed yield and net returns, and compare the results with those from a wheat-soybean [Glycine max (L.) Merr.] doublecrop system (TRT 6). Net returns were calculated using data from plantings made for 4 yr on a Tunica clay (clayey over loamy, montmorillonitic, nonacid, thermic Vertic Haplaquept) near Stoneville. MS. Within the monocropped wheat treatments, preplant management inputs were: TRT 1--wheat planted flat following summer fallow; TRT 2--wheat planted flat following a summer legume crop [Hemp sesbania, Sesbania exaltata (Raf.) Rydb. ex A.W. Hill]; TRT 3--wheat planted flat following summer fallow and subsoiling; TRT 4--wheat planted on 80-in.-wide beds following summer fallow; TRT 5--wheat planted on 80-in.-wide beds following summer fallow and subsoiling; and TRT 6--wheat-soybean doublecrop, where soybean was planted no-till in burned wheat straw and wheat was planted in harrowed (disk and/or spring-tooth) soybean stubble. Wheat yields from TRT 3 were among the highest each year, but net returns resulting from this treatment were among the highest in only 2 of the 4 yr. Combined net returns from TRT 6 were among the highest in all years, but they were positive in only 2 of the 4 yr and soybean yields averaged only 14.8 to 25.2 bu/acre. Net returns (losses in all 4 yr) resulting from TRT 2 were among the lowest each year because of the expense associated with establishing and incorporating the legume residue. These results indicate that monocropping of wheat, regardless of preplant management, is not a feasible replacement for winter wheat-soybean doublecropping in a nonirrigated environ on clay soil, even though wheat yields were higher in the monocrop treatments.

1585 Hussain, T.; Jilani, G. (University of Agriculture, Faisalabad (Pakistan). Dept. of Soil Science); Abbas, M.A. (Ayub Agricultural Research Inst., Faisalabad (Pakistan). Soil Chemistry Section) (1993) **Response of rice-wheat cropping system to K-applications.** *Journal of Agricultural Research (Pakistan) v. 31(2) p. 189-194.* 4 tables, 15 ref. English. (AGRIS 97-017424).

A long term field experiment was conducted to see the response of rice-wheat cropping sequence to K application in a Typic Camborthids sandy clay loam soil. K application alongwith nitrogen and phosphorus increased paddy/wheat yields significantly. Yield responses generally followed the order of NPK>NP>N> control. However, yield of both crops was higher at lower K-application. Potash in the soil was maximum from higher K level. Moreover, soil ECe was increased with fertilizer application whereas pH of the soil was decreased.

1586 Iragavarapu, T.K. (University of Minnesota, Southern Exp. Stn., Waseca, MN.); Randall, G.W. (1996) **Border effects on yields in a strip-intercropped soybean, corn, and wheat production system.** *Journal of production agriculture (USA) v. 9(1) p. 101-107.* references. English. (AGRIS 97-002161).

Strip-intercropping of corn (Zea mays L.) and soybean [Glycine max (L.) Merr.] normally results in corn producing a negative border effect on soybean production. This study was conducted to determine whether including a small grain strip between corn and soybean strips could reduce the negative border effects of corn and enhance soybean yields. Corn, soybean, and wheat (Triticum aestivum L.) were grown as strip intercrops (15-ft wide) in a ridge-till system at two locations in southern Minnesota from 1991 through 1994 and were compared with a two-crop corn-soybean system. Rows were oriented east-west at one location and north-south at the other. Soybean yield in the three-crop system was reduced by 17 for the north row adjacent to corn and 8 for the south row next to wheat compared with nonborder east-west rows. In north-south rows, soybean yields were reduced by 21 in the east row next to corn compared with nonborder rows with no yield reduction in the west row next to wheat. In the two-crop corn-soybean strip system, soybean yields were reduced by 34 and 11 in the south and north border rows, respectively, compared with the nonborder rows in east-west rows. In north-south rows, the outside east row yielded 19 less and the west row yielded 21 less than the nonborder rows. Corn yield of the outside north row next to wheat in east-west rows was 6 greater while the south row next to soybean yielded 18 greater than the nonborder rows. In north-

south rows, the east outside row next to wheat yielded 23 greater and the west row next to soybean yielded 27 greater than the nonborder rows. In the two-crop system, yield of the outside corn rows was enhanced similarly compared with the nonborder rows in both row orientations. Wheat yield in the 5-ft section next to soybean was 4 greater than the center 5-ft section and 6 greater than the 5-ft section next to corn in east-west rows and 9 and 17 greater in north-south rows.

1587 Jordan, V.W.L.; Hutcheon, J.A.; Donaldson, G.V.; Farmer, D.P. (IACR Long Ashton Research Station, Department of Agricultural Sciences, University of Bristol, Long Ashton, Bristol BS18 9AF (United Kingdom)) (1995) **Research into and development of integrated farming systems for less-intensive arable crop production: progress 1989-1994.** *Integrated crop protection: towards sustainability? Proceedings of a symposium, Edinburgh, UK, 11-14 September 1995 [chaired by McKinlay, R. G.; Atkinson, D.J. p. 287-295.* British Crop Protection Council. 5 ref., BCPC Symposium Proceedings No. 63. English. (AGRIS 97-002189).

1588 Khan, S.U. (Regional Agricultural Research Station, Bhairahawa (Nepal)) (1996) **Evaluation of cropping patterns under mid-wet land conditions, 1995/96.** National Winter Crops Research Workshop. Siddharthanagar, Bhairahawa (Nepal). 12-15 Sep 1996. *Summary of the wheat research reports. National Wheat Research Programme (Nepal) p. 136-146.* National Wheat Research Programme. 3 tables; 3 ref. English. (AGRIS 97-017339).

1589 Kim, D.H.; Son, B.Y.; Kim, S.K.; Shon, G.M.; Kang, D.J.; Shin, W.K. (Rural Development Administration, Chinju (Korea Republic). Gyeongnam Provincial Rural Development Administration) (1996) **Effect of over-sowing for labour-saving and on growth response as affected by different barley and wheats.** *RDA Journal of Agricultural Science (Korea Republic) v. 38(2) p. 106-116.* 4 illus.; 8 tables; 7 ref. Korean. (AGRIS 97-017369).

1590 Spiess, H. (Institut fuer Biologisch Dynamische Forschung, Bad Vilbel (Germany). Zweigstelle Bad Vilbel/Dottenfelder Hof) (1996) **[The crowing "land varieties" - what does it bring ? : Comparative investigations to many years of replanting of cereals by ecological cultivation]. Was bringt der Anbau von "Hofsorten" ? : Vergleichende Untersuchungen zum langjaehrigen Nachbau von Getreide bei biologischer Bewirtschaftung.** *Oekologie and Landbau (Germany) v. 24(3) p. 6-10.* German. (AGRIS 97-017450).

Eine Vergleichsuntersuchung, oekologisch-konventionell, ergab, dass unter Einhaltung wesentlicher Bedingungen, die naeher erlaeutert werden, der hofeigene Nachbau von Getreide, insbesondere von Weizen eine Reihe positiver Effekte hervorbringt.

1591 Verma, U.N. (Birsa Agricultural University, Ranchi (India). Department of Agronomy) (1995) **Wheat after rice in Bihar plateau constraints and potential.** *Indian Farming (India) v. 45(1-2) p. 29, 31-32.* 1 table; 2 ill. English. (AGRIS 97-002185).

F30 PLANT GENETICS AND BREEDING

1592 **[Breeding time of better triticum cultivars shortened]. Teeltyd van beter [triticum] kultivars met jare verkort** (1996) Landbouweekblad, Cape Town (South Africa). *Landbouweekblad (South Africa) (no.945) p.22-24.* Afrikaans. (AGRIS 97-018316).

1593 **Cereals variety handbook. NIAB recommended lists of cereals 1996** (1996) National Institute of Agricultural Botany, Cambridge (United Kingdom). National Institute of Agricultural Botany (NIAB). 141 p. English. (AGRIS 97-002961).

1594 Abay, F.; Cahalan, C. (Makalle University of College of Dry Land Agriculture, Tigray (Ethiopia)) (1995) **Evaluation of response of some barley landraces in drought prone sites of Trigray (Notrthern Ethiopia).** *Crop Improvement (India) v. 22(2) p. 125-132.* 2 ill., 2 tables; 8 ref. English. (AGRIS 97-002549).

1595 Abdalla, O.S.; Pena, R.J.; Autrique, J.E.; Nachit, M.M. (CIMMYT, Centro Internacional de Mejoramiento de Maiz y Trigo, Mexico D.C. (Mexico)) (1995) **[Durum wheat breeding and quality improvement at CIMMYT Mexico]. Selection du ble dur et amelioration de la qualite au CIMMYT, Mexique.** Seminar on Durum Wheat Quality in the Mediterranean Region. Zaragoza (Spain). 17-19 Nov 1993. Durum Wheat Quality in the Mediterranean Region. La Qualite du Ble Dur dans la Region Mediterraneenne. Fonzo, N. di (Istituto Sperimentale per la Cerealicoltura, Foggia (Italy). Sezione Operativa di Foggia); Kaan, F. (INRA, Institut National de la Recherche Agronomique, Mauguio (France). Station de Genetique et d'Amelioration des Plantes. Domaine de Melgueil); Nachit, M. (ICARDA, International Center for Agricultural Research in the Dry Areas, Aleppo (Syria)). *Options Mediterraneennes. Serie A: Seminaires mediterraneens (CIHEAM); no. 22 p. 133-141.* CIHEAM-IAMZ. 3 graphs.; 9 tables; 16 ref. English. (AGRIS 97-002269).

A travers l'amelioration dirigee sur les mega-environnements, le programme ble dur du CIMMYT base au Mexique a ete capable de mettre a la disposition de programmes nationaux un germoplasme a haut rendement, repondant aux techniques culturales et utilisant efficacement les ressources. L'objectif final du programme est simultanement l'augmentation du rendement et l'amelioration de la qualite du grain des bles durs dans les pays en developpement. Dans le present article, on discute des caracteristiques prioritaires pour la qualite comme la taille du grain, la vitrosite, la force du gluten et la teneur en pigment jaune, on decrit la selection des caracteres de qualite et on passe en revue les progres recents obtenus dans l'amelioration du ble dur au CIMMYT au Mexique. Les resultats indiquent que des valeurs elevees de la force du gluten sont actuellement disponibles dans le materiel genetique du CIMMYT. Cependant, des efforts sont encore necessaires pour augmenter le niveau de la concentration en pigment jaune.

1596 Abdalla, OS.; Crossa, J.; Cornelius, PL. (1997) **RESULTS AND BIOLOGICAL INTERPRETATION OF SHIFTED MULTIPLICATIVE MODEL CLUSTERING OF DURUM WHEAT CULTIVARS AND TEST SITE.** *Crop Science. 37(1):88-97.* English. [CIMMYT INT MAIZE & WHEAT IMPROVEMENT CTR LISBOA 27 APDO POSTAL 6-641 MEXICO CITY 06600 DF MEXICO].

The examination of crossover interactions (COI) (genotypic rank change) and identification of subsets of homogeneous groups of sites and cultivars without COI are important in the interpretation of cultivar trials in breeding and agronomy. The shifted multiplicative model (SHMM) clustering method was applied to a CIMMYT durum wheat (Triticum turgidum L. var. durum) yield trial consisting of 24 cultivars grown at 40 international sites during the 1990-1991 season. The objectives were to identify subsets of sites and cultivars with negligible genotypic rank change and attempt to give a biological interpretation for the resulting clusters. The SHMM with one multiplicative term (SHMM(1)) provided an adequate fit for seven final groups of cultivars and eight final groups of sites with small numbers of COI. Grouping of cultivars greatly reflected similarity in genetic backgrounds and, consequently, similarity of response to test environments. Differential responses within the same genetic background were attributed to differences in simply inherited traits such as plant height and disease resistance. The observed grouping of sites was generally associated with latitude, while environmental conditions that influenced crop phenology and cropping cycle delineated the final groupings. The results suggest that groups formed based on SHMM clustering methods have valid biological basis. Routine use of SHMM clustering methods could increase selection efficiency through the identification and selection of superior cultivars within clusters having negligible COI. Similarly, groups of test sites that represent similar selection environments could be identified and that would *facilitate* identification of key test sites as well as decision making concerning exchange of germplasm and information. [References: 18].

1597 Adamski, T.; Jezowski, S.; Lesniewska Fratczak, M.; Surma, M. (Polska Akademia Nauk, Poznan (Poland). Inst. Genetyki Roslin) (1996) **[Use of fluorescent techniques in evaluation of the brewing quality of barley. Pt.1. Evaluation of the brewing quality of barley by Malt Modification Analyzer]. Wykorzystanie technik fluorescencyjnych do oceny wartosci browarnianej jeczmienia. Cz. 1. Ocena wartosci browarnianej jecznienia za pomoca analizatora modyfikacji slodu.** *Hodowla Roslin i Nasiennictwo (Poland) (no.1) p. 4-6.* 1 fig., 14 ref. Polish. (AGRIS 97-017897).

The brewing quality of barley can be estimated, among others, by determining the destruction degree of the endosperm cell walls in malt. The higher the degree of cell wall looseness, the higher effectiveness of storage substances decomposition into simpler compounds soluble in water. The coefficient of malt modification is expressed as percentage of

modified surface of endosperm to its total surface. An apparatus making possible this character determination is a Malt Modification Analyzer (MMA). The paper gives principles of the MMA action as well as methods recommended by EBC for evaluation of the brewing quality of barley with the use of this apparatus.

1598 Adamski, T.; Jezowski, S.; Lesniewska Fratczak, M.; Surma, M. (Polska Akademia Nauk, Poznan (Poland). Inst. Genetyki Roslin); Madajewski, R. ("Piast" Hodowla Roslin Spolka z o.o., Lagiewniki (Poland)) (1996) **[Use of fluorescent techniques in evaluation of the brewing quality of barley. Pt. 2. Evaluation of brewing quality of spring barley strains]. Wykorzystanie technik fluorescencyjnych do oceny jakosci browarnianej jeczmienia. Cz. 2. Ocena wartosci browarnianej rodow jeczmienia jarego.** *Hodowla Roslin i Nasiennictwo (Poland) (no.1) p. 6-9.* 4 tables; 5 ref. Polish. (AGRIS 97-017898).

Crude protein content, malt extractability, cytolytic looseness and degree of malt modification and its homogenity were analysed in 32 strains and in the standard cultivars Rudzik and Maresi. It has been found that the degree of malt modification was significantly correlated with fine and coarse extract, but negatively - fine - coarse difference. The obtained results point to the propriety of using fluorescent techniques for determination of the brewing value in barley selection.

1599 Aheer, G.M. (Ayub Agricultural Research Inst., Faisalabad (Pakistan). Entomology Section); Ihsan ul Haq (Plant Protection Research Inst., AARI, Faisalabad (Pakistan)); Ahmad, K.J.; Ali, A. (1993) **Varietal resistance and sowing date effect on aphid density and wheat yield.** *Journal of Agricultural Research (Pakistan) v. 31(3) p. 313-317.* 2 tables, 7 ref. English. (AGRIS 97-018366).

Twenty wheat varieties/advance lines viz. Chakwal86, D84637, D84658, Faisalabad85, Pak81, Shalimar88, 82274-1, 83035-2, 83171, 84021, 84133-6, 85054, 85060-2, 85078, 85162, 85195, 85276-2, 86299, 86369 and 86371 were sown on nine different dates (October20, 30; November 10, 20, 30; December 10, 20, 30, 1988 and January 15, 1989) to determine varietal response and sowing date effect on aphid density and grain yield. A wheat line, D84658 was found more susceptible to aphid infestation (15.12/tiller). It gave grain yield of 2400 kg/ha. Whereas, D84637 was resistant with lower aphid density (5.47/tiller) and higher grain yield (3147 kg/ha). Late wheat sowing suffered more with maximum aphid density (8.88/tiller). It gave lowest grain yield (846 kg/ha). Higher grain yields (4242 and 4031 kg/ha) with the lowest aphid population i.e. 2.33 and 3.28 was recorded when sown on 20th and 30th October, respectively. It is suggested that wheat should be sown during October. The correlation between aphid and grain yield was significant and negative (r= -0.961).

1600 Aheer, G.M. (Ayub Agricultural Research Inst., Faisalabad (Pakistan). Entomology Section); Rashid, A.; Afzal, M. (Punjab Agricultural Research Inst., Bahawalpur (Pakistan)); Ali, A. (1993) **Varietal resistance/susceptibility of wheat to aphids, Sitobion avenae F. and Rhopalosiphum rufiabdominalis Sasaki.** *Journal of Agricultural Research (Pakistan) v. 31(3) p. 307-311.* 2 tables, 8 ref. English. (AGRIS 97-018365).

Thirteen wheat varieties/advance lines i.e. Kohinoor-83, Pak81, Punjab81, Sutlej86, V6236, V6300, V6521, V6550, V6566, V6632, V6751, V6916 and V7061 were tested during 1988-89 to determine loss in grain yield caused by aphids (Sitobion avenae F. and Rhopalosiphum rufiabdominalis Sasaki). The experiment was sown in two sets viz. sprayed and unsprayed. Perfekthion (dimethoate) at the rate of 741 ml/ha was sprayed in one set for four times at 10 days interval starting from February 18, 1989. Wheat lines differed significantly in response to aphid population and grain yield. There was no effect on grain yield. On an average, 7.19 aphids per tiller reduced 16.38 yield. Kohinoor83 was relatively susceptible with 22.53 grain yield loss. Whereas, V7061 was resistant with 10.76 yield loss. Correlation between grain yield loss and number of aphids causing yield loss was significant and negative. Wheat lines behaved differently with regard to aphid population and loss in grain yield.

1601 Aheer, G.M.; Ahmad, R. (Ayub Agricultural Research Inst., Faisalabad (Pakistan). Entomology Section) (1993) **Response of wheat to Trogoderma granarium (Everts.) and Rhizopertha dominica (F.B.).** *Journal of Agricultural Research (Pakistan) v. 31(3) p. 319-322.* 1 table, 9 ref. English. (AGRIS 97-018416).

Twelve wheat varieties/lines (85054, 86175, Shalimar-88, 85205, 86371, 85276-2, 84021, 86299, Punjab-85, 83035, 86369 and 84133-6) were tested against khapra beetle and lesser grain borer in the laboratory. Significant differences existed among the varieties for number of bored grain and grain weight loss caused by T. granarium and R. dominica. A wheat variety, 86175 proved less susceptible to the pests. R. dominica gave minimum damaged grains (0.60) and loss in weight (0.34). In case of T. granarium, a variety 86299 was relatively more resistant. It gave minimum loss in weight (0.58). Variety 86731 was comparatively less susceptible on the basis of damaged grains (1.10).

1602 Ainsworth, C.; Hosein, F.; Tarvis, M.; Weir, F.; Burrell, M.; Devos, K.M.; Gale, M.D. (London Univ., Wye, Kent (United Kingdom). Dept. of Biological Sciences, Plant Molecular Biology Lab.) (1995) **Adenosine diphosphate glucose pyrophosphorylase genes in wheat: differential expression and gene mapping.** *Planta (Germany) v. 197(1) p. 1-10.* 7 ill., 37 ref. English. (AGRIS 97-018331).

1603 Alhakimi, A.; Monneveux, P.; Deleens, E. (1996) **SELECTION RESPONSE FOR CARBON ISOTOPE DISCRIMINATION IN A TRITICUM POLONICUM X T-DURUM CROSS - POTENTIAL INTEREST FOR IMPROVEMENT OF WATER EFFICIENCY IN DURUM WHEAT.** *Plant Breeding. 115(5):317-324.* English. [ENSA INRA UFR GENET & AMELIORAT PLANTES F-34060 MONTPELLIER FRANCE].

This study has been conducted to evaluate the usefulness of carbon isotope discrimination (Delta) in mature kernels as a criterion for the improvement of water-use efficiency and yield under drought in durum wheat. For this purpose, Triticum durum 'Om Rabi 5' was crossed with T. polonicum pseudochrysospermum 9 (Tp9) which has been found to be more drought tolerant and to have a lower carbon isotope discrimination value of the grain. The F-2 population showed a wide segregation for carbon isotope discrimination. Further, divergent selections (selection of plants most different in carbon isotope discrimination) were made among individual F-2 plants, and for carbon isotope discrimination in F-2 progenies under field conditions. Selected F-3 and F-4 progenies were evaluated under field conditions for morphological and agronomical traits. Broad-sense heritability (h(b)(2)), response to selection and realized heritability (h(r)(2)) were high. The narrow-sense heritability (h(n)(2) = 0.37 +/- 0.047) indicated that additive and dominance effects were involved in the genetic control of carbon isotope discrimination. Negative correlations were noted between carbon isotope discrimination and grain yield and between carbon isotope discrimination and biomass yield within years and generations. An explanation of this result is attempted by analysing the relationships between carbon isotope discrimination and several phenological and morphological traits influencing the water-use efficiency. The divergent groups selected for low and high carbon isotope discrimination exhibited significant differences for days to heading, plant height, shape of the spike and number of spikelets per spike. Correlations were also found between carbon isotope discrimination and plant height, harvest index, shape of the spike, spike length, and number of spikes per plant. The potential use of carbon isotope discrimination as a criterion for the improvement of water-use efficiency in durum wheat is discussed by considering the genetics of this trait (variability, heritability, response to selection) and also the associations with phenological and morphological traits. [References: 38].

1604 Amer, I.M. Ben; Worland, A.J.; Boerner, A. (Institut fuer Pflanzengenetik und Kulturpflanzenforschung, Gatersleben (Germany)) (1995) **Chromosomal location of genes affecting tissue-culture response in wheat.** *Plant Breeding (Germany) v. 114(1) p. 84-85.* 1 ill.; 8 ref. English. (AGRIS 97-018321).

Six 'Chinese Spring/Triticum spelta' substitution lines for chromosomes 1A, 1D (duplicates), 3D (duplicates), 6D, and one 'Chinese Spring/Marquis' substitution line for chromosome 2B were studied for tissue-culture response (TCR). The results reported here indicate that chromosomes 2B and 6D are critical for TCR, whereas chromosome 1D affects callus weight only. Chromosomes 1A and 3D were not found to be critical, however, these chromosomes may carry genes with minor effects.

1605 Amsal Tarekegne; Getinet Gebeyehu (IAR, Addis Abeba (Ethiopia)); Tesfaye Tesema; Tanner, D.G. (1996) **Yield improvement effects on the morpho-physiological characters of bread wheat.** 1. Proceeduings of the Conference of the Agronomy and Crop Physiology Society of Ethiopia. Addis Abeba (Ethiopia). 30-31 May 1995. *Increasing food production through improved crop management. Woldeyesus Sinebo; Zerihun Tadele; Nigusie*

Alemayehu (IAR, Addis Abeba (Ethiopia)) (eds.) p. 32-42. APSE. 4 tables; 12 ref. English. (AGRIS 97-002911).

The yield of thirteen bread wheat (Triticum aestivum L.) varieties released in the Ethiopian highlands from 1949 to 1987 was evaluated under non-limiting levels of soil fertility, foliar disease, lodging and weed competition. The temporal improvement of the grain yield of bread wheat was associated with an increased harvest index, while biomass yield was unchanged. The number of grains m-2, grains spike-1, spikelets spike-1, and grains spikelet-1 were significantly increased in bread wheat over the period of yield improvement. Plant height was reduced significantly, while the days to anthesis was significantly increased over the period of varietal releases. Grain filling duration was not altered, while spike and total grain-sink filling rates were significantly increased by the breeding program. Apparently, the improvement of grain yield of bread wheat substantially increased the magnitude of the grain sink and the efficiency of assimilate partitioning into grain. Wheat breeders should continue to improve spike fertility as a means of further increasing the grain yield potential of wheat. However, since wheat straw is also considered important by peasant farmers in Ethiopia, the bread wheat improvement program should consider developing taller varieties whithout sacrificing grain yield.

1606 Annone, J. (1995) **[Detection and incorporation of resistance to foliar pathogens of wheat]. Deteccion e incorporacion de resistencia a patogenos foliares de trigo.** *[Wheat breeding in Argentina: Thirty years of cooperative investigation with CIMMYT; Balcarce, Argentina; 7-8 Oct 1992]. El mejoramiento de trigo en Argentina: Treinta anos de investigacion cooperativa con el CIMMYT; Balcarce, Argentina; 7-8 Oct 1992. Kohli, M.M.; Nisi, J.; Rajaram, S. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 137-141.* CIMMYT. Spanish. (AGRIS 97-018314).

The environmental conditions of the region served by INTA Experimental Station, Pergamino, are highly conducive to the establishment, Sunbird, Purdue 1, PF7619, PA T 72300 SUM79A and 68A. On the other hand, tan spot epidemics in the region have been on an increase due to stubble being left on the soil surface. The initial studies have shown differences among the genetic materials. Las condiciones ambientales presentes en la region bajo la inEluencia de la Estacion Experimental INTA Pergamino son altamente favorables para el establecimiento y desarrollo de enfermedades foliares en trigo. Las principales enfermedades presentes en la region son roya de la hoja (Puccinia recondita), Septoriosis de la hoja (Septoria tritici) y mancha amarilla o bronceada (Drechslera tritici repentis). En el caso de la roya de la hoja se utiliza la inoculacion artificial con una mezcla de virulencias para identificar los materiales resistentes y de lento desarrollo de la enfermedad. F1 plan de generar mejores fuentes de resistencia para septoriosis de la hoja ha producido un grupo destacado de lineas F4 y F5. Algunos progenitores de importancia en este caso han sido Bagula, Bobwhite, Sunbird, Purdue, PF76 19, PA T72300, SUM79A y 68A. Por otra parte, la epifitia de la mancha amarilla en la region esta creciendo debido a la presencia de los rastrojos en superficie. Los primeros estudios han podido detectar diferencias entre materiales geneticos.

1607 Annone, J.G.; Conta, H.; Calzolari, A.; Polidoro, O. (1995) **[Selection for resistance to Septoria tritici in advanced segregating progenies of bread wheat]. Seleccion por resistencia a Septoria tritici en filiales segregantes avanzadas de trigo pan.** *Proceedings of a Septoria Tritici Workshop; Mexico, D.F.; 20-24 Sep 1993. Gilchrist, L.; Ginkel, M. van; McNab, A.; Kema, G.H.J. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 73-83.* CIMMYT. 5 tables; 16 ref. Spanish. (AGRIS 97-018297).

Septoria tritici blotch (STB) is one of the most important diseases of wheat in Argentina. Control of STB mainly focuses on the use of genetic resistance. However, the present levels of resistance do not offer sufficient protection under severe epidemics. In order to overcome this limitation, the National Wheat Subprogram of the National Institute for Agricultural Technology (INTA) initiated a project specifically aimed at the identification, characterization, and transfer of genetic resistance to the causal organism of STB, the fungus Septoria tritici. The present paper describes the process of selection for resistance to the pathogen in advanced segregating progenies, the selection criteria used, the nature of selected germplasm, and the probable sources of resistance involved. La mancha de la hoja del trigo (MHT) es una de las enfermedades de mayor importancia economica para ese cultivo en Argentina. El manejo de la MHT se realiza principalmente mediante el empleo de resistencia genetica. Sin embargo, los niveles de proteccion conferidos no son adecuados bajo condiciones de epifitias severas. Con el fin de superar esta limitante, el Subprograma Nacional de Trigo del Instituto Nacional de Tecnologia Agropecuaria (INTA) desarrolla un proyecto especifico para la deteccion, caracterizacion y transferencia de resistencia al agente causal de la MHT, el hongo Septoria tritici. La presente contribucion describe el proceso de seleccion de lineas filiales segregantes avanzadas por su resistencia al patogeno, los criterios de seleccion adoptados, la composicion del germoplasma selecto y las probables fuentes de resistencia.

1608 Anon. (1996) **[Cereal crops: "special autumn campaign" [new cultivars, comparative tables of cultivars registered in the French Catalogue, key-figures of yield components]]. Cereales "special campagne d'automne" [nouvelles varietes, tableaux comparatifs des varietes du Catalogue francais, chiffres-cles de la formation du rendement].** *Semences et Progres (France) (no 88) p. 13-66.* Tableaux. French. (AGRIS 97-002258).

1609 Arbuzova, V.S. (Russian Academy of Sciences, Novosibirsk (Russian Federation). Inst. of Cytology and Genetics); Efremova, T.T.; Laikova, L.I.; Maystrenko, O.I.; Popova, O.M.; Pshenichnikova, T.A. (1996) **The development of precise genetic stocks in two wheat cultivars and their use in genetic analysis.** *Euphytica (Netherlands) v. 89(1) p. 11-15.* 7 ref. English. (AGRIS 97-018343).

1610 Arlow, P.A.; Mikhalevich, A.A. (Academy of Sciencies of Belarus, Minsk (Belarus). Institute of Genetics and Cytology) (1996) **[Genome- and plasmon effects on plant ability for induction of pollen embryogenesis in wheat anther culture]. Ehffekty genoma i plazmona na zdol'nasts' raslinaw da induktsyi pylkovaga ehmbryyagenezu u kul'tury pyl'nikaw pshanitsy.** *Vestsi Akadehmii Navuk Belarusi. Seyya biyalagichnykh navuk (Belarus) (no.1) p. 19-22.* 3 figures; 13 ref. Byelo Russian. (AGRIS 97-002906).

Genetic control of the parameters, characterizing plant ability for pollen embryogenesis induction in anther culture was investigated. Conclusion on plasmon involvement in these processes was drawn.

1611 Autran, J.C. (INRA, Institut National de la Recherche Agronomique, Montpellier (France). Laboratoire de Technologie des Cereales); Pogna, N.E. (Istituto Sperimentale Cerealicoltura, Roma (Italy)); Kudryavtsev, A.M.; Navilov, N.I. (Institute of Cereal Genetics, Moscow (Russian Federation)) (1995) **[Use of genetic variation in the improvement of quality in durum wheat]. Utilisation de la variation genetique pour l'amelioration de la qualite chez le ble dur.** Seminar on Durum Wheat Quality in the Mediterranean Region. Zaragoza (Spain). 17-19 Nov 1993. Durum Wheat Quality in the Mediterranean Region. La Qualite du Ble Dur dans la Region Mediterraneenne. Fonzo, N. di (Istituto Sperimentale per la Cerealicoltura, Foggia (Italy). Sezione Operativa di Foggia); Kaan, F. (INRA, Institut National de la Recherche Agronomique, Mauguio (France). Station de Genetique et d'Amelioration des Plantes. Domaine de Melgueil); Nachit, M. (ICARDA, International Center for Agricultural Research in the Dry Areas, Aleppo (Syria)). *Options Mediterraneennes. Serie A: Seminaires mediterraneens (CIHEAM); no. 22 p. 173-180.* CIHEAM-IAMZ. 7 ill.; 18 ref. English. (AGRIS 97-002274).

Les proteines de reserve, telles qu'elles sont habituellement definies a partir de leurs caracteristiques chimiques et de leur controle genetique, appartiennent a trois familles principales : les gliadines, les sous-unites glutenines de haut (HMW) et faible (LMW) poids moleculaire. Il existe chez le ble dur une importante variabilite genetique tant pour le nombre de loci que pour le nombre d'alleles. On a pu ainsi denombrer 8 blocs alleliques codes par le locus Gli-A1 (chromosome 1A), 4 blocs Gli-B1 (chromosome 1B) (en particulier les gamma-gliadines 42 et 45 dont on a demontre les effets opposes sur la qualite du gluten), 17 blocs Gli-A2 (chromosome 6A) et 9 blocs Gli-B2 (chromosome 6B). A partir des resultats genetiques et biochimiques, on a conclu que les gamma-gliadines 42 et 45 ne sont que des marqueurs genetiques, leur relation avec la qualite provenant de leur etroite liaison genetique avec les sous-unites LMW-glutenines codees au locus Gli-B3 sur le chromosome 1B et designees respectivement LMW-1 et LMW-2. Du fait d'une bonne correspondance entre les compositions alleliques observees au niveau des loci Glu-3 et Gli-1, les alleles gliadines peuvent etre utilises comme indicateurs de la composition allelique des LMW et de leur contribution aux proprietes du gluten. Une autre importante observation est l'existence de plusieurs

autres genes gliadines ("selfish"), eloignes des loci Gli-1, et qui sont homologues aux loci Gli-3, Gli-4, et Gli-5 du ble tendre. Une variabilite genetique existe egalement chez le ble dur du point de vue des aptitudes a la panification. Bien que de nombreuses varietes de ble dur aient des courbes alveographiques presentant des rapports tenacite/extensibilite (P/L) typiques de glutens extremement tenaces - ce qui est vraisemblablement du a l'absence du genome D - la translocation chromosomique peut etre utilisee pour introduire des genes d'especes etrangeres.

1612 Backes, G.; Schwarz, G.; Wenzel, G.; Jahoor, A. (1996) **COMPARISON BETWEEN QTL ANALYSIS OF POWDERY MILDEW RESISTANCE IN BARLEY BASED ON DETACHED PRIMARY LEAVES AND ON FIELD DATA.** *Plant Breeding. 115(5):419-421.* English. [TUM WEIHENSTEPHAN LEHRSTUHL PFLANZENBAU & PFLANZENZUCHTUNG D-85350 FREISING GERMANY].

A quantitative trait loci (QTL) analysis of quantitative powdery mildew resistance was performed on 216 doubled haploid lines derived from a cross between the winter-barley varieties 'Igri' and 'Danilo' using 67 RFLP loci. Resistance to powdery mildew was determined in the held with natural infection and on detached primary leaves with a specific isolate. The major QTL found in both sets of analysis mapped to the same chromosomal region. No further QTL could be found in the analysis based on detached leaves and one additional minor QTL was found in the analysis based on held data. [References: 14].

1613 Baezinger, Stephen (Nebraska Univ., Lincoln (USA). Dept. of Agronomy) (1995) **[Understanding the wheat genome: using all the available tools]. Trabajos y recomendaciones presentados al taller: Biotecnologia en relacion con tecnicas mutagenicas para el mejoramiento genetico vegetal.** Biotecnologia en relacion con tecnicas mutagenicas para el mejoramiento genetico vegetal. Santiago (Chile). 24-27 Abr 1995. [Papers and recommendations presented at the workshop: Biotechnology in relation to mutation techniques for plant breeding]. *Serie La Platina - Instituto de Investigaciones Agropecuarias. Centro Regional La Platina (Chile); no. 64 p. 57-61. Instituto de Investigaciones Agropecuarias, Santiago (Chile). Centro Regional La Platina.* INIA. 13 ref. English. (AGRIS 97-002201).

1614 Bainotti, C.T.; Fraschina, J.A.; Nisi, J.E.; Galich, N.A.; De Galich, M.T.; Formica, M.B.; Salines, J.H. (1995) **[Wheat breeding in the province of Cordoba]. Mejoramiento de trigo en la provincia de Cordoba.** *[Wheat breeding in Argentina: Thirty years of cooperative investigation with CIMMYT; Balcarce, Argentina; 7-8 Oct 1992]. El mejoramiento de trigo en Argentina: Treinta anos de investigacion cooperativa con el CIMMYT; Balcarce, Argentina; 7-8 Oct 1992. Kohli, M.M.; Nisi, J.E.; Rajaram, S. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 85-95.* CIMMYT. 5 graphs. Spanish. (AGRIS 97-018309).

The Wheat Breeding Program at INTA Marcos Juarez was started in 1960 in order to increase the wheat production. Marcos Juarez region is generally continental warm with a sub-humid climate and a strong water deficit during the winter and, with large variability among years. The wheat crop occupies approximately 8 percent of the national area and yields about 9 percent higher than the national average. The majority of the area is rainfed. During the decades of 70's to 90's, the farm yield increased from 1200 to 2500 kg/ha and the experimental yield from 1400 to 4100 kg/ha. During the last few years, the highest yields on farm and under experimental conditions have been between 5000 and 6000 kg/ha Por necesidad de contar con una mayor produccion triguera, es que a partir del ano 1960 se inicia el Programa de Mejoramiento de Trigo en la EEA Marcos Juarez. El area de influencia de la EEA Marcos Juarez se encuentra bajo un clima sub-humedo con modalidad de templado-continental, con marcado deficit hidrico in vernal y con gran variabilidad entre anos. El cultivo de trigo en Cordoba ocupa el 8 porciento de la superficie nacional y tiene un rendimiento superior en un 9 porciento al nacional. La mayoria de la superficie se conduce en secano. Desde la decada del 70 al 90 los rendimientos en campo de productor pasaron de 1200 a 2500 kg/ha y en campo experimental de 1400 a 4100 kg/ha. En los ultimos anos se obtuvieron rendimientos maximos de 5000 y 6500 kg/ha en campo de productor y experimental, respectivamente. La difusion de los cultivares liberados por el Programa, en la mencionada area llego a un 60 porciento durante la campana 91. El principal objetivo del Programa es la obtencion de variedades con alto potencial de rendimiento, con resistencia a Puccinia recondita, P. graminis tritici, Fusarium spp., Septoria tritici, Drechslera tritici repentis, etc., con buena calidad comercial e industrial para panificacion directa, con resistencia a estres hidrico temprano y alta capacidad de macollaje. Ademas se conducen lineas de trabajo en mejoramiento para resistencia a sequia y a Fusarium spp. La metodologia de mejoramiento es la creacion de variabilidad y la conduccion de la seleccion y evaluacion en diferentes localidades distribuidas en toda la region triguera Argentina. Los logros obtenidos en el programa de mejoramiento, a traves de todos estos anos, son la liberacion de 11 variedades y un gran numero de lineas avanzadas ineditas. La colaboracion recibida del Dr. N. Borlaug e investigadores del CIMMYT, desde los comienzos, permitio incrementar la produccion y estabilidad del rendimiento.

1615 Balatero, C.H.; Darvey, N.L.; Luckett, D.J. (Philippines Univ. Los Banos, College 4031, Laguna (Philippines). Inst. of Plant Breeding) (1995) **Genotypic and non-genotypic factors influencing the anther culture and doubled haploid production in hexaploid triticale.** 11. Annual Scientific Meeting of the Federation of Crop Science Societies of the Philippines. Dumaguete City (Philippines). 23-30 Apr 1995. *Philippine Journal of Crop Science (Philippines) v. 20(Supplement no. 1) p. 7.* Issued Jul 1996. English. (AGRIS 97-002903).

Greenplant regeneration efficiencies of calli/embryoids derived from either semi-solid or liquid MC17 media were similar. Alleles causing high androgenetic response appear to be dominant over alleles controlling low callus/embryo induction based on the performance of different breeding populations (F1, F2 and backcrosses). Pretreatment of spikes with 0.05 percent colchicine three days prior to anther culture significantly improved callus/embryoid induction but slightly reduced the regeneration potential of the calli/embryoids. The use of chromosome doubling agent in triticale is deemed necessary owing to the low frequency of spontaneously DH plants (7-8 percent). The conventional method of doubling the chromosome number using colchicine (0.05 percent) significantly improved the overall level of DH plant production. Likewise, the use of donor plants capable of meiotic restriction increased the number of partially-fertile haploid plants.

1616 Balkema Boomstra, A.G.; Mastebroek, H.D. (DLO Centre for Plant Breeding and Reproduction Research (Center for Plant Breeding and Reproduction Research DLO), Wageningen (Netherlands)) (1995) **Effect of powdery mildew (Erysiphe graminis f.sp. hordei) on photosynthesis and grain yield of partially resistant genotypes of spring barley (Hordeum vulgare L.).** *Plant Breeding (Germany) v. 114(2) p. 126-130.* 1 graph, 4 tables; 13 ref. English. (AGRIS 97-017888).

The effect of powdery mildew on the photosynthesis and grain yield of partially resistant spring barley was investigated. The effect of powdery mildew on the CO2 exchange rate (CER) of inoculated and non-inoculated leaves was measured in several glasshouse experiments. Grain yield reduction by powdery mildew was determined in three field experiments. The CER of the inoculated leaves was reduced by infection but that of the non-inoculated leaves was not significantly different from that of the corresponding leaves of the control plants. The reduction in CER of the different genotypes was closely related to the percentage leaf area infected with powdery mildew. The correlation between degree of mildew infection and grain yield reduction varied between $r = 0.84$ (significant at $P = 0.01$) and $r = 0.41$ (not significant). Differences in greenness of the crop were correlated better with grain yield reduction ($r = 0.66$, $P = 0.01$) than powdery-mildew infection itself. Low percentages of powdery-mildew infection did not lead to significant reduction in grain yield. Partial resistance to powdery mildew could thus be a valuable attribute of future barley varieties.

1617 Barbosaneto, JF.; Sorrells, ME.; Cisar, G. (1996) **PREDICTION OF HETEROSIS IN WHEAT USING COEFFICIENT OF PARENTAGE AND RFLP-BASED ESTIMATES OF GENETIC RELATIONSHIP.** *Genome. 39(6):1142-1149.* English. [CORNELL UNIV DEPT PLANT BREEDING & BIOMETRY 252 EMERSON HALL ITHACA, NY 14853 USA].

Genetic relationship can be a useful predictor of the relative performance of hybrid combinations for a hybrid breeding program resulting in reduced time and cost of hybrid testing. Genetic relationships of 112 wheat (Triticum aestivum L. em. Thell.) lines were estimated using 41 DNA clones hybridizing to 273 DNA fragments and by calculating coefficient of parentage (COP). Heterosis was estimated for 722 hybrids grown in multiple locations, with 189 being tested in more than 1 year. The

average RFLP (restriction fragment length polymorphism) based genetic distance index (DI) was 0.35. Midparent heterosis for grain yield ranged from -20 to 57% and high-parent heterosis from -22 to 47%. The correlation between RFLP-based estimates of genetic distance and COP was nonsignificant (-0.33). Coefficient of parentage was significantly correlated with heterosis for all traits in 1991 but not in other years. Genetic distance based on RFLPs scored in this study was not correlated with heterosis in any of the years tested. Further refinement of gene pools and new prediction methods will be required to facilitate the exploitation of genetic variability for hybrid wheat improvement. [References: 44].

1618 Bariffi, J.O. (1995) **[Wheat breeding in the southeast of Buenos Aires province]. Mejoramiento genetico de trigo en el sureste de la provincia de Buenos Aires.** *[Wheat breeding in Argentina: Thirty years of cooperative investigation with CIMMYT; Balcarce, Argentina; 7-8 Oct 1992]. El mejoramiento de trigo en Argentina: Treinta anos de investigacion cooperativa con el CIMMYT; Balcarce, Argentina; 7-8 Oct 1992. Kohli, M.M.; Nisi, J.E.; Rajaram, S. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 59-63.* CIMMYT. 3 tables. Spanish. (AGRIS 97-018306).

The Southeast of Buenos Aires province seeds approximately 1.1 million hectares of wheat representing almost 30 percent of the national production. The region is subdivided in the humid zone, mixed potato region, with high yield potential and the dry zone, mixed wheat region, with severe limitations on production. The importance of major wheat diseases in the humid zone can seriously limit the production of the crop. Due to existing system of rotation in the region, short cycle varieties are very necessary. Even when the region can produce both bread and durum wheats, the area under durum wheats suffered serious setback during the last few years due to disease and quality problems. Balcarceno INTA is the only semidwarf durum wheat variety released by Balcarce Experimental Station of INTA. In bread wheat, San Agustin INTA, Pionero INTA, and PROINTA Azul have been released and represent a yield advantage of 6 to 36 percent over the commercially sown varieties. The breeding for industrial quality is another important task for the future. At the same time, durable resistance to leaf rust and resistance to Septoria leaf blotch and Fusarium head blight are important germplasm priorities. El sur-este de la Provincia de Buenos Aires siembra alrededor de 1.100.000 has. de trigo, lo que representa el 30 porciento de la produccion nacional. La region esta subdividida en la zona humeda, mixta papera, con potenciales altos de rendimiento y la zona seca, mixta triguera, con serias limitantes a la produccion. La importancia de principales enfermedades de trigo en la zona humeda puede comprometer la produccion del cultivo. Debido a los sistemas de rotacion existentes en la region, variedades de ciclo corto son muy requeridas. A pesar de que el area puede producir tanto el trigo pan como el trigo para fideos; la siembra de trigos fideos sufrio una disminucion importante durante los ultimos anos debido a problemas sanitarios y calidad. La unica variedad semi-enana liberada por la Estacion Experimental INTA Balcarce en trigos fideos es Balcarceno INTA. En trigo pan, el programa ha identificado y liberado variedades como San Agustin INTA, Pionero INTA y PROINTA Azul que representan una ventaja entre 6 y 36 porciento sobre las variedades sembradas (testigos). El mejoramiento de la calidad es un aspecto importante para los trabajos futuros. Asimismo, la obtencion de germoplasma con resistencia duradera a las royas es prioritario como asi tambien a Septoria tritici y fusariosis de la espiga.

1619 Barriga B, Patricio; Proschle A, Alejandro (Universidad Austral de Chile, Valdivia (Chile). Fac. de Ciencias Agrarias) (1996) **[Inheritance of phosphorus content and phosphorus efficiency utilization in wheat]. Herencia del contenido y de la eficiencia de la utilizacion del fosforo en trigo.** *Agro-Ciencia (Chile) v. 12(1) p. 43-49.* 32 ref. Parte de tesis de grado del segundo autor. Spanish. (AGRIS 97-017465).

Cinco genotipos de trigo invernal fueron cruzados en un sistema dialelo para evaluar la heterosis y la capacidad combinatoria para el contenido de fosforo (P) y la eficiencia de utilizacion del P. La eficiencia de utilizacion del P fue estimada a traves del indice de cosecha de P (contenido de P en el grano/ P total de la planta), de la eficiencia biologica del P (materia seca total/P total de la planta) y de la eficiencia economica del P (materia seca de grano/ P total de la planta). El analisis dialelo de Gardner y Eberhart demostro altos niveles de efectos heteroticos para cada caracter estudiado. Los cuadrados medios para heterosis especifica (Sjj,) fueron altamente significativos para tres de los cuatro caracteres. El analisis de capacidad combinatoria general (CCG), de capacidad combinatoria especifica (CCE) y la relacion entre los efectos genicos aditivos y no aditivos (CCG/CCE) indicaron que gran parte de la variacion genetica observada, para todos los caracteres, fue asociada principalmente con accion genica de tipo no aditivo. La mayor importancia de la varianza genetica no aditiva, para todos los caracteres, estaria senalando que los hibridos pueden ser seleccionados sobre la base de sus efectos de capacidad combinatoria especifica.

1620 Bell, M.A. (Centro Internacional de Mejoramiento de Maiz y Trigo, Mexico, D.F. (Mexico)); Fischer, R.A.; Byerlee, D.; Sayre, K. (1995) **Genetic and agronomic contributions to yield gains: a case study for wheat.** *Field Crops Research (Netherlands) v. 44(2-3) p. 55-65.* 46 ref. English. (AGRIS 97-018333).

1621 Ben Amer, I.M. (Institut fuer Pflanzengenetik und Kulturpflanzenforschung, Gatersleben (Germany)); Worland, A.J.; Boerner, A. (1996) **The effects of whole chromosome substitutions differing in alleles for hybrid dwarfing and photoperiodic sensitivity on tissue culture response (TCR) in wheat.** *Euphytica (Netherlands) v. 89(1) p. 81-86.* 18 ref. English. (AGRIS 97-018352).

1622 Benmohamed, A. (Institut Technique des Grandes Cultures, Alger (Algerie). Station experimentale); Bouzerzour, H. (Centre Universitaire, Oum El Bouaghi (Algerie). Ecole normale superieure) (1995) **[Graphic analysis of diallel crossing in barley (Hordeum vulgare L.)]. Analyse graphique d'un croisement diallele sur l'orge (Hordeum vulgare L.).** *Cerealiculture (Algerie). Revue technique et scientifique (no. 28) p. 8-12.* 3 tableaux; 2 fig.; 5 ref. French. (AGRIS 97-017478).

1623 Bernicot, M.H. (Institut Technique des Cereales et des Fourrages, Paris (France)) (1996) **[Cultivars of spring barley (France)]. Orge de printemps. Quelle variete semer?** *Perspectives Agricoles (France) (no 209) p. 76-82.* 6 graph., 5 p. p. seulement. French. (AGRIS 97-017516).

1624 Bhutta, M.A.; Masih, Y.; Chawdhry, M.A.; Khaliq, I. (University of Agriculture, Faisalabad (Pakistan). Dept. of Plant Breeding and Genetics) (1995) **Studies on yield and yield components in spring wheat under drought conditions.** *Journal of Agricultural Research (Pakistan) v. 33(1) p. 75-79.* 1 table, 9 ref. English. (AGRIS 97-018370).

Two local wheat varieties (Pak81 and LU26S) were crossed with three exotic lines namely HABA-1, HABA-4 and HABA-6. Their F1, F2, BC1 and BC2 generations were studied during 1991 at University of Agriculture, Faisalabad to estimate narrow and broad sense heritabilities for yield and yield components. Moderate to high broad sense estimates of heritability were obtained for all the traits except number of tillers per plant. The latter was low to moderately high. Narrow sense estimates were low to moderate for some of the traits and low to high for the others. High broad sense and low narrow sense heritabilities indicated non-additive gene effects and/or epistasis. Prospects were bright for genetic improvement of all seven traits notably in a HABA-6 x LU26S cross. Thus the present findings had a greater significance in synthesizing a variety for drought areas.

1625 Blanco, A.; De Giovanni, C. (University of Bari, Bari (Italy). Institute of Plant Breeding) (1995) **[Triticum dicoccoides for qualitative improvement of durum wheat: Associations of protein loci to grain traits in recombinant inbred lines]. Triticum dicoccoides pour l'amelioration de la qualite du ble dur.** Seminar on Durum Wheat Quality in the Mediterranean Region. Zaragoza (Spain). 17-19 Nov 1993. Durum Wheat Quality in the Mediterranean Region. La Qualite du Ble Dur dans la Region Mediterraneenne. Fonzo, N. di (Istituto Sperimentale per la Cerealicoltura, Foggia (Italy). Sezione Operativa di Foggia); Kaan, F. (INRA, Institut National de la Recherche Agronomique, Mauguio (France). Station de Genetique et d'Amelioration des Plantes. Domaine de Melgueil); Nachit, M. (ICARDA, International Center for Agricultural Research in the Dry Areas, Aleppo (Syria)). *Options Mediterraneennes. Serie A: Seminaires mediterraneens (CIHEAM); no. 22 p. 149-158.* CIHEAM-IAMZ. 2 ill.; 1 graph.; 3 tables; 33 ref. English. (AGRIS 97-002271).

L'amelioration de la quantite et de la qualite des proteines sont des objectifs importants des programmes d'amelioration du ble dur ainsi que pour d'autres bles. Cette recherche vise a etudier la variabilite et les associations des alleles des sous-unites de gliadine et glutenine avec certains caracteres qualitatifs du ble a travers une serie de lignees "inbred" recombinantes (RIL) derivees du croisement ble dur cv. Messapia x

Triticum dicoccoides acc. MG4343. Les resultats obtenus montrent que : (i) le ble sauvage T. dicoccoides croise avec le ble dur presente une grande variation pour ce qui est de certains caracteres quantitatifs de la qualite des graines (ii) la teneur en proteines n'est pas correlee avec la valeur de sedimentation (iii) les loci de glutenine HMW et LMW sont associes avec la valeur de sedimentation mais ils n'expliquent qu'une partie de la variation (iv) les loci Gli-A1 et Gli-B2 de T. dicoccoides sont associes avec la quantite de proteines (v) les lignees "inbred" recombinantes constituent un bon materiel genetique pour l'etude de l'association entre les loci des marqueurs et les caracteres qualitatifs.

1626 Blanco, A.; Degiovanni, C.; Laddomada, B.; Sciancalepore, A.; Simeone, R.; Devos, KM.; Gale, MD. (1996) **QUANTITATIVE TRAIT LOCI INFLUENCING GRAIN PROTEIN CONTENT IN TETRAPLOID WHEATS.** *Plant Breeding. 115(5):310-316.* English. [UNIV BARI INST PLANT BREEDING VIA AMENDOLA 165-A I-70126 BARI ITALY].

Seed storage protein content of durum wheat (Triticum turgidum var. durum) has an important effect on nutritional value and pasta-making characteristics. The objective of this study was to determine by association with genetic markers the number, chromosomal location, and magnitude of effect of quantitative trait loci (QTLs) controlling protein concentration in kernels. A set of 65 recombinant inbred lines (RIs) was developed by single seed descent from a cross between cultivated durum wheat cv. 'Messapia' (low protein content) and accession MG4343 of the wild tetraploid wheat var. dicoccoides (high protein content). This population was characterized for eight morphological, six storage protein, one isozyme and 124 RFLP loci. Field trials were conducted in one location in 1993 and two locations in 1994. QTLs were mapped by regression analysis on each marker locus for each location and for the average across environments. A total of six putative QTLs were located on chromosome arms 4BS, 5AL, 6AS, 6BS and 7BS. The number and size of QTLs detected varied across environments. The marker with the highest r(2) value per QTL in each environment and across environments was chosen for a multiple linear regression analysis, which explained 49.2-56.4% of the phenotypic variation for protein content. Only some of the markers were found to be negatively associated with plant grain yield and/or seed weight in one or two of the environments. [References: 60].

1627 Blecher, O.; Erel, N.; Callebaut, I.; Aviezer, K.; Breiman, A. (1996) **A NOVEL PLANT PEPTIDYL-PROLYL-CIS-TRANS-ISOMERASE (PPIASE) - CDNA CLONING, STRUCTURAL ANALYSIS, ENZYMATIC ACTIVITY AND EXPRESSION.** *Plant Molecular Biology. 32(3):493-504.* English. [TEL AVIV UNIV GEORGE S WISE FAC LIFE SCI DEPT BOT IL-69978 TEL AVIV ISRAEL].

A novel cDNA encoding for a peptidyl-prolyl-cis-trans-isomerase (PPIase) belonging to the FK506-binding protein (FKBP) family was isolated from wheat. It contains an open reading frame of 559 amino acids and it represents the first plant FKBP-PPIase to be cloned. It possesses a unique sequence which is composed of three FKPB-like domains, in addition to a putative tetratricopeptide repeat (TPR) motif and a calmodulin-binding site. The recombinant FKBP-PPIase expressed in and purified from Escherichia coli exhibits PPIase activity that is efficiently inhibited by the immunosuppressive drugs FK506 and rapamycin. Northern blot analysis showed that wheat FKBP was found mainly in young tissues. Polyclonal antibodies revealed the presence of cross-reacting proteins in embryos, roots and shoots. The unique structural features, the enzymatic activity and the presence of putative isoforms in wheat tissues indicate the possibility of the involvement of wheat PPIase in essential biological functions, similar to other members of the FKBP gene family. [References: 65].

1628 Blechl, A.E. (ARS, USDA, Western Regional Research Center, Albany, CA.); Anderson, O.D. (1996) **Expression of a novel high-molecular-weight glutenin subunit gene in transgenic wheat.** *Nature biotechnology (USA) v. 14(7) p. 875-879.* references. English. (AGRIS 97-018379).

1629 Boerner, A. (Institute of Plant Genetics and Crop Plant Research, Gatersleben (Germany)); Plaschke, J.; Korzun, V.; Worland, A.J. (1996) **The relationships between the dwarfing genes of wheat and rye.** *Euphytica (Netherlands) v. 89(1) p. 69-75.* 46 ref. English. (AGRIS 97-018350).

1630 Boggini, G.; di Fonzo, N. (Istituto Sperimentale per la Cerealicoltura, Foggia (Italy). Sezione Operativa di Foggia e Catania) (1995) **[The breeding methodology for the future of durum wheat in Italy].** **Methodologie d'amelioration pour l'avenir du ble dur en Italie.** Seminar on Durum Wheat Quality in the Mediterranean Region. Zaragoza (Spain). 17-19 Nov 1993. Durum Wheat Quality in the Mediterranean Region. La Qualite du Ble Dur dans la Region Mediterraneenne. Fonzo, N. di (Istituto Sperimentale per la Cerealicoltura, Foggia (Italy). Sezione Operativa di Foggia); Kaan, F. (INRA, Institut National de la Recherche Agronomique, Mauguio (France). Station de Genetique et d'Amelioration des Plantes. Domaine de Melgueil); Nachit, M. (ICARDA, International Center for Agricultural Research in the Dry Areas, Aleppo (Syria)). *Options Mediterraneennes. Serie A: Seminaires mediterraneens (CIHEAM); no. 22 p. 189-196.* CIHEAM-IAMZ. 1 graph.; 37 ref. English. (AGRIS 97-002276).

L'amelioration genetique des plantes autogames suppose la creation de populations pour pouvoir effectuer la selection, l'amelioration des plantes memes et le developpement varietal. Generalement la base genetique est petite et pourtant son enrichissement est tres important. On va presenter de nouvelles strategies d'amelioration genetique.

1631 Brinchpedersen, H.; Galili, G.; Knudsen, S.; Holm, PB. (1996) **ENGINEERING OF THE ASPARTATE FAMILY BIOSYNTHETIC PATHWAY IN BARLEY (HORDEUM VULGARE L) BY TRANSFORMATION WITH HETEROLOGOUS GENES ENCODING FEED-BACK-INSENSITIVE ASPARTATE KINASE AND DIHYDRODIPICOLINATE SYNTHASE.** *Plant Molecular Biology. 32(4):611-620.* English. [CARLSBERG RES LAB GAMLE CARLSBERG VEJ 10 DK-2500 COPENHAGEN DENMARK].

In prokaryotes and plants the synthesis of the essential amino acids lysine and threonine is predominantly regulated by feed-back inhibition of aspartate kinase (AK) and dihydrodipicolinate synthase (DHPS). In order to modify the flux through the aspartate family pathway in barley and enhance the accumulation of the corresponding amino acids, we have generated transgenic barley plants that constitutively express mutant Escherichia coli genes encoding lysine feed-back insensitive forms of AK and DHPS. As a result, leaves of primary transformants (T-0) exhibited a 14-fold increase of free lysine and an 8-fold increase in free methionine. In mature seeds of the DHPS transgenics, there was a 2-fold increase in free lysine, arginine and asparagine and a 50% reduction in free proline, while no changes were observed in the seeds of the two AK transgenic lines analysed. When compared to that of control seeds, no differences were observed in the composition of total amino acids. The introduced genes were inherited in the T-1 generation where enzymic activities revealed a 2.3-fold increase of AK activity and a 4.0-9.5-fold increase for DHPS. T-1 seeds of DHPS transformants showed the same changes in free amino acids as observed in T-0 seeds. It is concluded that the aspartate family pathway may be genetically engineered by the introduction of genes coding for feed-back-insensitive enzymes, preferentially giving elevated levels of lysine and methionine. [References: 49].

1632 Broers, L.H.M. (Centro Internacional de Mejoramiento de Maiz y Trigo, Mexico, D.F. (Mexico)); Cuesta Subias, X.; Lopez Atilano, R.M. (1996) **Field assessment of quantitative resistance to yellow rust in ten spring bread wheat cultivars.** *Euphytica (Netherlands) v. 90(1) p. 9-16.* 26 ref. English. (AGRIS 97-018342).

1633 Brownguedira, GL.; Badaeva, ED.; Gill, BS.; Cox, TS. (1996) **CHROMOSOME SUBSTITUTIONS OF TRITICUM TIMOPHEEVII IN COMMON WHEAT AND SOME OBSERVATIONS ON THE EVOLUTION OF POLYPLOID WHEAT SPECIES.** *Theoretical & Applied Genetics. 93(8):1291-1298.* English. [KANSAS STATE UNIV DEPT PLANT PATHOL THROCKMORTON HALL MANHATTAN, KS 66506 USA].

Whether the two tetraploid wheat species, the well known Triticum turgidum L. (macaroni wheat, AABB genomes) and the obscure T. timopheevii Zhuk. (A(t)A(t)GG), have monophyletic or diphyletic origin from the same or different diploid species presents an interesting evolutionary problem. Moreover, T. timopheevii and its wild form T. araraticum are an important genetic resource for macaroni and bread-wheat improvement. To study these objectives, the substitution and genetic compensation abilities of individual T. timopheevii chromosomes for missing chromosomes of T. aestivum 'Chinese Spring' (AABBDD) were analyzed. 'Chinese Spring' aneuploids (nullisomic-tetrasomics) were crossed with a T. timopheevii x Aegilops tauschii amphiploid to isolate T. timopheevii chromosomes in a monosomic condition. The F-1 hybrids were backcrossed one to four times to Chinese Spring aneuploids without selection for the T. timopheevii chromosome of interest. While spontaneous substitutions involving all A(t)- and G-genome chromosomes

were identified, the targeted T. timopheevii chromosome was not always recovered. Lines with spontaneous substitutions from T. timopheevii were chosen for further backcrossing. Six T. timopheevii chromosome substitutions were isolated: 6A(t) (6A), 2G (2B), 3G (3B), 4G (4B), 5G (5B) and 6G (6B). The substitution lines had normal morphology and fertility. The 6A(t) of T. timopheevii was involved in a translocation with chromosome 1G, resulting in the transfer of the group-1 gliadin locus to 6A(t). Chromosome 2G substituted for 2B at a frequency higher than expected and may carry putative homoeoalleles of gametocidal genes present on group-2 chromosomes of several alien species. Our data indicate a common origin for tetraploid wheat species, but from separate hybridization events because of the presence of a different spectrum of intergenomic translocations. [References: 39].

1634 Calderini, D.F.; Dreccer, M.F.; Slafer, G.A. (Universidad de Buenos Aires (Argentina). Facultad de Agronomia. Dept. de Produccion Vegetal. Catedra de Cerealicultura) (1995) **Genetic improvement in wheat yield and associated traits. A re-examination of previous results and the latest trends.** *Plant Breeding (Germany) v. 114(2) p. 108-112.* 7 graphs, 1 table; 20 ref. English. (AGRIS 97-018322).

Two field experiments were carried out with seven wheat cultivars (three of them, including a commercial hybrid, released during the last 10 years) representing different eras of plant breeding, to evaluate genetic improvement over the last century in grain yield, height, biomass, harvest index and grain yield components. Plots were fertilized and irrigated, and lodging and diseases were prevented. Main culm height was negatively correlated with the year of release of the cultivars, probably as a consequence of selection for increased lodging resistance. There was no significant association between total above-ground biomass and year of release of the cultivars. On the other hand, grain yield increased as newer cultivars were released. Results indicate that during recent years harvest index has been kept as the main attribute responsible for increases in grain yield. In general, number of grains/square m was associated with increases in grain yield during the century. However, the newest cultivars showed an increased grain weight. In both growing seasons, cultivars released before 1980 showed a trend towards reduced grain weight, but cultivars released after 1987 had a similar number of grains per square m with a higher grain weight than their predecessors. This was probably because the most modern cultivars have a longer grain-filling duration with a similar length of growth cycle.

1635 Carrillo, J.M. (Universidad Politecnica de Madrid, Madrid (Spain). Escuela Tecnica Superior de Ingenieros Agronomos Departamento de Genetica) (1995) **[Variability for glutenin proteins in Spanish durum wheat landraces]. La variabilite des proteines de glutenine chez les especes autochtones espagnoles de ble dur.** Seminar on Durum Wheat Quality in the Mediterranean Region. Zaragoza (Spain). 17-19 Nov 1993. Durum Wheat Quality in the Mediterranean Region. La Qualite du Ble Dur dans la Region Mediterraneenne. Fonzo, N. di (Istituto Sperimentale per la Cerealicoltura, Foggia (Italy). Sezione Operativa di Foggia); Kaan, F. (INRA, Institut National de la Recherche Agronomique, Mauguio (France). Station de Genetique et d'Amelioration des Plantes. Domaine de Melgueil); Nachit, M. (ICARDA, International Center for Agricultural Research in the Dry Areas, Aleppo (Syria)). *Options Mediterraneennes. Serie A: Seminaires mediterraneens (CIHEAM); no. 22 p. 143-147.* CIHEAM-IAMZ. 2 ill.; 2 tables; 12 ref. English. (AGRIS 97-002270).

La diversite des sous-unites de glutenine a haut et faible poids moleculaire (HMW et LMW) de 201 especes autochtones espagnoles de ble dur a fait l'objet de recherches a l'aide du SDS-PAGE et du SDS-PAGE a deux phases unidimensionnelles (2S-1D). On a trouve une grande variabilite chez les sous-unites de glutenine a haut poids moleculaire (HMW) ainsi que plusieurs modeles chez les sous-unites de glutenine a faible poids moleculaire (LMW) de type 1 et 2. La localisation chromosomique des genes responsables de certaines des B-LMW a ete etudiee. Les frequences de la glutenine chez les especes autochtones ont ete comparees a celles des cultivars utilises en Espagne.

1636 Castro, AM.; Martin, A.; Martin, LM. (1996) **LOCATION OF GENES CONTROLLING RESISTANCE TO GREENBUG (SCHIZAPHIS GRAMINUM ROND.) IN HORDEUM CHILENSE.** *Plant Breeding. 115(5):335-338.* English. [UNIV NACL LA PLATA FACAYF DEPT BIOL CC 31 LA PLATA 1900 ARGENTINA].

Wheat/Hordeum chilense disomic addition lines have been used to locate genes influencing resistance against greenbug (Schizaphis graminum Rond.) in specific chromosomes of H. chilense. H. chilense is a source of antixenosis, antibiosis and host tolerance to the greenbug, being resistant also to the Russian wheat aphid, the two key pests in wheat. For measuring antixenosis, the numbers of aphids per plant were recorded in a host free choice test; antibiotic resistance was determined by measuring the developmental time, the fecundity and the intrinsic rate of population increase of aphids reared on the different hosts, and host tolerance to aphids was evaluated by the leaf damage and the number of expanded leaves on the hosts after 3 weeks of infestation. The greenbugs belonged to a clone of biotype C. Plant genes with positive effects for antixenosis were located on chromosome 1H(ch). Genes with positive effects for antibiosis were located on three different chromosomes and those that prolonged aphid developmental time were located on chromosomes 5H(ch) and 7H(ch) while those that reduced the total fecundity were on 4H(ch). Chromosome 7H(ch) accounted for host tolerance to greenbug. [References: 33].

1637 Ceoloni, C. (Tuscia Univ., Viterbo (Italy). Dept. of Agrobiology and Agrochemistry); Biagetti, M.; Ciaffi, M.; Forte, P.; Pasquini, M. (1996) **Wheat chromosome engineering at the 4x level: the potential of different alien gene transfers into durum wheat.** *Euphytica (Netherlands) v. 89(1) p. 87-97.* Bibliography (51 ref.). English. (AGRIS 97-018384).

1638 Cettour, I.R. (1995) **[Cultivation of wheat in northeast Argentina]. El cultivo de trigo en el noroeste Argentino.** *[Wheat breeding in Argentina: Thirty years of cooperative investigation with CIMMYT; Balcarce, Argentina; 7-8 Oct 1992]. El mejoramiento de trigo en Argentina: Treinta anos de investigacion cooperativa con el CIMMYT; Balcarce, Argentina; 7-8 Oct 1992. Kohli, M.M.; Nisi, J.E.; Rajaram, S. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 103-111.* CIMMYT. 2 tables; 1 graph. Spanish. (AGRIS 97-018311).

The Northeast region of Argentina (NEA) comprising of the provinces of Chaco, Formosa and north of Santa Fe can be subdivided into subhumid and subhumid to dry zones. In general the climate of the region is maritime subtropical with precipitation between 700 - 1200 mm per year and between 280-360 frost free days in different parts. The temperatures oscillate between an average of 27. C (in January) and 15.5. C in July. The importance of the wheat crop in NEA is based on its utilization in mixed farming in combination with other summer crops in rotations. Depending on the agro-climatic factors and management practices, the yield potential varies between 800-4300 kg/ha. In addition, diseases like rusts and foliar blights can seriously restrict achieving high yield potential. Based on these aspects, the wheat breeding program relies heavily on germplasm introduction and breeding as well as evaluation of germplasm and crop management strategies. The breeding program utilizes both pedigree and mass selection methods to identify adapted germplasm of long and intermediate cycle, high yield potential and resistance to diseases, lodging and shattering and superior commercial and industrial quality. La region noreste de Argentina (NEA) comprende las provincias de Chaco, Formosa y norte de Santa Fe que puede ser subdividida en zonas sub-humedas y sub-humedas a secas. En general el clima de la region es sub-tropical maritimo con precipitaciones que varian entre 700-1200 mm por ano y tiene entre 280-360 dias libres de heladas en diferentes partes. Las temperaturas oscilan entre una media de 27.C (enero) y 15.5.C (Julio). La importancia de trigo en NEA se basa en sus posibilidades en explotaciones mixtas, combinandose con otros cultivos de verano en rotaciones. Su potencial de rendimiento varia marcadamente (800-4300 kg/ha.) dependiendo de los factores agro-climaticos y de manejo de cultivos. Ademas, las enfermedades como royas y manchas foliares pueden presentar serias restricciones en lograr el potencial de rendimiento. Por tales motivos, el programa de mejoramiento genetico esta basado en introduccion y creacion de cultivares como su evaluacion y en el manejo del cultivo. Programa utiliza la metodologia geneologica y masal para identificar el germoplasma adaptado, de ciclo largo a intermedio, de buen potencial de rendimiento y resistencia a enfermedades, vuelco y desgrane y de buena calidad industrial y comercial.

1639 Chaudhry, M.H.; Subhani, G.M.; Khan, F.A.; Ali, A.M.; Khan, N.; Sattar, A. (Wheat Research Inst., AARI, Faisalabad (Pakistan)) (1994) **Combining ability analysis of physiological and agronomic traits of wheat.** *Journal of Agricultural Research (Pakistan) v. 32(3) p. 227-237.* 4 tables, 17 ref. English. (AGRIS 97-018367).

Combining ability analysis was performed to determine prepotency of seven spring wheat lines in a set of diallel F1 crosses (excluding

reciprocals) for days to heading, days to maturity, flag leaf area, plant height, peduncle length, spike length, number of spikes per plant, number of spikelets per spike, number of grains per spike, 1000-grain weight and grain yield per plant. General combining ability mean squares were highly significant for all traits. Specific combining ability mean squares were non-significant for days to heading/maturity, flag leaf area, number of spikes per plant, spikelets per spike and grain yield per plant; highly significant for plant height, peduncle length and 1000-grain weight and significant for spike length. For all traits, general combining ability mean squares were considerably higher than the specific combining ability. Out of seven parents, Mirlo"s", Goshawk"s", HD2172 and Satluj86 showed positive general combining ability effects for grain yield and one or more traits directly affecting grain yield. V84011 and Mirlo"s" were good general combiners for lesser number of days to heading and maturity. Five hybrids viz. V84011 x Goshawk"s", Mirlo"s" x Goshawk"s", Mirlo"s" x CF1770, Arz x Goshawk"s" and HD2172 x Satluj86 involving at least one good general combiner for grain yield, days to heading/maturity and other traits were identified to develop short duration high yielding wheat lines.

1640 Chowdhry, M.A.; Ramzan, M.; Alam, K.; Khaliq, I. (University of Agriculture, Faisalabad (Pakistan). Dept. of Plant Breeding and Genetics) (1995) **Correlation analysis for grain yield and quality traits in wheat.** *Journal of Agricultural Research (Pakistan) v. 33(1) p. 71-74.* 3 tables, 8 ref. English. (AGRIS 97-018369).

Grain yield and two quality traits were studied at Department of Plant Breeding and Genetics, University of Agriculture, Faisalabad during 1990-91 in 15 wheat strains. Data were analyzed and correlation coefficients were computed. Higher mean protein (12.76) and carbohydrate content (74.58) were observed in HTN10. Carbohydrate contents showed positive phenotypic and genotypic correlation with protein contents and grain yield. Phenotypic and genotypic correlation between protein contents and grain yield was negative and non-significant.

1641 Chowdhry, M.A.; Riaz, M.; Khaliq, I.; Ahmad, N. (University of Agriculture, Faisalabad (Pakistan). Dept. of Plant Breeding and Genetics) (1993) **Transmissibility index in spring wheat.** *Journal of Agricultural Research (Pakistan) v. 31(2) p. 139-144.* 1 table, 12 ref. English. (AGRIS 97-018364).

Transmissibility index coefficient of variability and genetic advance values of plant height, number of tillers per plant, spike length, number of spikelets per spike, number of grains per spike, 1000-grain weight, grain yield per plant, flag leaf area, flag leaf weight, specific flag leaf area, specific flag leaf weight and days taken to maturity were computed in five wheat crosses. Heritability, coefficient of variability and genetic advance were generally high for all plant traits except specific flag leaf weight, specific flag leaf area and days taken to maturity which had lower values. It reflects the selection scope for these characters.

1642 Cooper, M. (Queensland Univ., Brisbane, Qld. (Australia). Dept. of Agriculture); Woodruff, D.R. (1993) **Predicting grain yield in Australian environments using data from CIMMYT international wheat performance trials. 3. Testing predicted correlated response to selection.** *Field Crops Research (Netherlands) v. 35(3) p. 191-204.* 30 ref. English. (AGRIS 97-018288).

1643 Cortazar S, Rene (1995) **[Development and impact of the genetic plant improvement in Chile, with special reference to wheat]. Desarrollo e impacto de los programas de mejoramiento genetico en Chile con especial referencia a trigo.** Biotecnologia en relacion con tecnicas mutagenicas para el mejoramiento genetico vegetal. Santiago (Chile). 24-27 Abr 1995. [Papers and recommendations presented at the workshop: Biotechnology in relation to mutation techniques for plant breeding]. Trabajos y recomendaciones presentados al taller: Biotecnologia en relacion con tecnicas mutagenicas para el mejoramiento genetico vegetal. *Serie La Platina - Instituto de Investigaciones Agropecuarias. Centro Regional La Platina (Chile); no. 64 p. 28-36. Instituto de Investigaciones Agropecuarias, Santiago (Chile). Centro Regional La Platina.* INIA. Spanish. (AGRIS 97-002197).

1644 Cranstoun, D.A.S. (SAC Crop Systems Department, Bush Estate, Penicuik, Midlothian EH26 0PH (United Kingdom)) (1996) **The effect of early ripening on commercial uptake of spring barley varieties in Scotland.** *Aspects of Applied Biology (United Kingdom) (no.45) p. 113-116.* 4 ref. Implications of 'Global environmental change' for crops in Europe, 1-3 April 1996, Churchill College, Cambridge, UK. English. (AGRIS 97-002935).

1645 Cuadrado, A. (Alcala de Henares Univ., Alcala de Henares, Madrid (Spain). Dept. of Cellular Biology and Genetics); Rubio, P.; Ferrer, E.; Jouve, N. (1996) **Sequential combinations of C-banding and in situ hybridization and their use in the detection of interspecific introgressions into wheat.** *Euphytica (Netherlands) v. 89(1) p. 107-112.* 20 ref. English. (AGRIS 97-018354).

1646 Cyran, M. (Institute of Plant Breeding and Acclimatization, Blonie (Poland)); Rakowska, M.; Miazga, D. (1996) **Chromosomal location of factors affecting content and composition of non-starch polysaccharides in wheat-rye addition lines.** *Euphytica (Netherlands) v. 89(1) p. 153-157.* 15 ref. English. (AGRIS 97-018358).

1647 D'Ovidio, R.; Tanzarella, O.A.; Lafiandra, D.; Porceddu, E. (Universit degli Studi della Tuscia, Viterbo (Italy). Dipartimento di Agrobiologia e Agrochimica) (1995) **[Identification of durum wheat cultivars with good and poor quality by PCR-based markers]. Identification des cultivars de ble dur presentant une qualite bonne ou mediocre au moyen de marqueurs a PCR.** Seminar on Durum Wheat Quality in the Mediterranean Region. Zaragoza (Spain). 17-19 Nov 1993. Durum Wheat Quality in the Mediterranean Region. La Qualite du Ble Dur dans la Region Mediterraneenne. Fonzo, N. di (Istituto Sperimentale per la Cerealicoltura, Foggia (Italy). Sezione Operativa di Foggia); Kaan, F. (INRA, Institut National de la Recherche Agronomique, Mauguio (France). Station de Genetique et d'Amelioration des Plantes. Domaine de Melgueil); Nachit, M. (ICARDA, International Center for Agricultural Research in the Dry Areas, Aleppo (Syria)). *Options Mediterraneennes. Serie A: Seminaires mediterraneens (CIHEAM); no. 22 p. 241-247.* CIHEAM-IAMZ. 6 ill.; 17 ref. English. (AGRIS 97-002281).

La reaction PCR a ete utilisee pour amplifier les sequences de gamma-gliadine et de glutenine a faible poids moleculaire (LMW) provenant de l'ADN genomique des genotypes de ble dur. Les reactions d'amplification, realisees en utilisant plusieurs amorces d'oligonucleotides, ont donne des produits specifiques d'amplification. Les analyses PCR effectuees en utilisant deux amorces specifiques a la gamma-gliadine et deux autres differentes specifiques aux sequences de glutenine LMW ont donne des modeles d'amplification caracteristiques des cultivars de ble dur presentant des proprietes technologiques bonnes ou mediocres. Dans cet article est discutee l'utilite des marqueurs a PCR pour la selection de genotypes de ble dur ayant des caracteres souhaitables.

1648 Das, S.; Sinha, S.K. (Orissa University of Agriculture and Technology, Bhubaneswar (India). Department of Plant Breeding and Genetics) (1995) **Physiotaxometric studies of adaptation in wheat: 1. A classification of genotypes based on seedling growth response to streptomycin.** *Current Agricultural Research (India) v. 8(3-4) p. 101-106.* 1 table; 2 ill., 4 ref. English. (AGRIS 97-002917).

1649 Davoyan, R.O. (Krasnodar Research Inst. of Agriculture (Russian Federation). Dept. of Biotechnology); Ternovskaya, T.K. (1996) **Use of a synthetic hexaploid Triticum miguschovae for transfer of leaf rust resistance to common wheat.** *Euphytica (Netherlands) v. 89(1) p. 99-102.* 8 ref. English. (AGRIS 97-018291)

1650 De Galich, M.T. (1995) **[Development of bread wheat resistant to Fusarium head blight]. Desarrollo de trigo pan con resistencia a fusariosis de la espiga.** *[Wheat breeding in Argentina: Thirty years of cooperative investigation with CIMMYT; Balcarce, Argentina; 7-8 Oct 1992]. El mejoramiento de trigo en Argentina: Treinta anos de investigacion cooperativa con el CIMMYT; Balcarce, Argentina; 7-8 Oct 1992. Kohli, M.M.; Nisi, J.; Rajaram, S. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 143-148.* CIMMYT. 2 tables. Spanish. (AGRIS 97-018315).

The development of wheat germplasm for resistance to fusarium head blight is based at the INTA Experimental Station at Marcos Juarez. The methodology utilized to generate the sources of resistance include hybridization and selection of parents of different origins under artificially inoculated conditions. For inoculation purposes a spore concentration of 1 x 10^{**} (5) in the green house and 3 x 10^{**} (5) in the field is utilized. Under both conditions a relative humidity of 80-100 percent is necessary. Recurrent selection is used to combine the diverse sources of resistance

and individual selections are tested under green house and field conditions to combine high level of resistance with good agronomic type. El desarrollo para resistencia a fusariosis de la espiga (Fusarium graminearum) tiene su sede en la Estacion Experimental INTA Marcos Juarez. La metodologia utilizada para generacion de las fuentes de resistencia incluye combinacion y seleccion de progenitores de diferentes origenes bajo condiciones de inoculacion artificial. Las inoculaciones en invernaculo usan una concentracion de 1 X 10** (5) espora/ml y de 3 X 10** (5) espora/ml en el campo. Bajo ambas condiciones el desarrollo de la infeccion esta apoyado con alta (80-100) humedad relativa. La metodologia de seleccion recurrente es utilizada para combinar los genes de resistencia a fusariosis entre progenitores de origen mas diverso. Posteriormente, las selecciones individuales estan probadas en invernaculo y campo para lograr combinaciones de alto grado de resistencia con un buen tipo agronomico.

1651 Dofing, SM. (1996) **NEAR-ISOGENIC ANALYSIS OF UNICULM AND CONVENTIONAL-TILLERING BARLEY LINES.** *Crop Science. 36(6):1523-1526.* English. [PALMER RES CTR 533 E FIREWOOD PALMER, AK 99645 USA].

The uniculm phenotype has been proposed as a component of a small grain ideotype that maximizes crop productivity. Additionally, uniculm plants do not produce late-developing tillers that delay harvest and reduce grain quality in short-season or northern areas of production. No comprehensive studies that assessed the uniculm phenotype in barley (Hordeum vulgare L.) using near-isogenic lines were found in the literature. This study was conducted to compare the performance of uniculm and conventional-tillering near-isogenic barley lines that differed by the presence of the uc(2) (uniculm) gene. Two pairs of near-isogenic lines were evaluated at seeding rates of 50, 140, 230, and 320 kernels m(-2) and row spacings of 15 and 30 cm, for 3 yr at Palmer, AK. Uniculm lines matured an average of 6 d earlier than conventional-tillering lines. However, maximum grain yield of uniculm lines was only 52% of that of conventional-tillering lines. At all seeding rates, spikes per square meter and kernels per spike of uniculm lines were lower than conventional-tillering lines, but kernel weight was higher. The lower grain yield of uniculm lines was due primarily to reduced kernels per spike at high seeding rates. Selection for grain yield or kernels per spike at high seeding rates should be investigated as a possible means of increasing grain yield of uniculm lines. [References: 19].

1652 Dornelles, ALC.; Decarvalho, FIF.; Federizzi, LC.; Sereno, MJCD.; Handel, CL.; Mittelmann, A. (1997) **SOMACLONAL VARIATION IN ALUMINUM TOLERANCE AND GIBBERELLIC ACID SENSIBILITY IN WHEAT.** *Pesquisa Agropecuaria Brasileira. 32(2):193-200.* Portuguese. [UFRGS DEPT HORT & SILVICULTURA FAC AGRON AV BENTO GONCALVES 7712 CAIXA POSTAL 776 BR-91501970 PORTO ALEGRE RS BRAZIL].

In order to detect the induction of variability through tissue culture and the utilization of somaclonal variation in wheat (Triticum aestivum L.) breeding, five genotypes of different statures and with tolerance to aluminum (Al+++) toxicity, and their F-1 hybrids, were submitted to immature embryo culture. Parallel to the tissue culture, regeneration and development processes, the genotypes and their progenies were sown to obtain F-2 population, with or without tissue culture, which were simultaneously tested by means of successive nutritive solutions in selective concentrations of Al+++ (10 ppm) and gibberellic acid-GA3 (100 ppm). The comparisons among populations submitted or not to tissue culture showed the existence of a possible somaclonal variation since some F-2 populations which passed through the in vitro process had a differentiated behavior regarding the two evaluated traits. The method employed confirmed the possibility of detecting genetic differences in wheat and its possible utilization in plant breeding. [References: 17].

1653 Dovidio, R.; Anderson, OD.; Masci, S.; Skerritt, J.; Porceddu, E. (1997) **CONSTRUCTION OF NOVEL WHEAT HIGH-M(R) GLUTENIN SUBUNIT GENE VARIABILITY - MODIFICATION OF THE REPETITIVE DOMAIN AND EXPRESSION IN E-COLI.** *Journal of Cereal Science. 25(1):1-8.* English. [UNIV TUSCIA DIPARTIMENTO AGROBIOL & AGROCHIM VIA S CAMILLO LELLIS I-01100 VITERBO ITALY].

We report the construction of modified high M(r) glutenin subunit genes with variable lengths of the repetitive domain and their expression in Escherichia coli. The modified glutenin subunits showed anomalously slow migration by SDS-PAGE characteristic of these polypeptides. Changes in the size of the repetitive domain correlated with both the migration behaviour on SDS-PAGE and with the surface hydrophobicities of the polypeptides measured by RP-HPLC. These constructs made it possible to obtain direct evidence for the first time that the anomalous electrophoretic mobilities of high M(r) glutenin subunits in SDS-PAGE, compared with globular proteins, are mainly due to the repetitive domain. These constructs should be useful for establishing the role of the repetitive domain of high, I, glutenin subunits in determining the viscoelastic. properties of dough. They also offer the possibility of creating new genetic variability For wheat improvement. (C) 1997 Academic Press Limited [References: 24].

1654 Dovidio, R.; Porceddu, E. (1996) **PCR-BASED ASSAY FOR DETECTING 1B-GENES FOR LOW MOLECULAR WEIGHT GLUTENIN SUBUNITS RELATED TO GLUTEN QUALITY PROPERTIES IN DURUM WHEAT.** *Plant Breeding. 115(5):413-415.* English. [UNIV TUSCIA DIPARTIMENTO AGROBIOL & AGROCHIM VIA SAN CAMILLO DE LELLIS I-01100 VITERBO ITALY].

A PCR assay has been developed for selecting low molecular weight (LMW) glutenin genes, located on chromosome 1B, and related to durum wheat quality characteristics. Most durum wheat lines possessing good technological properties can be identified on the basis of the presence of specific 1B LMW glutenin components that have been designated LMW-2 glutenin subunits. On the basis of nucleotide sequences corresponding to LMW glutenin genes, a series of specific oligonucleotide primers were prepared and used in PCR analysis. A pair of these primers gave a single amplification product which can distinguish between durum wheat lines possessing LMW-2 glutenin subunits and Lines possessing other 1B-LMW allelic variants. Because the proposed PCR analysis can be carried out using part of the endosperm. of a single seed, it represents a helpful approach for speeding up the selection of genotypes possessing LMW-2 glutenin subunits. This part of primers could also be very useful in genome mapping analysis and for testing the purity of wheat hour stock. [References: 10].

1655 Dubavets, N.I.; Dymkova, G.U.; Salavej, L.A.; Shtyk, T.I.; Bormataw, U.Ya. (Academy of Sciencies of Belarus, Minsk (Belarus). Institute of Genetics and Cytology) (1996) **[Tetraploid triticales - theoretical and applied aspects of investigations]. Tehtraploidnyya trytsikale - teharehtychny i prykladny aspekty dasledavannyaw.** *Vestsi Akadehmii Navuk Belarusi. Seryya biyalagichnykh navuk (Belarus) (no.1) p. 63-67.* 2 tables; 7 ref. Byelo Russian. (AGRIS 97-002901).

Formation of synthetic karyotypes (mixogenomes) was studied on the basis of tetraploid triticales used as a model object. The findings developing a series of representations of the introgressive hybridization theory in evolution of polyploid cereals species were obtained. Experiments in reconstructing hexaploid triticale karyotype by D(A)- and D(B)-chromosome substitutions were conducted.

1656 Dunn, M.A. (Newcastle upon Tyne Univ. (United Kingdom). Dept. of Biochemistry and Genetics); Brown, K.; Lightowlers, R.; Hughes, M.A. (1996) **A low-temperature-responsive gene from barley encodes a protein with single-stranded nucleic acid-binding activity which is phosphorylated in vitro.** *Plant Molecular Biology (Netherlands) v. 30(5) p. 947-959.* 46 ref. English. (AGRIS 97-017896).

1657 Dylyanok, L.A.; Yatsevich, A.P.; Kudzelka, L.I.; Khomich, E.A.; Anisimava, N.U.; Khatyleva, L.I. (Academy of Sciencies of Belarus, Minsk (Belarus). Institute of Genetics and Cytology) (1996) **[Genetic investigations of wheat using aneuploids]. Genetychnyya dasledavanni pshanitsy z vykarystannem aneuploidaw.** *Vestsi Akadehmii Navuk Belarusi. Seryya biyalagichnykh navuk (Belarus) (no.1) p. 69-73.* 26 ref. Byelo Russian. (AGRIS 97-002907).

Main results of investigations using wheat aneuploids are presented. A new approach to developing monosomic lines is proposed.

1658 Elef, A.V.; Vanakh, P.V. (Academy of Sciencies of Belarus, Minsk (Belarus). Institute of Genetics and Cytology) (1996) **[Phenotypic variability of hybrids from crossing triticale unstable mutants and zoned varieties of spring wheat]. Fenatypovaya zmenlivasts' gibrydaw ad skryzhavannya nestabil'nykh mutantaw z trytsikale z rayanavanymi sartami yaravoj pshanitsy.** *Vestsi Akadehmii Navuk Belarusi. Seryya biyalagichnykh navuk (Belarus) (no.1) p. 73-77.* 2 tables; 8 ref. Byelo Russian. (AGRIS 97-002908).

Scope for using unstable wheat-type mutants based on triticale as sources for phenotypic variability in mutant variety hybridization of spring wheat was defined.

1659 Endo, TR. (1996) **ALLOCATION OF A GAMETOCIDAL CHROMOSOME OF AEGILOPS CYLINDRICA TO WHEAT HOMOEOLOGOUS GROUP 2.** *Genes & Genetic Systems. 71(4):243-246.* English. [KYOTO UNIV GRAD SCH AGR LAB PLANT GENET SAKYO KU OIWAKE CHO KYOTO 60601 JAPAN].

A chromosome derived from Aegilops cylindrica (2n=4x=28, genomically CCDD) causes chromosome breakage in the gametes lacking the alien chromosome in a common wheat (Triticum aestivum, 2n=6x=42, AABBDD) cv. Chinese Spring. The Ae. cylindrica chromosome was studied by monosomic analysis and demonstrated to successfully substitute for chromosomes 2A, 2B, and 2D in the disomic condition. From its morphology and C-banding pattern, the Ae. cylindrica chromosome was assumed to have been originated from the C genome. Therefore, the present author proposed to designate this alien chromosome as 2C. During this study, a telosome of the long arm, an isochromosome of the long arm, and a deletion in the long arm of the Ae. cylindrica chromosome were obtained. Their abilities of inducing chromosome breakage suggested that a gene responsible for the chromosome breakage was located on the distal half of the long arm of the alien chromosome. [References: 9].

1660 Escorial, MC.; Sixto, H.; Garciabaudin, JM.; Chueca, MC. (1996) **IN VITRO CULTURE SELECTION INCREASES GLYPHOSATE TOLERANCE IN BARLEY.** *Plant Cell Tissue & Organ Culture. 46(3):179-186.* English. [INIA CIT AREA PROTECC VEGETAL CARRETERA LA CORUNA MADRID 28040 SPAIN].

In vitro culture of barley calluses has been used to produce plants with increased glyphosate tolerance. Calluses from immature embryos of barley Hordeum vulgare L. 'Jeff') were cultured on Murashige and Skoog medium with 10(-6), 10(-5), 10(-4), 5x10(-4), 10(-3), or 10(-2)M glyphosate for one, four or thirty months. Plants were regenerated from calluses maintained in glyphosate medium at 10(-6), 10(-5) or 10(-4)M for four months, at 10(-5) or 5x10(-4)M for one month and at 10(-5)M for thirty months. The progeny of each regenerated plant was analyzed for response to glyphosate. Some progenies showed increased tolerance to glyphosate. [References: 30].

1661 Eyal, Z. (1995) **Virulence in Septoria tritici, causal agent of Septoria tritici blotch of wheat.** *Proceedings of a Septoria Tritici Workshop; Mexico, D.F.; 20-24 Sep 1993. Gilchrist, L.; Ginkel, M. van; McNab, A.; Kema, G.H.J. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 27-33.* CIMMYT. 30 ref. English. (AGRIS 97-018294).

Physiologic specialization in Septoria tritici (Rob. ex Desm.) was reported in several independent studies, based on the differential interaction between isolates and wheat cultivars. Differential interactions were recorded between isolates derived from different Triticum species and cultivars of the same or different Triticum species. The presence of physiologic specialization should be adapted in designing strategies for resistance breeding. La especializacion fisiologica en Septoria tritici (Rob. ex Desm.) ha sido reportada en forma independiente por varios estudios, basados en la interaccion diferencial entre aislamientos y cultivares de trigo. Las interacciones diferenciales se han reportado entre aislamientos derivados de diferentes especies de Triticum, y aislamientos de cultivares de la misma o diferentes especies de Triticum. La presencia de especializacion fisiologica podria ser utilizada para disenar estrategias en el mejoramiento genetico.

1662 Favoretti, C.; Gonzalez, L. (1995) **[Buck wheat breeding and the interchange of germplasm with CIMMYT]. Mejoramiento de trigo en el Criadero Buck y el intercambio de germoplasma con el CIMMYT.** *[Wheat breeding in Argentina: Thirty years of cooperative investigation with CIMMYT; Balcarce, Argentina; 7-8 Oct 1992]. El mejoramiento de trigo en Argentina: Treinta anos de investigacion cooperativa con el CIMMYT; Balcarce, Argentina; 7-8 Oct 1992. Kohli, M.M.; Nisi, J.E.; Rajaram, S. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 41-51.* CIMMYT. 5 tables; 1 graph. Spanish. (AGRIS 97-018305).

The Buck Wheat Breeding Program is located in the Southeast of the Buenos Aires province and in the Center South of the Wheat Region IV. The average annual rainfall is 800 mm with heavy rains during fall, relative drought during winter, and intermediate spring and summer. The soils of the region are rich in organic matter averaging 5 to 6 percent, but low in phosphorus. The environmental conditions allow attaining very high levels of yield averaging 3380 kg/ha during the past five years and experimental average of 4826 kg. ha. The wheat crop is sown in rotation with a summer crop where sunflower is the most popular crop. The objectives of the breeding program are: high grain yield, industrial and commercial quality, resistance to the diseases (rusts, septoria, fusarium and bacterial stripe) and lodging and shattering El Criadero Buck esta ubicado al sudeste de la Provincia de Buenos Aires en el centrosur de la llamada sub-region triguera IV. El regimen de precipitacion es de 800 mm de promedio anual, determinando otonos generalmente lluviosos, inviernos relativamente secos y con primaveras y veranos intermedios. En esta region los suelos son ricos en materia organica con valores promedios de 5 a 6 porciento, otra caracteristica es el bajo contenido de fosforo asimilable. La condicion de ambiente descriptos hace que se logren rendimientos elevados alcanzando un promedio de cinco anos a nivel de produccion 3380 kg/ha y a nivel experimental un promedio de 4826 kg/ha. Con respecto a la rotacion, el trigo se siembra principalmente despues de un cultivo de verano, siendo el girasol el antecedente mas comun. Los objetivos de mejoramiento buscados son: elevado rendimiento de grano, calidad industrial y comercial, resistencia a enfermedades (royas, septoriosis, fusariosis, bacteriosis) y resistencia a desgrane y vuelco. Con respecto al germoplasma utilizado en el programa de mejoramiento podemos agruparlos de acuerdo a sus origenes en tradicional, foraneo y mixto que es una combinacion entre ambos. La mayoria de los ultimos cultivos obtenidos poseen germoplasma del CIMMYT. La excepcion de este grupo es Buck Charrua que no posee genes de enanismo y es sensible al fotoperiodo. En los materiales derivados de las cruzas primaverales por invernales surgieron trigos con mayor adaptacion, tal es el caso del cultivar Buck Bagual. Ultimamente existen lineas avanzadas seleccionadas a partir del material F2 que tienen en comun al Veery. Otro tipo de trigo sembrado en la region es el trigo para fideos que se siembra aproximadamente 60.000 has. El germoplasma utilizado es principalmente el cultivar Buck Cristal, derivado de una seleccion de material segregante del CIMMYT (F2).

1663 Feuillet, C.; Schachermayr, G.; Keller, B. (1997) **MOLECULAR CLONING OF A NEW RECEPTOR-LIKE KINASE GENE ENCODED AT THE LR10 DISEASE RESISTANCE LOCUS OF WHEAT.** *Plant Journal. 11(1):45-52.* English. [SWISS FED RES STN DEPT RESISTANCE & QUAL BREEDING RECKENHOLZSTR 191 CH-8046 ZURICH SWITZERLAND].

More than 100 resistance genes against wheat rust pathogens have been described in wheat and its relatives. Although many of them have been extensively used in wheat resistance breeding, none of these resistance loci has yet been analyzed at the molecular revel. By screening a set of near-isogenic lines carrying different leaf rust resistance genes with a wheat probe encoding a serine/threonine protein kinase, we detected a polymorphic DNA fragment in the line with the Lr10 resistance gene. This fragment mapped to the Lr10 disease resistance locus and encodes a receptor-like protein kinase which we called LRK10. LRK10 contains a new type of extracellular domain not found in known plant or animal receptor kinases. Several conserved amino acids in S-domain glycoproteins and receptor-like kinases were also found in LRK10, suggesting that LRK10 and S-domain proteins belong to the same superfamily of specific recognition molecules in plants. Lrk10 was expressed at low revels in young seedlings and belongs to a gene family. Analysis of wheat lines with and without the Lr10 gene demonstrated that Lrk10 and Lr10 belong td the same genetic locus. We conclude that gene isolation based on protein kinase homology can identify new receptor domains and provide candidates for disease resistance genes in the complex wheat genome. [References: 29].

1664 Finckh, MR.; Mundt, CC. (1996) **TEMPORAL DYNAMICS OF PLANT COMPETITION IN GENETICALLY DIVERSE WHEAT POPULATIONS IN THE PRESENCE AND ABSENCE OF STRIPE RUST.** *Journal of Applied Ecology. 33(5):1041-1052.* English. [ETH ZENTRUM INST PFLANZENWISSENSCH GRP PATHOL LFW UNIV STR 2 CH-8092 ZURICH SWITZERLAND].

1. Effects of disease and environment on competitive interactions among wheat genotypes were investigated. Five wheat genotypes were grown in up to six different two-way combinations and as pure stands in two or three locations during one to three growing seasons in the presence and absence of wheat stripe rust (caused by Puccinia striiformis). 2.

Overall yield of the mixtures relative to the means of the monocultures did not differ among locations and years. However, interactions between genotypes were often affected by location and to a lesser degree by year. Disease significantly affected seed weight and seed number of the two susceptible genotypes in pure stands and in mixtures. Disease also led to changes in competitive interactions between resistant and susceptible genotypes. 3. Competitive interactions among genotypes often changed from early in the season (as measured by the number of tillers) to late in the season (as measured by yield per tiller). In a few mixtures negative correlations between early competitive ability (relative number of tillers) and components of late competition suggested that intra-genotypic competition might have been stronger than inter-genotypic competition. [References: 26].

1665 Forster, BP.; Lee, MA.; Lundqvist, U.; Millam, S.; Vamling, K.; Wilson, TMA. (1997) **GENETIC ENGINEERING OF CROP PLANTS - FROM GENOME TO GENE [Review].** *Experimental Agriculture. 33(1):15-33.* English. [SCOTTISH CROP RES INST CELL & MOL GENET DEPT DUNDEE DD2 5DA SCOTLAND].

Genetic engineering of crop plants has been in progress since the dawn of agriculture, about 10 000 years ago. For millennia the genetic make-up of our crop plants has been changed by mankind's selection of naturally occurring variants. As the trade routes were developed, novel plant types were introduced into new environments and provided more variation from which to choose. At the end of the nineteenth century an understanding of the laws of heredity was gained and plant breeding protocols were devised whereby selection became accompanied by deliberate crossing. As the knowledge of the genetic structure of crop plants improved, new ways of manipulation were invented and exploited. Indeed plant breeding became a testing bed for new ideas in genetics. For the plant breeder the techniques which were most widely employed in the past were those which aided breeding, for example techniques which speeded up the production of new varieties, but still used traditional routes of crossing and selection. This was a transitional phase between plant breeding as an art and plant breeding as a science. [References: 103].

1666 Fouquin, G. (Malteries Soufflet, Nogent sur Seine (France)); Boue, A. (1996) **[Job: gold, barley, digger: a new approach to the development of varieties]. Metier: "chercheur d'or.ge": une nouvelle approche du developpment des varietes.** *BIOS BOISSONS (France) v. 27(261) p. 87-91.* Barley Malt Beer. English. (AGRIS 97-002246).

1667 Fuentes Davila, G.; Rajaram, S.; Singh, G. (International Maize and Wheat Improvement Center (CIMMYT), Mexico (Mexico)) (1995) **Inheritance of resistance to Karnal bunt (Tilletia indica Mitra) in bread wheat (Triticum aestivum L.).** *Plant Breeding (Germany) v. 114(3) p. 250-252.* 2 tables; 5 ref. English. (AGRIS 97-018328).

The mode of inheritance and allelic relationships among genes conferring resistance to Karnal bunt were studied in seven bread-wheat (six resistant and one susceptible) genotypes. The resistant genotypes originated in China ('Shanghai*8'), Brazil (PF71131), the USA ('Chris'), and Mexico ('Amsel', CMH77.308 and 'Pigeon'). The susceptible line WL711 was from India. Evaluation of these wheat lines and all possible crosses among their F and F generations (about 100 progenies in each cross) revealed that two partially recessive genes conferred the resistance to Karnal bunt in 'Pigeon', whereas four partially dominant genes were present in the other genotypes. 'Chris', 'Amsel' and PF71131 carry one gene, whereas 'Shanghai*8' and CMH77.308 have two genes. 'Chris', 'Amsel', and PF71131 have different genes, whereas one gene was common to PF71131, CMH77.308 and 'Shanghai*8', and another to 'Chris' and CMH77.308. Gene symbols were formally designated to the resistant stocks. Resistance was incomplete and stable.

1668 Ganets, N.U.; Valodzin, U.G.; Lisowskaya, Z.I.; Plyaskevich, A.M. (Academy of Sciencies of Belarus, Minsk (Belarus). Institute of Genetics and Cytology) (1996) **[Analysis of sister chromatid exchanges in instable forms of barley]. Analiz syasrynskikh khramatydnykh abmenaw u nestabil'nykh formaw yachmenyu.** *Vestsi Akadehmii Navuk Belarusi. Seryya biyalagichnykh navuk (Belarus) (no.1) p. 33-36.* 3 tables; 7 ref. Byelo Russian. (AGRIS 97-002544).

Frequency of sister chromatid axchanges in instable barley mutants and their starting varieties was studied. The methods of differential staining of sister chromatids was used and chromosomes with the greatest number of exchanges were defined.

1669 Gardzej, I.A.; Gardzej, G.M.; Novikava, L.I. (Academy of Sciencies of Belarus, Minsk (Belarus). Institute of Genetics and Cytology) (1996) **[Triticale: new genetic and biotechnological methods of development]. Trytsikale: novyya genetychnyya i biyatehkhnalagichnyya metady stvarehnnya.** *Vestsi Akadehmii Navuk Belarusi. Seryya biyalagichnykh navuk (Belarus) (no.1) p. 54-56.* 2 tables; 5 ref. Byelo Russian. (AGRIS 97-002900).

Paper deals with the genetic principles of new methods for producing wheat-rye amphidiploids based on the application of genetic systems of wheat and rye compatability, gamete unreduction, induction of unreduced gametes in wheat and genetic recombination in wheat-rye hybrids.

1670 Gilchrist, L.; Abdalla, O.S.; Velazquez, C. (1995) **Inheritance of resistance to Septoria tritici leaf blotch in selected durum wheat lines.** *Proceedings of a Septoria Tritici Workshop; Mexico, D.F.; 20-24 Sep 1993. Gilchrist, L.; Ginkel, M. van; McNab, A.; Kema, G.H.J. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 126-129.* CIMMYT. 2 tables; 1 fig.; 5 ref. English. (AGRIS 97-018385).

Durum wheat cultivars derived from CIMMYT germplasm are widely grown in West Asia, North Africa and the Mediterranean region. Septoria tritici leaf blotch is a major disease on durum wheat in those areas. To study the inheritance of resistance, parents and crosses of Altar 84 and Sula (resistant) with Bejaga Red (susceptible) were inoculated in the field with a virulent isolate of Septoria tritici (Mycosphaerella graminicola). Preliminary results from F2 and F3 generations indicated that resistance in both Altar 84 and Sula is controlled by two recessive genes. The use of this source of resistance in breeding is recommended. Los cultivares de trigo duro derivados del germoplasma de CIMMYT son cultivados ampliamente en el este de Asia, norte de Africa y la region del Mediterraneo. El tizon causado por Septoria es una enfermedad importante en trigo duro en estas areas. Para estudiar la herencia de la resistencia, los padres y cruzas de Altar 84 y Sula (resistentes) con Bejaga Red (susceptible) fueron inoculados en el campo con un aislamiento virulento de Septoria tritici (Mycosphaerella graminicola). Los resultados preliminares de las generaciones F2 y F3 indican que la resistencia en ambos Altar 84 y Sula esta controlada por dos genes recesivos. El uso de estas fuentes de resistencia es recomendada en mejoramiento genetico.

1671 Gilchrist, L.; Skovmand, B. (1995) **Evaluation of emmer wheat (Triticum dicoccon) for resistance to Septoria tritici.** *Proceedings of a Septoria Tritici Workshop; Mexico, D.F.; 20-24 Sep 1993. Gilchrist, L.; Ginkel, M. van; McNab, A.; Kema, G.H.J. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 130-134.* CIMMYT. 2 tables; 1 fig.; 6 ref. English. (AGRIS 97-018299).

Head selections (2619) from 325 Triticum dicoccon Schrank accessions in the CIMMYT wheat collection were evaluated for their reaction to Septoria tritici in Toluca (Mexican highlands), during 1992. The S. tritici inoculum used was originally selected under controlled conditions by inoculating 10 durum cultivars with different isolates. The more virulent isolates were then used to inoculate susceptible emmer wheats, and re-isolate from them. These isolates were increased in a yeast sucrose liquid medium. Field inoculations were done weekly for three weeks, starting at the tillering stage with a 10 spore concentration using an ultra low volume sprayer. Thirty four percent of the selections were highly susceptible to either stripe rust (Puccinia striiformis) or leaf rust (Puccinia recondita) and were eliminated. Eleven percent of the selections were moderately to highly susceptible to S. tritici, 24 percent were extremely resistant to S. tritici but moderately to very resistant to both rusts. 31 percent were highly resistant to S. tritici and seemingly immune to both rusts. These emmer wheat accessions can be considered valuable for both bread and durum wheat improvement, and may well represent untapped sources of resistance. Durante 1992, se evaluo en Toluca (Valles Altos de Mexico) la resistencia a Septoria tritici de 2619 selecciones de espiga de Triticum dicoccon Schrank. obtenidas de 325 entradas de la coleccion de trigos de CIMMYT. El inoculo de S. tritici usado fue seleccionado originalmente bajo condiciones controladas al inocular 10 cultivares de trigo duro con aislamientos de S. tritici. Los aislamientos mas virulentos fueron usados para inocular trigos emmer susceptibles y reaislarlos desde alli. Para las inoculaciones de campo, el inoculo se incremento en medio liquido de sucrosa levadura y se aplico tres veces tres semanas consecutivas, usando una aspersora de ultra bajo volumen a una concentracion de 10^{**} (9) esporas por ml. S. tritici usado fue seleccionado originalmente bajo condiciones controladas al inocular 10 cultivares de trigo duro con

aislamientos de S. tritici. Los aislamientos mas virulentos fueron usados para inocular trigos emmer susceptibles y reaislarlos desde alli. Para las inoculaciones de campo, el inoculo se incremento en medio liquido de sucrosa levadura y se aplico tres veces tres semanas consecutivas, usando una aspersora de ultra bajo volumen a una concentracion de 10^{**} (9) esporas por ml. Treinta y cuatro por ciento de las selecciones fueron eliminadas por ser altamente susceptibles, ya sea a roya estriada (Puccinia striiformis) o roya de la hoja (Puccinia recondita).

1672 Gill, KS.; Gill, BS.; Endo, TR.; Taylor, T. (1996) **IDENTIFICATION AND HIGH-DENSITY MAPPING OF GENE-RICH REGIONS IN CHROMOSOME GROUP 1 OF WHEAT.** *Genetics. 144(4):1883-1891.* English. [UNIV NEBRASKA DEPT AGRON 279 PLANT SCI POB 830915 LINCOLN, NE 68583 USA].

We studied the distribution of genes and recombination in wheat (Triticum aestivum) group 1 chromosomes by comparing high-density physical and genetic maps. Physical maps of chromosomes 1A, 1B, and 1D were generated by mapping 50 DNA markers on 56 single-break deletion lines. A consensus physical map was compared with the 1D genetic map of Triticum tauschii (68 markers) and a Triticeae group 1 consensus map (288 markers) to generate a cytogenetic ladder map (CLM). Most group 1 markers (86%) were present in five clusters that encompassed only 10% of the group 2 chromosome. This distribution may reflect that of genes because more than half of the probes were cDNA clones and 30% were PstI genomic. All 14 agronomically important genes in group 1 chromosomes were present in these clusters. Most recombination occurred in gene-cluster regions. Markers fell at an average distance of 244 kb in these regions. The CLM involving the Triticeae consensus genetic map revealed that the above distribution of genes and recombination is the same in other Triticeae species. Because of a significant number of common markers, our CLM can be used for comparative mapping and to estimate physical distances among markers in many Poaceae species including rice and maize. [References: 38].

1673 Ginkel, M. van; Rajaram, S. (1995) **Breeding for resistance to Septoria tritici at CIMMYT.** *Proceedings of a Septoria Tritici Workshop; Mexico, D.F.; 20-24 Sep 1993. Gilchrist, L.; Ginkel, M. van; McNab, A.; Kema, G.H.J. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 55-61.* CIMMYT. 3 tables; 7 ref. English. (AGRIS 97-018295).

CIMMYT's Bread Wheat Breeding Program has divided its target wheat area into 12 mega-environments. In some of these (ME2 and ME3), Septoria spp. are important. In regard to genetic variability on the side of the pathogen, it appears from global data analysis, that differences in aggressiveness are more apparent and important in farmers' fields, than clear differences in virulence. Thus rankings of wheat germplasm obtained, for example, in Toluca, Mexico, tend to hold up in other countries. The Bread Wheat Program emphasizes breeding for durable resistance. The horizontal kind of resistance to Septoria tritici is commonly found. Genetic variability for resistance is found, among others, in spring wheats from Latin America, and in winter wheat germplasm. The segregating populations are artificially inoculated with infected straw in Toluca. The modified pedigree/bulk method of selection is applied, and appears particularly effective, since resistance is considered to be based on several additive genes. Selection emphasizes low levels of disease on the upper foliage, bright yellow peduncle, plump seed, and high test weight plus yield. The segregating material is shuttled between Toluca and Cd. Obregon, Mexico, where selection for high yield potential is carried out. In addition to several sites in Mexico, the germplasm is also tested in global hot pots such as Ethiopia and Ecuador. New germplasm combining resistance with yield is listed. El programa de mejoramiento de trigos harineros ha dividido sus areas clave para trigo en 12 mega-ambientes. En algunos de estos (MA2 y MA3) las especies de Septoria son importantes. Con respecto a la variabilidad genetica del patogeno, parece ser que, con base en un analisis global de datos, las diferencias en agresividad parecen ser mas aparentes e importantes al nivel de campos de agricultores, que diferencias claras en virulencia. Asi las evaluaciones de germoplasma de trigo obtenidas por ejemplo en Toluca, Mexico, tienden a sostenerse en otros paises. El programa de trigos harineros enfatiza el mejoramiento para "resistencia durable". El tipo de resistencia horizontal de Septoria tritici se encuentra comunmente. La variabilidad genetica para resistencia se encuentra, entre otros, en trigos de primavera de Latinoamerica, y en germoplasma de trigo de invierno. Las poblaciones segregantes son artificialmente inoculadas con paja infectada en Toluca. Se aplica el metodo de seleccion modificado linea pura/masal, y parece particularmente efectivo, ya que se considera que la resistencia esta basada en varios genes aditivos. Durante la seleccion se hace enfasis en bajos niveles de enfermedad sobre la parte superior del follaje, pedunculo de color amarillo brillanty.

1674 Giura, A. (Research Inst. for Cereals and Industrial Crops, Fundulea (Romania)); Saulescu, N.N. (1996) **Chromosomal location of genes controlling grain size in a large grained selection of wheat (Triticum aestivum L.).** *Euphytica (Netherlands) v. 89(1) p. 77-80.* 6 ref. English. (AGRIS 97-018351).

1675 Gonzalez Iqiguez, R.M.; Castrejon Sanguino, A.; Rajaram, S. (1995) **[Genetic variability of resistance to Septoria tritici in wheat (Triticum aestivum L.)]. Variabilidad genetica de la resistencia a Septoria tritici en trigo (Triticum aestivum L.).** *Proceedings of a Septoria Tritici Workshop; Mexico, D.F.; 20-24 Sep 1993. Gilchrist, L.; Ginkel, M. van; McNab, A.; Kema, G.H.J. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 99-108.* CIMMYT. 7 tables; 1 fig.; 8 ref. Spanish. (AGRIS 97-018298).

The research presented here was carried out in Patzcuaro, Michoacan, Mexico, in the 1992 summer crop cycle. The following traits were studied: days to heading, days to maturity, plant height, test-weight, grain yield, and Coefficient of Infection (C.I.) for septoria. Principal component and multivariate analysis of the data indicated that the variability between the 7 groupings of 22 genotypes was explained by grain yield, days to heading, days to maturity, plant height, and C.I. Tolerance to Septoria tritici was observed in the following lines: CMH78A.544, F30081, F28977, CM82368, CMH83.262 and CM96251. Regression analysis showed that for each day heading was delayed, the C.I. value dropped 1.4 percent. C.I increased by 1.9 percent for every centimeter drop in plant height. Yield losses varied between 22.1-70.8 percent, relative to the control treatment protected with fungicide. No direct correlation was observed between yield losses and C.I. El presente trabajo se realizo en Patzcuaro, Edo de Michoacan, Mexico, durante el ciclo de verano 1992. Se estudio espigamiento, madurez, altura de planta, peso hectolitrico, rendimiento y Coeficiente de Infeccion (C. I.) por septoriosis. Con base en el analisis de componentes principales y multivariados, las caracteristicas de rendimiento, espigamiento, madurez, altura y C.I. explicaron la variabilidad existente entre 22 genotipos y permitio formar 7 grupos. Se observo tolerancia a Septoria tritici en las lineas CMH78A.544, F30081, F28977, CM82368, CMH 83.262 y CM96251. Con base en la ecuacion de regresion, por cada dia de retraso en el espigamiento, el C.I. disminuye en 1.4 porciento y por cada centimetro menos en la planta, el C.I. aumenta en 1.9 porciento. Las perdidas de rendimiento variaron del 22.1 a 70.8 porciento calculandose en base a la proteccion quimica. No existio una relacion directa entre las perdidas de rendimiento y el C.I.

1676 Grewal, HS.; Graham, RD.; Rengel, Z. (1996) **GENOTYPIC VARIATION IN ZINC EFFICIENCY AND RESISTANCE TO CROWN ROT DISEASE (FUSARIUM GRAMINEARUM SCHW GROUP 1) IN WHEAT.** *Plant & Soil. 186(2):219-226.* English. [UNIV ADELAIDE WAITE AGR RES INST DEPT PLANT SCI GLEN OSMOND SA 5064 AUSTRALIA].

A crown rot disease in wheat caused by the fungus Fusarium graminearum Schw. Group 1 is a widespread problem in chronically Zn-deficient Australian soils. A link between crown rot and Zn deficiency was established by Sparrow and Graham (1988). This paper reports a test of a further hypothesis, that wheat genotypes more efficient at extracting zinc from low-zinc soils are more resistant to infection by this pathogen. Three wheat cultivars (Excalibur, Songlen and Durati) of differential Zn efficiency were tested at three zinc levels (0.05, 0.5 and 2.0 mg Zn kg(-1) of soil) and three levels of F. graminearum S. Group 1 inoculum (0.1 g and 0.3 g kg(-1) live chaff-inoculum and control having 0.1 g kg(-1) dead chaff inoculum). Six weeks after sowing dry matter production of shoots and roots was decreased by Fusarium inoculation at 0.05 mg and 0.5 mg kg(-1) applied Zn. Fusarium inoculum at 0.1 g was as effective as 0.3 g kg(-1) for infection and decreasing dry matter. The infection at the basal part of culm decreased significantly by increasing the rate of Zn application. Excalibur, a Zn-efficient cultivar (tolerant to Zn deficiency) produced significantly more shoot and root dry matter, and showed less disease infection compared with Zn-inefficient cultivars (Durati and Songlen) at low (0.05 mg Zn kg(-1) soil) and medium (0.5 mg Zn kg(-1) soil) Zn fertilization rates. Higher rate of Zn fertilization (2.0 mg Zn kg(-1) soil) reduced the disease level in Durati to the level of Excalibur but the disease level of

Songlen was still high, indicating its high Zn requirement and or sensitivity to crown rot. The data on Zn uptake show that Excalibur, being Zn-efficient, was able to scavenge enough Zn from Zn-deficient soil, we suggest that besides sustaining growth Excalibur was able to build and maintain resistance to the pathogen; inefficient cultivars needed extra Zn fertilization to achieve performance comparable to that of Excalibur. The present study indicates that growing Zn-efficient cultivars of wheat along with judicious use of Zn fertilizer in Zn-deficient areas where crown rot is a problem may sustain wheat production by reducing the severity of the disease as well as by increasing the plant vigour through improved Zn nutrition. [References: 27].

1677 Grimwade, B. (Bristol Univ. (United Kingdom). Dept. of Agricultural Sciences); Tatham, A.S.; Freedman, R.B.; Shewry, P.R.; Napier, J.A. (1996) **Comparison of the expression patterns of genes coding for wheat gluten proteins and proteins involved in the secretory pathway in developing caryopses of wheat.** *Plant Molecular Biology (Netherlands) v. 30(5) p. 1067-1073.* 35 ref. English. (AGRIS 97-018289).

1678 Gupta, R.R.; Ahmad, Z. (Chander Shekhar Azad University of Agriculture and Technology, Kanpur (India)) (1995) **Line x tester analysis for some metric traits in macaroni wheat.** *Crop Improvement (India) v. 22(2) p. 244-249.* 2 tables; 7 ref. English. (AGRIS 97-002925).

1679 Gupta, S.; Saini, R.G.; Gupta, A.K. (Punjab Agricultural Univ., Ludhiana (India). Dept. of Genetics) (1995) **Genetic analysis of resistance to leaf-rust (Puccinia recondita f.sp. tritici) pathotypes in the durum wheats 'PBW 34' and 'DWL 5023'.** *Plant Breeding (Germany) v. 114(2) p. 176-178.* 2 tables; 13 ref. English. (AGRIS 97-018383).

Genetic analysis of leaf-rust resistance was conducted on two durum wheats. Triticum durum cvs. 'PBW 34' and 'DWL 5023' were crossed with the leaf-rust-susceptible durum wheat 'Malvi Local'. The F1, F2 and F3 generations were tested against leaf-rust pathotypes 1, 77A and 108. In 'PBW 34', a single dominant gene was effective against each of the pathotypes 1 and 108, whereas two independently inherited dominant genes were effective against pathotype 77A. In 'DWL 5023', two independently inherited dominant genes were operative against pathotypes 1 and 77A, whereas a single dominant gene was identified as being operative against pathotype 108. Allelic tests on F2 generation and joint segregation analysis on F3 generation seedlings, suggested that two different genes in each cultivar are effective against these three leaf-rust pathotypes. Cultivar 'PBW 34' has Lrd1 and Lrd2 genes whereas Lrd1 and Lrd3 genes are present in 'DWL 5023'.

1680 Haley, S.D. (South Dakota State University.); Schut, R.A. (1996) **Winter wheat breeding and genetics.** *Plant science pamphlet (USA) (no. 84) p. 10-12.* English. (AGRIS 97-018258).

1681 Harrabi, M.; Cherif, M.; Amara, H.; Ennaiffer, Z.; Daaloul, A. (1995) **In vitro selection for resistance to Septoria tritici in wheat.** *Proceedings of a Septoria Tritici Workshop; Mexico, D.F.; 20-24 Sep 1993. Gilchrist, L.; Ginkel, M. van; McNab, A.; Kema, G.H.J. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 109-116.* CIMMYT. 2 tables; 1 fig.; 32 ref. English. (AGRIS 97-018376).

Adult resistance to Septoria tritici was evaluated in the field on three and eleven local bread and durum wheat varieties, respectively. Based on LSD (1 percent) value, the fourteen genotypes were classified in five groups. Jeneh Khotifa seemed to have excellent resistance, whereas DB 33-35 and Karim showed the highest susceptible reactions. All the three bread wheat genotypes had an acceptable level of Septoria tritici resistance. Wheat callus from three durum and two bread wheat genotypes were exposed in vitro to four concentrations of Septoria tritici crude toxin. The increase in fresh weight was recorded for 120 days of incubation in selective medium. For the five genotypes, losses in fresh weight increased with toxin concentration. However the reaction of genotypes according to toxin concentration differed from one variety to another. Cell response in the toxic medium was not in perfect accordance with that of adult plants. La resistencia a Septoria tritici en planta adulta fue evaluada en el campo en tres y once variedades locales de trigos harineros y duros respectivamente. Basado en el valor de LSD (1 porciento), los 14 genotipos fueron clasificados en 5 grupos. Jeneh Kotifa parece tener una resistencia excelente mientras que DB 33-35 y Karim mostraron las reacciones mas suceptibles. Los tres genotipos de trigo harinero tuvieron un nivel de resistencia aceptable a Septoria tritici. Los callos de tres genotipos de trigo duro y dos de trigo harinero fueron expuestos in vitro a cuatro concentraciones de extracto crudo de la toxina de Septoria tritici. El incremento en peso fresco fue registrado a los 120 dias de incubacion en medio selectivo. Para los cinco genotipos, las perdidas en peso fresco aumentaron con la concentracion de toxina. Sin embargo la reaccion de los genotipos difirio de una variedad a otra de acuerdo a la concentracion de la toxina. La respuesta de la celula en el medio toxico no estuvo en perfecta concordancia con la de la planta adulta al hongo.

1682 Heck, G.R. (Washington Univ., St. Louis, MO (USA). Dept. of Biology); Ho, T.H.D. (1996) **Gibberellin-repressible gene expression in the barley aleurone layer.** *Plant Molecular Biology (Netherlands) v. 30(3) p. 611-623.* Bibliography (56 ref.). English. (AGRIS 97-017893).

1683 Heim, U.; Manteuffel, R.; Baeumlin, H.; Steinbiss, H. H.; Wobus, U. (Institut fuer Pflanzengenetik und Kulturpflanzenforschung, Gatersleben (Germany)) (1995) **Transient expression of a lysine-rich vicilin gene of Vicia faba in barley endosperm detected by immunological tissue printing after particle bombardment.** *Plant Cell Reports (Germany) v. 15(1-2) p. 125-128.* 2 ill.; 24 ref. English. (AGRIS 97-018402).

1684 Hollenbach, B.; Dietz, K. J. (Wuerzburg Univ. (Germany). Julius von Sachs Inst. fuer Biowissenschaften) (1995) **Molecular cloning of emip, a member of the major intrinsic protein (MIP) gene family, preferentially expressed in epidermal cells of barley leaves.** *Botanica Acta (Germany) v. 108(5) p. 425-431.* 2 ill., 2 tables; 26 ref. English. (AGRIS 97-017891).

1685 Hucl, P. (Saskatchewan Univ., Saskatoon (Canada). Crop Development Centre) (1995) **Divergent selection for sprouting resistance in spring wheat.** *Plant Breeding (Germany) v. 114(3) p. 199-204.* 5 tables; 16 ref. English. (AGRIS 97-018325).

The development of sprouting-resistant spring-wheat (Triticum aestivum L.) cultivars is a major breeding objective in many wheat-producing regions. Sprouting resistance is thought to be associated with delayed maturity. The primary objective of this study was to measure the reciprocal effects of selection for sprouting resistance and maturity. Two experiments were conducted over a 3-4-year period in Saskatoon, Canada. In the first experiment, two populations of hard red spring wheat were subjected to divergent selection (k = 10) for maturity. In the second experiment, six populations derived from crosses between two sprouting-resistant, late-maturing, white-grained cultivars ('AUS1293' and 'AUS1408') and three early maturing, red-grained cultivars ('Park', 'PT516' and 'Roblin'), were subjected to divergent selection (k = 10) for sprouting resistance. Selection for earliness reduced sprouting resistance in one population but had no effect in the second. For both populations, earlier maturity was associated with higher test weight but lower grain yield. In the second experiment, selection for increased sprouting resistance was effective, with realized heritabilities averaging 0.74. Increased sprouting resistance was associated with a slight delay (1-2.5 days) in time to spike emergence in four out of six populations, but had little effect on time to maturity in most populations. There was a trend towards redder grain in the sprouting-resistant selections. The recovery of sprouting-resistant, early maturing segregants was relatively low, averaging less than 10 over the six populations. In conclusion, selection for increased sprouting resistance can result in delayed maturity, but the magnitude of that delay will vary among populations.

1686 Huel, DG.; Hucl, P. (1996) GENOTYPIC VARIATION FOR COMPETITIVE ABILITY IN SPRING WHEAT. *Plant Breeding. 115(5):325-329.* English. [UNIV SASKATCHEWAN CTR CROP DEV 51 CAMPUS DR SASKATOON SK S7N 5A8 CANADA].

Herbicides are the primary method of weed control for crop production in developed countries. For economic and environmental reasons alternative control strategies are being devised. One of these strategies is the development of competitive crop cultivars. The objectives of this research were to establish whether spring wheat (Triticum aestivum L.) genotypes differed in competitive ability and if those differences were related to specific growth characteristics. Sixteen genotypes of spring wheat were grown under simulated weed competition conditions at Saskatoon, Canada over a 3-year period. Four high and four low tillering genotypes from each of two crosses (Neepawa/M1417 and Ingal/M1417) were studied. Weeds consisted of cultivated oat (Avena sativa cv. 'Waldern') and oriental mustard (Brassica juncea cv. 'Cutlass') sown at two densities (48 and 96 seeds/m(2) per weed species). Seedling establishment,

ground cover, and seed yield for the three species were determined, as was wheat tiller number, spike number, maximum height, leaf area index, leaf orientation, and flag leaf length and size. Significant (P = 0.001) weed rate by genotype interactions involving changes in genotype rank were detected for wheat grain yield, indicating that the 16 wheat genotypes differed in competitive ability. Wheat grain yield reductions averaged over the two weed densities ranged from 45% to 59%. The highest-yielding genotypes under weed-free conditions were not necessarily the highest yielding under weedy conditions. Genotypes which suffered smaller yield reductions were more effective in suppressing weed growth. Although competitive genotypes were generally taller than noncompetitive genotypes, other traits such as large seedling ground cover and flag leaf length were associated with wheat yield under competitive conditions. [References: 23].

1687 Immonen, Sirkka (1996) **Triticale breeding and synthesis : applications of tissue culture.** Helsinki Univ. (Finland). University of Helsinki. Department of Plant Biology. Bibliography p. 45-61. 95 p. English. (AGRIS 97-018284).

1688 Impiglia, A.; Nachit, M.M. (ICARDA, International Center for Agricultural Research in the Dry Areas, Aleppo (Syria). Cereal Improvement Program); Lafiandra, D.; Porceddu, E. (University of Tuscia, Viterbo (Italy). Department of Agrobiology and Agrochemistry) (1995) **[Effect of gliadin and glutenin components on gluten strength in durum wheat]. Effet des composantes gliadine et glutenine sur la force du gluten chez le ble dur.** Seminar on Durum Wheat Quality in the Mediterranean Region. Zaragoza (Spain). 17-19 Nov 1993. Durum Wheat Quality in the Mediterranean Region. La Qualite du Ble Dur dans la Region Mediterraneenne. Fonzo, N. di (Istituto Sperimentale per la Cerealicoltura, Foggia (Italy). Sezione Operativa di Foggia); Kaan, F. (INRA, Institut National de la Recherche Agronomique, Mauguio (France). Station de Genetique et d'Amelioration des Plantes. Domaine de Melgueil); Nachit, M. (ICARDA, International Center for Agricultural Research in the Dry Areas, Aleppo (Syria)). *Options Mediterraneennes. Serie A: Seminaires mediterraneens (CIHEAM); no. 22 p. 167-172.* CIHEAM-IAMZ. 2 ill.; 2 tables; 12 ref. English. (AGRIS 97-002273).

L'electrophorese du contenu proteique qui se trouve dans le grain de ble dur a permis l'identification d'une population avec une recombinaison dans le Gli-B1. Cette procedure a ete combinee avec la bande gliadine 45 et LMW-1. Le resultat de la qualite a confirme qu'il y a une relation fonctionnelle positive entre le LMW et la propriete viscoelastique du gluten, et que les bandes 42 et 45 sont seulement des marqueurs genetiques pour la qualite chez le ble dur.

1689 Jensen, C.A. (1995) **[Durum wheat breeding in the Integrated Experimental Station, Barrow]. Mejoramiento de trigo candeal en la Chacra Experimental Integrada, Barrow.** *[Wheat breeding in Argentina: Thirty years of cooperative investigation with CIMMYT; Balcarce, Argentina; 7-8 Oct 1992]. El mejoramiento de trigo en Argentina: Treinta anos de investigacion cooperativa con el CIMMYT; Balcarce, Argentina; 7-8 Oct 1992. Kohli, M.M.; Nisi, J.E.; Rajaram, S. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 37-40.* CIMMYT. 1 table. Spanish. (AGRIS 97-018304).

The durum wheat has been seeded in the southeast part of Buenos Aires province for a long time, and reached its maximum area during the decade of '70s. During the mid seventies severe disease epidemics and the introduction of short cycle bread wheat varieties caused a significant reduction in the area seeded as well as production of the durum wheats. Due to local quality constraints it has not been possible to utilize introduced germplasm with high yield potential and resistance to diseases. The program has used this germplasm in crosses with the local traditional materials to develop new high yielding lines. Some of the newer CIMMYT advanced lines under test promise very high yield potential without sacrificing the required quality characteristics. Considering the export possibilities, it will be necessary to develop more germplasm with high quality characteristics. El trigo candeal ha sido sembrado en el sudeste de la Provincia de Buenos Aires desde hace tiempo, alcanzando su superficie maxima durante la decada del 70. A mediados de la decada del 70 las epidemias severas de enfermedades y la introduccion de variedades de trigo pan de ciclo corto causaron una reduccion significativa en la superficie sembrada como tambien la produccion total. Por otra parte no ha sido posible utilizar el germoplasma introducido de alto potencial de rendimiento y resistencia a enfermedades debido a las exigencias de caracteristicas de calidad local. El programa ha utilizado este germoplasma en cruzamiento con el material tradicional para lograr nuevas variedades de alto potencial de rendimiento. Algunas de las nuevas lineas de origen CIMMYT bajo prueba de rendimiento estan prometiendo un incremento significativo de la productividad sin sacrificar la calidad requerida. Considerando la posibilidad de cubrir parte del mercado de exportacion seria muy necesario desarrollar mayor cantidad de germoplasma de alta calidad.

1690 Jensen, L.G. (Carlsberg Laboratory, Copenhagen, Valby, Denmark.); Olsen, O.; Kops, O.; Wolf, N.; Thomsen, K.K.; Wettstein, D. von (1996) **Transgenic barley expressing a protein-engineered, thermostable (1, 3-1, 4-)-beta-glucanase during germination.** *Proceedings of the National Academy of Sciences of the United States of America (USA) v. 93(8) p. 3487-3491.* references. English. (AGRIS 97-002553).

The codon usage of a hybrid bacterial gene encoding a thermostable (1, 3-1, 4)-beta-glucanase was modified to match that of the barley (1, 3-1, 4)-beta-glucanase isoenzyme EII gene. Both the modified and unmodified bacterial gene were fused to a DNA segment encoding the barley high-pI alpha-amylase signal peptide downstream of the barley (1, 3-1, 4)-beta-glucanase isoenzyme EII gene promoter. When introduced into barley aleurone protoplasts, the bacterial gene with adapted codon usage directed synthesis of heat stable (1, 3-1, 4)beta-glucanase, whereas activity of the heterologous enzyme was not detectable when protoplasts were transfected with the unmodified gene. In a different expression plasmid, the codon modified bacterial gene was cloned downstream of the barley high-pI alpha-amylase gene promoter and signal peptide coding region. This expression cassette was introduced into immature barley embryos together with plasmids carrying the bar and the uidA genes. Green, fertile plants were regenerated and approximately 75 of grains harvested from primary transformants synthesized thermostable (1, 3-1, 4)-beta-glucanase during germination. All three trans genes were detected in 17 progenies from a homozygous T1 plant.

1691 Jestin, L. (Institut National de la Recherche Agronomique, Clermont Ferrand (France). Centre de Clermont Ferand Theix, Genetique et Amelioration des Plantes); Menteur, S.; Joseph, J.L.; Lauret, B.; Branlard, G. (1995) **[Improvement of malting barley for enzymes traits: investigating beta-glucanase and alpha-amylase polymorphism related to malt quality]. Amelioration de la qualite de l'orge brassicole par l'etude des enzymes-cles: investigation du polymorphisme des beta-glucanases et alpha-amylases en relation avec la qualite du malt.** *BIOS BOISSONS (France) v. 26(255) p. 113-118.* 23 ref. English. (AGRIS 97-002245).

1692 Jlibene, M.; El Bouami, F. (1995) **Inheritance of partial resistance to Septoria tritici in hexaploid wheat (Triticum aestivum).** *Proceedings of a Septoria Tritici Workshop; Mexico, D.F.; 20-24 Sep 1993. Gilchrist, L.; Ginkel, M. van; McNab, A.; Kema, G.H.J. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 117-125.* CIMMYT. 4 tables; 19 ref. English. (AGRIS 97-018377).

Study of partial resistance components could produce useful information to develop better resistance to Septoria tritici in wheat (Triticum aestivum). Inheritance of four partial resistance components: incubation period, latent period, leaf necrosis, and pycnidial density, was studied. Testing of Parent-1, Parent-2, F1, B1CFX, B2CF1, and F2 generations of six wheat crosses against two isolates of S. tritici indicated simple Mendelian inheritance of all components. Long incubation period seemed to be controlled by two complementary genes. Long latent period and low pycnidial density were each controlled by a single dominant gene. However, low leaf necrosis was controlled by one dominant gene in the genotype Vee's'/Snb's', by two dominant genes in the genotype Nasma*2/14-2, and by one dominant and one recessive gene in the genotype Saada. Phenotypic correlations among the four components of partial resistance indicated that leaf necrosis and pycnidial density were closely correlated. The close correlation may suggest that the dominant gene which controls leaf necrosis and the dominant one which controls pycnidial density may be the same. Al realizar estudios de los componentes de la resistencia parcial se podria generar informacion util para desarrollar mejores niveles de resistencia a Septoria tritici en trigo (Triticum aestivum). Se estudio la herencia de cuatro componentes de la resistencia parcial: periodo de incubacion, periodo de latencia, area necrosada y densidad de pycnidios. La evaluacion del padre-1, padre 2, F1, B1CF1, B2CF1 y generacion F2 de seis cruzas de trigo con dos aislamientos de S. tritici indico una herencia Mendeliana simple de todos los

componentes. Los periodos largos de incubacion parecen estar controlados por dos genes complementarios. El periodo de latencia largo y la baja densidad de picnidios fueron cada uno controlado por un gene simple dominante. Sin embargo, el area necrosada reducida fue controlada por un gene dominante en el genotipo Vee"S"/Snb"S", por dos genes dominantes en el genotipo Nasma"2/14-2, y por un gene dominante y uno recesivo en el genotipo Saada. Las correlaciones fenotipicas entre los cuatro componentes de resistencia parcial indicaron que el area necrosada de la hoja y la densidad de picnidios estan estrechamente correlacionados. Esta estrecha correlacion sugiere que el gene dominante que controla el area con necrosis y el dominante que controla densidad de picnidios podria ser el mismo.

1693 Jlibene, M.; Mazouz, H.; Farih, A. (1995) **Host-pathogen interaction of wheat (Triticum aestivum) and Septoria tritici in Morocco.** *Proceedings of a Septoria Tritici Workshop; Mexico, D.F.; 20-24 Sep 1993. Gilchrist, L.; Ginkel, M. van; McNab, A.; Kema, G.H.J. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 34-40.* CIMMYT. 7 tables; 3 ref. English. (AGRIS 97-018375).

Reports on Septoria tritici x Triticum aestivum interaction are numerous, strengthening the hypothesis of specialization of the pathogen to the host. The present report is intended to present a view on how specialization to wheat species as well as to wheat genotypes could have occurred in North Africa. Three experiments were carried out, one consisting of inoculating both bread and durum wheat species in the greenhouse at the seedling stage, with 5. tritici isolated from fields of durum wheat and bread wheat, and the other one consisting of inoculating a differential set of bread wheat genotypes with isolates from bread wheat fields only. La abundate informacion sobre la interaccion Septoria tritici x Triticum aestivum consolida la hipotesis de la especializacion del patogeno hacia el hospedante. En este trabajo se presenta un panorama sobre como la especializacion de especies de trigo, asi como la de genotipos de trigo, pudo haber ocurrido en el norte de Africa. Se llevaron acabo dos experimentos, uno que consistio en inocular trigo duro y harinero en invernadero en plantula con aislamientos de S. tritici de campos de trigo duro y trigo harinero; el otro consistio en inocular un grupo diferencial de genotipos de trigo harinero con aislamientos de campos de trigo harinero solamente.

1694 Johanson, P.F. (Monsanto Agriculture, St. Louis Missouri (USA)); Laudoyer, O. (Hybritech Europe SNC, Lescar (France)) (1995) **[Future uses of biotechnologies in plant improvement. Monsanto's work in wheat transformation]. Utilisations futures des biotechnologies en amelioration vegetale. Les travaux de Monsanto pour la transformation du ble.** Seminar on Durum Wheat Quality in the Mediterranean Region. Zaragoza (Spain). 17-19 Nov 1993. Durum Wheat Quality in the Mediterranean Region. La Qualite du Ble Dur dans la Region Mediterraneenne. Fonzo, N. di (Istituto Sperimentale per la Cerealicoltura, Foggia (Italy). Sezione Operativa di Foggia); Kaan, F. (INRA, Institut National de la Recherche Agronomique, Mauguio (France). Station de Genetique et d'Amelioration des Plantes. Domaine de Melgueil); Nachit, M. (ICARDA, International Center for Agricultural Research in the Dry Areas, Aleppo (Syria)). *Options Mediterraneennes. Serie A: Seminaires mediterraneens (CIHEAM); no. 22 p. 221-226.* CIHEAM-IAMZ. 10 plates. English. (AGRIS 97-002279).

Plusieurs caracteres de qualite du ble peuvent etre ameliores par transformation genetique. De nouveaux genes sont introduits dans les cellules de ble en utilisant un canon a particules. Des balles microscopiques d'or ou de tungstene sont baignees dans l'ADN et bombardees a travers les parois cellulaires. L'anthocyanine, un marqueur, a ete utilisee avec succes pour mettre au point des systemes pour la transformation et la regeneration chez le ble.

1695 Johnson, JP.; Carver, BF.; Baligar, VC. (1997) **EXPRESSION OF ALUMINUM TOLERANCE TRANSFERRED FROM ATLAS 66 TO HARD WINTER WHEAT.** *Crop Science. 37(1):103-108.* English. [OKLAHOMA STATE UNIV DEPT AGRON STILLWATER, OK 74078 USA].

Genetic improvement of acid soil tolerance of wheat (Tritium aestivum L.) adaptable to the Great Plains involves the transfer of Al tolerance from other gene pools. One hindrance may be the interaction of gene effect with genetic background. Aluminum-tolerant near-isolines of hard red winter (HRW) wheat were selected on the basis of the hematoxylin assay using 'Atlas 66' as the source of tolerance. The objectives were to enumerate the genes for Al tolerance in these lines and to quantify their expression in artificial solution and natural soil media containing Al. Laboratory and growth chamber experiments were conducted with Al-tolerant and Al-susceptible near-isolines of 'Chisholm' and 'Century'. Segregation for hematoxylin staining score in populations derived from crossing the tolerant isoline with its recurrent parent indicated a single dominant gene was transferred from Atlas 66. This gene does not appear to be unique relative to '2180'. Dose-response curves for relative root length (RRL) measured in solution culture confirmed differences in Al tolerance predicted by the hematoxylin assay. Each tolerant isoline showed a linear decline in RRL to increasing Al concentration (0.09-0.72 mM Al), while the susceptible isolines and recurrent parents showed a more acute curvilinear response. The tolerant isolines exceeded their recurrent parent by 19% (Chisholm) and 38% (Century) in RRL, measured in five acidic Appalachian soils. While the hematoxylin assay enabled selection of a dominant gene conferring increased root growth in response to Al, complete expression of tolerance from Atlas 66 was not achieved or was modified in these HRW backgrounds. [References: 19].

1696 Joshi, C.P. (Texas Tech Univ., Lubbock, TX (USA). Dept. of Plant and Soil Science); Kumar, S.; Nguyen, H.T. (1996) **Application of modified differential display technique for cloning and sequencing of the 3' region from three putative members of wheat HSP70 gene family.** *Plant Molecular Biology (Netherlands) v. 30(3) p. 641-646.* 15 ref. English. (AGRIS 97-018335).

1697 Joudrier, P.; Lullien, V.; Dieryck, W.; Alary, R.; Gautier, M.F. (INRA, Institut National de la Recherche Agronomique, Montpellier (France). Laboratoire de Technologie des Cereales) (1995) **[Studies of genes coding for the Triticum turgidum L. var. durum family of cystein rich proteins]. Etude des genes codant pour des proteines riches en cysteine chez le ble dur (Triticum durum Desf.).** Seminar on Durum Wheat Quality in the Mediterranean Region. Zaragoza (Spain). 17-19 Nov 1993. Durum Wheat Quality in the Mediterranean Region. La Qualite du Ble Dur dans la Region Mediterraneenne. Fonzo, N. di (Istituto Sperimentale per la Cerealicoltura, Foggia (Italy). Sezione Operativa di Foggia); Kaan, F. (INRA, Institut National de la Recherche Agronomique, Mauguio (France). Station de Genetique et d'Amelioration des Plantes. Domaine de Melgueil); Nachit, M. (ICARDA, International Center for Agricultural Research in the Dry Areas, Aleppo (Syria)). *Options Mediterraneennes. Serie A: Seminaires mediterraneens (CIHEAM); no. 22 p. 263-270.* CIHEAM-IAMZ. 5 ill.; 14 ref. English. (AGRIS 97-002283).

Des resultats importants ont ete obtenus ces dernieres annees pour ameliorer genetiquement la valeur d'utilisation des bles cependant des progres sont encore possibles grace a l'utilisation des techniques de biologie moleculaire. Il est bien etabli que les proteines qui contribuent de maniere predominante a la qualite sont les proteines de reserve du grain. Cependant, recemment, il a ete mis en evidence que les proteines riches en cysteine pouvaient egalement jouer un role dans la qualite technologique. Ces resultats viennent conforter les tres nombreuses etudes qui ont souligne le role des reactions d'echange entre les groupements -SH et l'etablissement de ponts disulfures entre les proteines du grain. De plus, des resultats encore plus recents ont mis en evidence l'existence d'un systeme d'oxydoreduction (Thioredoxine h NADP -dependante) capable d'agir a la fois sur les proteines de reserve mais egalement sur des petites proteines riches en cysteine (=PPRC). Dans ce travail, apres avoir presente les differentes familles de PPRC (purothionines, proteines de transfert de lipides, = LTP, CM-proteines, puroindolines) nous presentons les resultats que nous avons obtenus avec certaines d'entre elles : les LTP, CM, pour lesquelles nous avons isole differents clones cDNA (caracteristiques et structures primaires des proteines correspondantes), l'etude de l'expression de ces genes au cours de la maturation de la graine ainsi que la production dans des hotes heterologues de ces proteines en vue d'etudier les relations structure-fonction. Les perspectives de ces travaux sont de comprendre le role de ces proteines in vivo et dans la qualite technologique afin de preparer la voie de la transgenese.

1698 Kaan, F.; Chihab, B.; Borries, C.; Monneveux, P. (INRA, Institut National de la Recherche Agronomique, Montpellier (France). ENSA, Ecole Nationale Superieure Agronomique, Station de Genetique et d'Amelioration des Plantes); Branlard, G. (INRA, Institut National de la Recherche Agronomique, Clermont Ferrand (France). Station de Genetique et d'Amelioration des Plantes) (1995) **[Prebreeding and breeding durum wheat germplasm (Triticum turgidum L. var. durum) for quality**

products]. **Pre-amelioration et amelioration du germoplasme de ble dur (Triticum turgidum L. var. durum) pour des produits de qualite.** Seminar on Durum Wheat Quality in the Mediterranean Region. Zaragoza (Spain). 17-19 Nov 1993. Durum Wheat Quality in the Mediterranean Region. La Qualite du Ble Dur dans la Region Mediterraneenne. Fonzo, N. di (Istituto Sperimentale per la Cerealicoltura, Foggia (Italy). Sezione Operativa di Foggia); Kaan, F. (INRA, Institut National de la Recherche Agronomique, Mauguio (France). Station de Genetique et d'Amelioration des Plantes. Domaine de Melgueil); Nachit, M. (ICARDA, International Center for Agricultural Research in the Dry Areas, Aleppo (Syria)). *Options Mediterraneennes. Serie A: Seminaires mediterraneens (CIHEAM); no. 22 p. 159-166.* CIHEAM-IAMZ. 2 tables; 26 ref. English. (AGRIS 97-002272).

Une teneur en proteine du grain elevee et stable est un caractere genetique d'importance capitale pour l'obtention de produits de qualite, mais elle est difficile a combiner avec d'autres caracteres favorables des varietes modernes. Des ressources genetiques mondiales de ble dur, des varietes locales et modernes ont ete analysees pour la presence d'unites et sous-unites gliadine et glutenine ainsi que pour le test de sedimentation SDS et la teneur en proteine utilises pour la prediction de la qualite des pates cuites. Une relation negative nouvelle entre l'allele nul du locus Glu A1 codant pour les sous-unites de Haut Poids Moleculaire et le test SDS ainsi qu'avec la teneur en proteine a ete trouvee. Les alleles du locus GLU A1 codant pour les sous-unites 1, 2*, et 2** pourraient etre relies a une meilleure aptitude a la qualite des pates cuites. Une grande diversite pour la teneur en carotenoides de l'albumen en relation avec la couleur jaune des produits du ble dur est utilisable. Des lignees modernes avec des niveaux tres eleves de carotenoides sont en cours d'utilisation pour la creation varietale.

1699 Kaan, F.; Souyris, I. (INRA, Institut National de la Recherche Agronomique, Montpellier (France). Station de Genetique et d'Amelioration des Plantes); Macheix, J.J.; Regnier, T. (Universite de Montpellier II, Montpellier (France)); Andary, C. (Universite de Montpellier I, Montpellier (France). Faculte de Pharmacie); Braun, P. (ITCF, Institut Technique des Cereales et des Fourrages, Nimes (France)); Mahaut, B. (ITCF, Institut Technique des Cereales et des Fourrages, Paris (France)); Ponchet, M. (INRA, Institut National de la Recherche Agronomique, Antibes (France). Station de Botanique et de Pathologie Vegetale) (1995) **[The use of in vitro methods for blackpoint control and resistance in durum wheat (T. turgidum L. var. durum)]. Utilisation de methodes in vitro pour le controle de la moucheture et la resistance chez le ble dur.** Seminar on Durum Wheat Quality in the Mediterranean Region. Zaragoza (Spain). 17-19 Nov 1993. Durum Wheat Quality in the Mediterranean Region. La Qualite du Ble Dur dans la Region Mediterraneenne. Fonzo, N. di (Istituto Sperimentale per la Cerealicoltura, Foggia (Italy). Sezione Operativa di Foggia); Kaan, F. (INRA, Institut National de la Recherche Agronomique, Mauguio (France). Station de Genetique et d'Amelioration des Plantes. Domaine de Melgueil); Nachit, M. (ICARDA, International Center for Agricultural Research in the Dry Areas, Aleppo (Syria)). *Options Mediterraneennes. Serie A: Seminaires mediterraneens (CIHEAM); no. 22 p. 271-275.* CIHEAM-IAMZ. 2 tables; 7 ref. English. (AGRIS 97-002284).

Il a ete possible de faire apparaitre a volonte la moucheture du grain de ble dur grace a la realisation de conditions de brumisation au champ. Dans ces conditions, le niveau de polyphenols parietaux du grain est modifie. De plus, en conditions abiotiques confinees in vitro, des symptomes proches de la moucheture peuvent se developper meme sur des grains murs sterilises a l'autoclave. L'intensite de la reponse apparait liee a la sensibilite au champ des genotypes a la moucheture. Aucun phenomene d'hypersensibilite du ble dur n'a pu etre mis en relation avec la moucheture.

1700 Kema, G.H.J.; Yu Da Zhao (1995) **Pathogenesis of Septoria tritici in wheat cultivars with different levels of resistance.** *Proceedings of a Septoria Tritici Workshop; Mexico, D.F.; 20-24 Sep 1993. Gilchrist, L.; Ginkel, M. van; McNab, A.; Kema, G.H.J. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 25-26.* CIMMYT. English. (AGRIS 97-018293).

The pathogenesis of Septoria tritici was studied in a compatible and incompatible reaction. On both the resistant cultivar Kavkaz/K4500 L.6.A.4. and the susceptible cultivar Shafir spore germination frecuency was high. Infection is purely stomatal, although a germ tube may cross several stomata before it enters one. Forty-eight hours after infection hyphae in the susceptible host have reached the mesophyll cells visual symptoms may develop. From ten days after inoculation onwards, extensive cell death occurs. Further colonization culminates in pycnidia formation in substomatal cavities. In the resistant host, colonization is very limited. Associated necrotic blotches are not always colonized by the fungus. Se estudio la patogenesis de Septoria tritici en una reaccion compatible incompatible. La frecuencia de la germinacion de esporas fue alta sobre el cultivar resistente Kavkaz/K4500 L.6.A.4. y el susceptible Shafir. La infeccion ocurrio unicamente atraves de los estomas, aunque el tubo germinativo cruzo varios estomas antes de penetrar en uno. Cuarenta y ocho horas despues de que la infeccion alcanzo las celulas del mesofilo en el hospedaje susceptible se desarrollaron los sintomas visuales. Muchas celulas murieron a partir de los 10 dias despues de la inoculacion. Mas adelante, la colonization culmino con la formacion de picnidios en las cavidades estomaticas. El hospedaje resistente, la colonizacion fue muy limitada. Las manchas necroticas no siempre fueron colonizadas por el hongo.

1701 Khalil, I.H.; Carver, B.F.; Smith, E.L. (Oklahoma State Univ., Stillwater (USA). Dept. of Agronomy) (1995) **Genetic gains in two selection phases of a wheat-breeding programme.** *Plant Breeding (Germany) v. 114(2) p. 117-120.* 3 tables; 8 ref. English. (AGRIS 97-018323).

Genetic gain in field crops is usually estimated as the collective contribution of several breeding programmes. Critical to an individual breeder, however, is the genetic gain realized within a single programme. The objective was to quantify per-annum genetic gains from 1969 to 1993 within two successive phases of experimental line testing in the wheat (Triticum aestiuum L.) breeding programme of the Oklahoma Agricultural Experiment Station. Data for grain yield (Phases 1 and 2). volume weight and heading date (Phase 2) were analysed according to the procedure developed by St. Martin and McBlain (1991). Genetic gains for grain yield were indistinguishable between phases, averaging 4.6 +- 1.1 and 4.2 +- 1.3 of the control mean across the 24-year period. Genetic gain fovolume weight averaged only 0.2 of the check mean, reflecting lower selection pressure for that trait compared to grain yield. Inconsistengenetic gains in heading date reflect a preference for a window of desirable heading dates rather than difficulties in selecting uni-directionally for maturity. The absence of a decline in genetic gain in recent years indicates that future improvement in grain yield is likely; however, increased attention must be given to volume weightto maintain US domestic and export standards for hard winter wheat. Thstatistical procedure was useful in monitoring long-term trends in genetic gains and identifying gaps in programme efficiency.

1702 Khan, N.; Bajwa, M.A. (Ayub Agricultural Research Inst., Faisalabad (Pakistan)) (1993) **Variability and correlation between metric traits in wheat.** *Journal of Agricultural Research (Pakistan) v. 31(2) p. 131-137.* 4 tables, 16 ref. English. (AGRIS 97-018363).

In ten wheat varieties (Chenab79, Indus79, Barani79, Punjab81, Pavon, WL711, Sandal, LU26, Nacozari and V1316) genetic coefficient of variability was higher for grain yield per plant (12.18) followed by 1000 grain weight (10.15), number of spikelets per spike (5.34), number of grains per spike (5.14) and number of spikes per plant (3.24). Heritability in the broad sense was higher for 1000 grain weight (99.60) and number of spikelets per spike (75.70) than other traits. Genetic advance (of mean) was higher for 1000 grain weight (20.86) followed by grain yield per plant (19.04). Higher direct effect on grain yield per plant was exerted by 1000 grain weight (0.8460) followed by number of grains per spike (0.4465), number of spikes per plant (0.3539) and number of spikelets per spike (0.0126).

1703 King, I.P. (John Innes Centre, Norwich (United Kingdom)); Cant, K.A.; Law, C.N.; Worland, A.J.; Orford, S.E.; Reader, S.M.; Miller, T.E. (1996) **An assessment of the potential of 4DS.4DL-4s(l)L translocation lines as a means of eliminating tall off types in semi-dwarf wheat varieties.** *Euphytica (Netherlands) v. 89(1) p. 103-106.* 10 ref. English. (AGRIS 97-018353).

1704 Kintzios, S.; Jahoor, A.; Fischbeck, G. (Technical Univ. of Munich, Freising Weihenstephan (Germany). Inst. of Agronomy and Plant Breeding) (1995) **Powdery-mildew-resistance genes Mla29 and Mla32 in H. spontaneum derived winter barley lines.** *Plant Breeding (Germany) v. 114(3) p. 265-266.* 1 ill.; 12 ref. English. (AGRIS 97-017889).

Allelism to the highly polymorphic Mla locus was demonstrated for the powdery-mildew resistance of two Hordeum spontaneum derived winter-barley lines, '110-4 x Sonja' and '142-29 x Dura', by testing the F progeny of

crosses between these lines and the winter-barley cv. 'Triton' (Mla13) with two appropriate isolates. The results were confirmed by RFLP analysis, using the probe MWG 1H036, which is very closely linked to the Mla locus. The designations Mla29 and Mla32 are proposed for the genes identified in the two lines.

1705 Kipnits, A.A.; Batrakova, V.A.; Nikol'skaya, V.P.; Rashtal', I.D.; Kartel', M.A. (Academy of Sciencies of Belarus, Minsk (Belarus). Institute of Genetics and Cytology) (1996) **[Dynamics of the callose content in barley seedlings which differ in resistance to powdery mildew]. Dynamika kol'kastsi kalozy u prarostkakh yachmenyu, yakiya adroznivayutstsa pa ustojlivastsi da muchnistaj rasy.** *Vestsi Akadehmii Navuk Belarusi. Seryya biyalagichnykh navuk (Belarus) (no.1) p. 77-79.* 9 ref. Byelo Russian. (AGRIS 97-002545).

Spectrofluorimetic determination of the callose content in barley isogenic lines for ml-o gene during powdery mildew infection was carried out. The barley lines, sensitive and insensitive to powdery mildew were shown to differ from each other by callose formation response. The differences are of quantitative and temporal character.

1706 Kir'yanov, G.I.; Kintsurashvili, L.N.; Manamsh'yan, T.A.; Noskov, V.A.; Smirnova, T.A. (1996) **[Chromatin structure and enzymatic methylation of alpha-amylase gene DNA in barley aleurone layer cells during gene expression induction]. Struktura khromatina i ehnzimaticheskoe metilirovanie DNK genov al'fa-amilazy kletok alejronovogo sloya yachmenya pri induktsii ikh ehkspressii.** *Biokhimiya (Russian Federation) v. 61(1) p. 55-64.* 17 ref. Russian. (AGRIS 97-002551).

The pattern of methylation of alpha-amylase gene DNA and the state of chromatin in these genes in cells of native aleurone layers of barley corn seeds and in primary cultures of these cells have been studied with regard to gene expression. It has been found that the probed by the cloned alpha-amylase 3'-sequence genes appear to be completely nonmethylated or only weakly methylated in the CCGG site of the cells prior to gene expression induction. Induction of expression of alpha-amylase genes by the phytohormone, gibberellic acid (GA) and/or the increase in Ca2+ ion concentration have no effect on the level of these genes methylation. Prior to cell induction as well as during their expression alpha-amylase genes do not display any distinct nucleosome structure. With regard to DNA methylation pattern and chromatin structure, the genes of alpha-amylase in barley aleurone layer cells are competent for expression ("activated"); hence the phytohormone GA does not selectively induce the expression of individual genes in those cells but is a functional link in a hitherto unknown trigger mechanism.

1707 Kiribuchiotobe, C.; Nagamine, T.; Yanagisawa, T.; Ohnishi, M.; Yamaguchi, I. (1997) **PRODUCTION OF HEXAPLOID WHEATS WITH WAXY ENDOSPERM CHARACTER.** *Cereal Chemistry. 74(1):72-74.* English. [NATL AGR RES CTR DEPT CROP BREEDING TSUKUBA IBARAKI 305 JAPAN].

In our wheat breeding program to introduce the low amylose character of Tanikei A6099 to elite lines, five waxy lines were unexpectedly obtained from 249 doubled haploid lines of the F-1 hybrid of Saikai 168 x Tanikei A6099. The amylose content of all the waxy lines was <1% and the blue value was <0.1. Starch granule-bound proteins were extracted and subjected to modified sodium dodecyl sulfate polyacrylamide gel electrophoresis. The waxy lines lacked the Wx protein. Starch paste viscosity measurements gave pasting profiles of waxy wheat starch that were quite different from those of nonwaxy wheats but similar to those of waxy maize. However, the peak viscosity of waxy wheats was much higher than that of the waxy maize. [References: 15].

1708 Kjaer, B. (Risoe National Lab., Roskilde (Denmark). Dept. of Environmental Science and Technology); Jensen, J. (1996) **Quantitative trait loci for grain yield and yield components in a cross between a six-rowed and a two-rowed barley.** *Euphytica (Netherlands) v. 90(1) p. 39-48.* 31 ref. English. (AGRIS 97-017895).

1709 Kohli, M.M. (1995) **Resistance to Septoria tritici blotch in Southern Cone germplasm.** *Proceedings of a Septoria Tritici Workshop; Mexico, D.F.; 20-24 Sep 1993. Gilchrist, L.; Ginkel, M. van; McNab, A.; Kema, G.H.J. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 62-72.* CIMMYT. 12 tables; 2 ref. English. (AGRIS 97-018296).

Between 1984 and 1991, 1974 lines included in the regional wheat screening nursery from South America were analyzed to study resistance to septoria tritici leaf blotch and pathogen variability existing in the region. In terms of germplasm, Uruguay offers the highest level of resistance even though the infection is variable at the key testing sites over the years. In general, the level of resistance in germplasm originating from southern parts of Argentina, Brazil and Uruguay is the highest, followed by that of Chile and Paraguay. Germplasm from Bolivia, in general, was susceptible. Based on correlation coefficients calculated for each set of locations and years, La Estanzuela, Uruguay, is the most critical location for germplasm screening. Pathogen variability between Balcarce, Argentina, and La Estanzuela, Uruguay, demonstrates the existence of different pathogen populations under field conditions. El vivero regional de seleccion de trigos del Cono Sur de Sud America incorporo 1974 lineas entre los anos 1984 a 1991; esta informacion fue analizada para estudiar la resistencia al tizon de la hoja causado por Septoria tritici y su variabilidad en la region. En terminos de germoplasma, Uruguay ofrece los mayores niveles de resistencia aun cuando la resistencia es variable en los sitios clave a traves de los anos. En general, el nivel resistencia en el germoplasma originario de partes del sur de Argentina, Brazil, y Uruguay es el mas alto, seguido por el de Chile y Paraguay. El germoplasma de Bolivia, en general, fue susceptible. Basado en los coefficientes de correlacion calculados para cada grupo de localidades y anos, La Estanzuela, Uruguay, es la localidad mas critica para la seleccion de germoplasma. La variabilidad del patogeno entre Balcarce, Argentina, y La Estanzuela, Uruguay, demostro la existencia de diferentes poblaciones del patogeno bajo condiciones de campo.

1710 Kohli, M.M.; Nisi, J.E.; Rajaram, S. (eds.) (1995) **[Klein S.A. wheat breeding]. Mejoramiento de trigo del Criadero Klein S.A.** *[Wheat breeding in Argentina: Thirty years of cooperative investigation with CIMMYT; Balcarce, Argentina; 7-8 Oct 1992]. El mejoramiento de trigo en Argentina: Treinta anos de investigacion cooperativa con el CIMMYT; Balcarce, Argentina; 7-8 Oct 1992. Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 65-72.* CIMMYT. Spanish. (AGRIS 97-018307).

Klein Breeding Program in wheat was started in 1919 by Ing. Enrique Klein. It is located in Pla in the Alberti Department of the Buenos Aires province. The average annual rainfall is 978 mm. The level of the rainfall is lower during the winter and early spring and higher during summer and early fall. The soils are deep with good drainage and without calcareous layers near the surface. The phosphorus content is generally low, between 6 and 7 ppm, and the nitrogen content is variable depending on the number of years of cropping. Klein varieties are grown primarily from the center of the Buenos Aires province to the limits of the wheat region in the North and the West El Criadero Klein fue fundado en el ano 1919 por el Ing. Enrique Klein. Esta ubicado en la localidad de Pla en el Partido de Alberti, en la Provincia de Buenos Aires. El promedio de precipitaciones anuales es de 978 mm. El regimen de lluvias es con menos precipitaciones en los meses de invierno y comienzos de la primavera y mayores en los meses de verano y comienzos del otono. Con respecto a sus suelos, son profundos con buen drenaje y sin capas de calcareo proximos a la superficie. El contenido de fosforo es bajo, entre 6 el ano 1919 por el Ing. Enrique Klein. Esta ubicado en la localidad de Pla en el Partido de Alberti, en la Provincia de Buenos Aires. El promedio de precipitaciones anuales es de 978 mm. El regimen de lluvias es con menos precipitaciones en los meses de invierno y comienzos de la primavera y mayores en los meses de verano y comienzos del otono. Con respecto a sus suelos, son profundos con buen drenaje y sin capas de calcareo proximos a la superficie. El contenido de fosforo es bajo, entre 6 y 7 ppm y el de nitrogeno es variable y depende de los anos de cultivo. El area de difusion de los cultivos es principalmente desde el centro de la Provincia de Buenos Aires hasta los limites norte y oeste del area triguera. Los trigos de ciclo corto e intermedio son los que han ocupado una mayor superficie sembrada, principalmente despues de un cultivo de verano, soja o maiz. Los cultivares que han presentado amplia difusion son los siguientes: Klein Cometa (1942) Klein Rendider (1954), Klein Atlas (1963), Klein Toledo (1969), Klein Chamaco (1979). La introduccion de germoplasma del CIMMYT a traves de los cruzamientos se realizo a partir del ano 1970, dando como resultado la deteccion hasta el presente de 20 nuevos cultivares. Con respecto a las prioridades de los proximos anos, podemos mencionar a las royas de la hoja y del tallo, fusariosis de la espiga, septoriosis de la hoja, vuelco y calidad industrial. La colaboracion y los materiales recibidos del CIMMYT han sido un significativo aporte para los distintos programas de mejoramiento de trigo en Argentina.

1711 Kohli, M.M.; Nisi, J.E.; Rajaram, S. (eds.) (1995) **[Wheat breeding in Argentina: Thrity years of cooperative research with CIMMYT; Balcarce, Argentina; 7-8 Oct 1992]. El mejoramiento de trigo en Argentina: Treinta anos de investigacion cooperativa con el CIMMYT; Balcarce, Argentina; 7-8 Oct 1992.** Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). CIMMYT. 197 p. Spanish. (AGRIS 97-018300).

1712 Kohli, M.M.; Rajaram, S. (1995) **[Collaboration between the wheat breeding programs in Argentina and CIMMYT]. Colaboracion entre programas de mejoramiento de trigo en Argentina y CIMMYT.** *[Wheat breeding in Argentina: Thirty years of cooperative investigation with CIMMYT; Balcarce, Argentina; 7-8 Oct 1992]. El Mejoramiento de Trigo en Argentina: Treinta Anos de Investigacion Cooperativa con el CIMMYT. Kohli, M.M.; Nisi, J.; Rajaram, S. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 181-189.* CIMMYT. 1 table. Spanish. (AGRIS 97-018378).

The collaboration between the wheat breeding programs of the Southern Cone and CIMMYT started almost four decades ago, much before the latter was created. The collaboration of Dr. Norman E. Borlaug in exchange of germplasm and creation of Interamerican Yield Trial was an integral part of this process. The collaboration between the national programs of the region and CIMMYT increased significantly with the start of a CIMMYT regional office in 1978. The results of this close collaboration have led to the development of large quantity of germplasm adapted to the region, primarily for resistance to the diseases. As a result 78 percent of the regional wheat area, including 82 percent in Argentina and 78 percent in Brazil, is seeded to the germplasm of CIMMYT origin. On the other hand, to target its germplasm to specific environments, CIMMYT has created a dozen mega-environments internationally. For achieving higher efficiency in adaptation and selection of germplasm, the Argentine programs should concentrate on the mega-environments 1 (irrigated), 2 (high precipitation), 4b (early drought) and 8b (facultative wheats) La colaboracion entre programas de mejoramiento de trigo de la region Cono Sur y el CIMMYT comenzo hace casi cuatro decadas, mucho antes que este ultimo fuera creado. La colaboracion del Dr. Norman E. Borlaug en intercambio de germoplasma y creacion de ensayo interamericano de rendimiento formo una parte integral de este proceso. La colaboracion entre los programas nacionales de la region y el CIMMYT aumento significativamente con la puesta de un programa de CIMMYT en la region en 1978. Los resultados de la colaboracion estrecha ha resultado en desarrollo de mayor cantidad de germoplasma adaptado a la region, principalmente por su resistencia a las enfermedades. Como resultado, 87 porciento de la superficie regional de trigo, incluyendo 82 porciento en Argentina y 78 porciento en Brasil esta sembrada con germoplasma de origen CIMMYT. Por otra parte para apuntar germoplasma a los ambientes especificos, CIMMYT ha creado una docena de mega-ambientes a nivel internacional. Para lograr mayor eficiencia en adaptacion y seleccion de germoplasma, los programas de mejoramiento de Argentina deben concentrarse en los mega-ambientes 1 (irrigado), 2 (de alta precipitacion), 4b (sequia temprana) y 8b (trigos facultativos). Como prioridades futuras para la region el programa de CIMMYT considera los siguientes aspectos muy importantes: 1. resistencia a enfermedades; 2. tolerancia a sequia y/o calor, 3. eficiencia en extraccion del fosforo; 4. germoplasma para la siembra directa; 5. trigos para doble proposito y 6. mejor calidad industrial.

1713 Korzun, V.; Balzer, HJ.; Balzer, A.; Baumlein, H.; Borner, A. (1996) **CHROMOSOMAL LOCATION OF THREE WHEAT SEQUENCES WITH HOMOLOGY TO POLLEN ALLERGEN ENCODING, DNA REPLICATION REGULATING, AND DNA (CYTOSINE-5)-METHYLTRANSFERASE GENES IN WHEAT AND RYE.** *Genome. 39(6):1213-1215.* English. [INST PFLANZENGENET & KULTURPFLANZENFORSCH D-06466 GATERSLEBEN GERMANY].

Three wheat sequences, shown to be homologous to pollen allergen encoding, DNA replication regulating, and DNA (cytosine-5)-methyltransferase genes were localized on chromosomes using nullisomic-tetrasomic wheat ('Chinese Spring') and wheat-rye ('Chinese Spring'/'Imperial') addition lines. Whereas the loci for the pollen allergen encoding sequence (Tri a III) were shown to be located on homoeologous group 4, the DNA replication regulating (Rep) and DNA (cytosine-5)-methyltransferase (Mtase) genes were located to homoeologous groups 1 and 7, respectively, of Triticeae. Chromosomal rearrangements in wheat and rye relative to each other are discussed. [References: 16].

1714 Kosar, K.; Psota, V. (Vyzkumny Ustav Pivovarsky a Sladarsky, Brno (Czech Republic)) (1996) **[Newly approved spring barley varieties in the Czech Republic]. Nove povolene odrudy jarniho jecmene v Ceske republice.** *Kvasny Prumysl (Czech Republic) v. 42(6) p. 206-209.* 3 tables. Czech. (AGRIS 97-017883).

1715 Kostin, V.V.; Mudrova, A.A. (1995) **[Breeding low-sized winter durum wheat varieties in Krasnodar P.P.Lukyanenko agricultural research Institute [Russian Federation]]. Selektsiya nizkoroslykh sortov ozimoj tverdoj pshenitsy v Krasnodarskom NIISKh.** *Doklady RASKhN (Russian Federation) (no.6) p. 5-7.* 5 ref. Russian. (AGRIS 97-002926).

Widely used methods applied for breeding winter durum wheat in Krasnodar P.P.Lukyanenko agricultural research Institute have been studied. The breeding material was analysed for productivity and structural elements of wheat crop yield. The varieties Kristall 2 and Yashma created and registered in Kuban region were described.

1716 Kraan, G. (1995) **[Wheat breeding in the Integrated Experimental Station, Barrow]. Mejoramiento de trigo en Chacra Experimental Integrada, Barrow.** *[Wheat breeding in Argentina: Thirty years of cooperative investigation with CIMMYT; Balcarce, Argentina; 7-8 Oct 1992]. El mejoramiento de trigo en Argentina: Treinta anos de investigacion cooperativa con el CIMMYT; Balcarce, Argentina; 7-8 Oct 1992. Kohli, M.M.; Nisi, J.E.; Rajaram, S. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 29-35.* CIMMYT. Spanish. (AGRIS 97-018303).

The climatic conditions prevalent in the region of integrated Experimental Station at Barrow, a part of wheat sub-region IV, allows to attain very high yield potential in wheat. Even when the yields of 6 t/ha. have been attained in the commercial fields, the average of the region during the last few years remains between 2500-2700 kg/ha. Due to its geographic location, long cycle wheats can be seeded. Yet it is necessary to develop more long and inrermediate cycle varieties with superior industrial quality. The wheat breeding program utilizes the traditional germplasm for its better adaptation and crosses it with CIMMYT germplasm of high yield potential and resistance to diseases. A new variety, Bonaerense Pericon, has been selected locally from the germplasm received from CIMMYT. Another variety, Bonaerense Pasuco, is also a cross with CIMMYT germplasm Bluebird. In general, CIMMYT germplasm demonstrates higher susceptibility to Septoria leaf blotch and lower industrial quality; two aspects that need to be improved for better utilization of the available generic variability. Las condiciones climaticas prevalentes en la region bajo la influencia de la Chacra Experimental Integrada de Barrow, una parte de la sub-region triguera IV, permite lograr niveles de rendimiento muy altos en el cultivo de trigo. A pesar de que rendimientos de 6 tn/ha. han sido logrados en lotes comerciales, el promedio de la region durante los ultimos anos se ubica en 2500-2700 kg/ha. Debido a la localizacion de la region es posible sembrar variedades de ciclo largo. Aun asi es necesario lograr mayores variedades de ciclo largo a intermedio y con buena calidad industrial. El programa de mejoramiento ha utilizado el germoplasma tradicional por su gran adaptacion y cruzado con el material de origen CIMMYT por su alto potencial de rendimiento y resistencia a las enfermedades. Del germoplasma recibido del CIMMYT seleccionado localmente se ha inscripto una nueva variedad denominada Bonaerense Pericon. Asimismo, la variedad Bonaerense Pasuco tiene Bluebird, de origen CIMMYT, en su cruzamiento. En general, el material de origen CIMMYT tiene mayor susceptibilidad a septoriosis de la hoja y menor calidad industrial, dos aspectos que necesitan ser mejorados para aprovechar mejor la gran variabilidad disponible.

1717 Kraan, G.; Nisi, J.E. (1995) **[Septoriosis of wheat in the Republic of Argentina: aspects of cultivation towards the disease]. Septoriosis del trigo en la Republica Argentina situacion del cultivo frente a la enfermedad.** *Proceedings of a Septoria Tritici Workshop; Mexico, D.F.; 20-24 Sep 1993. Gilchrist, L.; Ginkel, M. van; McNab, A.; Kema, G.H.J. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 1-8.* CIMMYT. 4 figs.; 10 ref. Spanish. (AGRIS 97-018292).

In the wheat producing area of Argentina, septoria leaf blotch, caused by Septoria tritici, is an endemic disease, which is present every year, since normally conditions are conducive to its appearance and dissemination. The wheat crop situation was analyzed vis-a-vis to S. tritici during the period when high yielding varieties were slowly replacing the traditional

varieties. A rise in disease incidence was noted, resulting in a three-fold increase in the intensity of attack on these new varieties compared to the traditional ones, as measured in leaf area damaged. The effect on grain yield was not determined. Presently breeding has partly reversed this situation, in particular with the recent release of long-cycle varieties, most of which contain traditional Argentina varieties in their pedigrees. En la region triguera argentina la septoriosis de la hoja provocada por Septoria tritici es una enfermedad endemica que se presenta todos los anos, ya que normalmente ocurren condiciones propicias para su aparicion y difusion. Se analizo la situacion del cultivo de trigo frente a Septoria tritici durante el periodo en que los cultivares de alto potencial de rendimiento fueron reemplazando paulatinamente a los tradicionales. Se comprobo un incremento en la incidencia de la enfermedad, que llego a triplicar la intensidad de ataque sobre esos nuevos cultivares respecto a los tradicionales medido a traves del area foliar danada, aunque no se determino su incidencia sobre rendimiento de grano. Actualmente por mejoramiento genetico se ha revertido parcialmente la situacion, especialmente con los ultimos cultivares de ciclo largo. En el pedigree de la mayoria de estos participan variedades tradicionales argentinas.

1718 Krattiger, A.F. (John Innes Centre, Norwich (United Kingdom). Dept. of Cereals Research); Payne, P.I.; Law, C.N. (1996) **Effects of homoeologous group 1 and 6 chromosomes of the Cappelle-Desprez (Bezostaya 1) substitution lines on aspects of bread-making quality of wheat.** *Euphytica (Netherlands) v. 89(1) p. 17-25.* 29 ref. English. (AGRIS 97-018344).

1719 Kulshrestha, V.P.; Chowdhury, S.; Deshmukh, P.S. (Indian Agricultural Research Institute, New Delhi (India), Division of Genetics) (1995) **Breeding for high temperature stress in wheat.** *Crop Improvement (India) v. 22(2) p. 200-206.* 2 tables; 14 ref. English. (AGRIS 97-018332).

1720 Kuwabara, T.; Abe, J.; Iriki, N.; Tsuchiya, T.; Nakajima, T. (1996) **NEW GENETIC RESOURCES FOR RESISTANCE TO SNOW MOLDS IN WHEAT (TRITICUM AESTIVUM L) [Japanese].** *Breeding Science. 46(4):409-411.* Japanese. [HOKKAIDO NATL AGR EXPT STN SAPPORO HOKKAIDO 062 JAPAN].

1721 Lafarga, A.; Lezaun, J.A.; Armesto, A.P. (Instituto Tecnico y de Gestion Agricola, Pamplona (Espana)) (1996) **[Cereals, results of 95-96 campaign in Navarra [Spain], 3: Trial results of soft wheat cultivars]. Cereales, balance de resultados de la campana 95-96 en Navarra, 3: Resultados de la experimentacion de variedades de trigo blando.** *Navarra Agraria (Espana) (no.98) p. 24-33.* 2 tab., graf. Spanish. (AGRIS 97-017479).

1722 Lafarga, A.; Lezaun, J.A.; Armesto, A.P. (Instituto Tecnico y de Gestion Agricola, Pamplona (Espana)) (1996) **[Cereals, results of 95-96 campaign in Navarra [Spain], 4: Trial results of barley cultivars]. Cereales, balance de resultados de la campana 95-96 en Navarra, 4: Resultados de la experimentacion de variedades de cebada.** *Navarra Agraria (Espana) (no.98) p. 34-43.* Tab., graf. Spanish. (AGRIS 97-017480).

1723 Landgeva, S.; Ganeva, G. (1996) **N-BANDED KARYOTYPE OF AEGILOPS OVATA AND CHROMOSOMAL CONSTITUTION OF ITS AMPHIPLOID WITH TRITICUM AESTIVUM.** *Plant Breeding. 115(5):330-334.* English. [BULGARIAN ACAD SCI INST GENET DEPT CYTOGENET BG-1113 SOFIA BULGARIA].

The N-banded karyotype of an Aegilops ovata (2n = 4x = 28) accession was produced, and the chromosomal constitution of its partial amphiploid with bread wheat Triticum aestivum 'Chinese Spring' was established. All A. ovata chromosomes showed specific N-banding patterns and can easily be distinguished from each other. As a result of irregular meiotic behaviour of the chromosomes in the amphiploid, some structural rearrangements have probably occurred in most of the A. ovata chromosomes. The wheat chromosomes remained unmodified in their morphology and the N-banding patterns. [References: 18].

1724 Lapitan, NLV.; Brown, SE.; Kennard, W.; Stephens, JL.; Knudson, DL. (1997) **FISH PHYSICAL MAPPING WITH BARLEY BAC CLONES.** *Plant Journal. 11(1):149-156.* English. [COLORADO STATE UNIV DEPT SOIL & CROP SCI FT COLLINS, CO 80523 USA].

Fluorescence in situ hybridization (FISH) is a useful technique for physical mapping of genes, markers, and other single- or low-copy sequences. Since clones containing less than 10 kb of single-copy DNA do not reliably produce detectable signals with current FISH techniques in plants, a bacterial artificial chromosome (BAG) partial library of barley was constructed and a FISH protocol for detecting unique sequences in barley BAC clones was developed. The library has a 95 kb average barley insert, representing about 20% of a barley genome. Two BAC clones containing hordein gene sequences were identified and partially characterized. FISH using these two BAC clones as probes showed specific hybridization signals near the end of the short arm of one pair of chromosomes. Restriction digests of these two BAC clones were compared with restriction patterns of genomic DNA; all fragments contained in the BAC clones corresponded to bands present in the genomic DNA, and the two BAC clones were not identical. The barley inserts contained in these two BAC clones were faithful copies of the genomic DNA. FISH with four BAC clones with inserts varying from 20 to 150 kb, showed distinct signals on paired chromatids. Physical mapping of single- or low-copy sequences in BAC clones by FISH will help to correlate the genetic and physical maps. FISH with BAC clones also provide an additional approach for saturating regions of interest with markers and for constructing contigs spanning those regions. [References: 46].

1725 Law, C.N. (John Innes Centre, Norwich (United Kingdom). Dept. of Cereal Research); Worland, A.J. (1996) **Inter-varietal chromosome substitution lines in wheat: revisited.** *Euphytica (Netherlands) v. 89(1) p. 1-10.* 17 ref. English. (AGRIS 97-018290).

1726 Lefebvre, D.; Devaux, P. (1996) **DOUBLED HAPLOIDS OF WHEAT FROM WHEAT X MAIZE CROSSES - GENOTYPIC INFLUENCE, FERTILITY AND INHERITANCE OF THE 1BL-1RS CHROMOSOME.** *Theoretical & Applied Genetics. 93(8):1267-1273.* English. [BIOTECHNOL LAB BP 41 F-59242 CAPPELLE PEVELE FRANCE].

The wheat x maize cross as a technique for haploid induction in wheat was evaluated in a replicated block design comprising 18 wheat F-1 hybrids and five Zea mays L. parents. Haploid plants were regenerated at an average of 9.1 (4.4-14.7) plants per 100 florets processed. Genotypic differences for haploid production efficiency were recorded for both wheat and Zen mays L. Interaction between parents was significant for number of plants/100 florets. All 610 of the 1, 703 regenerated plantlets that were analyzed by flow cytometry were haploid. At maturity, 70% (60-81%) of the colchicine-treated haploid plants were fertile, but the frequency of fertile and sterile plants was not consistent over the wheat hybrids from which they were derived. Flow cytometry performed using the first tiller which arose following colchicine treatment enabled prediction of fertility. The 1BL-1RS chromosome was found at the expected ratios in the F-2 and in the haploid progenies produced through the wheat x maize cross but deviated from the 1:1 ratio in the haploid progenies produced by anther culture. [References: 57].

1727 Leijerstam, B. (SLU, Alnarp (Sweden). Inst. foer Vaextskyddsvetenskap) (1996) **Sources of resistance to powdery mildew, Erysiphe graminis f.sp. hordei, in barley.** *Sveriges Utsaedesfoerenings Tidskrift (Sweden) v. 106(2) p. 64-68.* English. (AGRIS 97-002543).

1728 Lemerle, D.; Verbeek, B.; Cousens, RD.; Coombes, NE. (1996) **THE POTENTIAL FOR SELECTING WHEAT VARIETIES STRONGLY COMPETITIVE AGAINST WEEDS.** *Weed Research. 36(6):505-513.* English. [CRC WEED MANAGEMENT SYST WAGGA WAGGA NSW 2650 AUSTRALIA].

The competitive abilities of a wide range of genotypes of wheat (Triticum aestivum L.) and durum wheat (Triticum durum Desf.) against Lolium rigidum Gaud. (annual ryegrass) were examined to determine the potential for breeders to select strongly competitive varieties. Considerable potential within the wheat genome to breed varieties with greater competitive ability was demonstrated. In 1993, 250 genotypes from around the world were screened and in 1994 a subset of 45 (mainly Australian) genotypes were further examined. A uniform density of L. rigidum reduced grain yield of wheat by up to about 80% in 1993 and to 50% in 1994, depending on wheat genotype. Reduction in grain yield was correlated with L. rigidum dry matter. Wheats varied in competitive ability with source, and durum wheats were less competitive than T. aestivum. The 'old' standard wheat varieties (released between 1880 and 1950) suppressed the weed more than all the current varieties, with the exception of eight 9 hybrids. A doubling of the crop seeding rate of 10 of the genotypes in 1994 reduced the biomass of L. rigidum by an average of 25% compared with the standard seeding rate. Ranking of competitive

ability of varieties at high density was consistent at both seeding rates. The strongly competitive genotypes had high early biomass accumulation, large numbers of tillers, and were tall with extensive leaf display. The potential for breeding enhanced competitive ability in wheat is discussed. [References: 21].

1729 Linacero, R. (Universidad Complutense de Madrid (Spain). Dept. de Genetica); Lopez Bilbao, M.G.; Romero, C.; Laurie, D.A.; Vazquez, A.M. (1996) **Genotypic differences in polyembryo formation and somatic embryogenesis increment in wheat (Triticum aestivum L.), following 2, 4-D treatment.** *Euphytica (Netherlands) v. 89(3) p. 345-348.* 11 ref. English. (AGRIS 97-018337).

1730 Liu, C.Y.; Rathjen, A.J.; Shepherd, K.W.; Gras, P.W.; Giles, L.C. (Adelaide Univ., Glen Osmond (Australia). Waite Agricultural Research Inst. Dept. of Plant Science) (1995) **Grain quality and yield characteristics of D-genome disomic substitution lines in 'Langdon' (Triticum turgidum var. durum).** *Plant Breeding (Germany) v. 114(1) p. 34-39.* 3 graphs, 2 tables; 33 ref. English. (AGRIS 97-018382).

Sets of D-genome disomic substitution lines of 'Langdon' (Triticum turgidum var. durum) were used to study the effect of chromosome substitutions on grain yield and flour technological properties. In general, the substitution of any D-genome chromosome had a detrimental effect on grain yield and growth vigour (some lines were sterile). SDS-sedimentation, SE-HPLC and two-gram mixograph procedures were used to measure dough strength of the lines studied. Significant correlations were observed between protein concentration and grain yield and other quality parameters such as SDS-sedimentation value, the proportion of glutenin, dough mix time and peak resistance. Most of the quality characters were highly correlated with each other. Substitution of chromosomes 1D, 5D, 2D and 7D resulted in positive responses to SDS-sedimentation values, but only chromosome 1D had positive effects on the proportion of peak 1 (P(1)), measured by SE-HPLC. Besides the major influence of chromosome 1D on three major mixograph parameters (mixing time, peak resistance and resistance breakdown), chromosome 5D also exhibited significant effects on these mixing parameters. Principal-component analysis showed that the predominant effect on durum-wheat rheological properties was from chromosome 1D, whereas chromosome 5D had a major effect on grain hardness (50) and increased the whiteness of the flour.

1731 Liu, KB.; Somerville, S. (1996) CLONING AND CHARACTERIZATION OF A HIGHLY REPEATED DNA SEQUENCE IN HORDEUM VULGARE L. *Genome. 39(6):1159-1168.* English. [CARNEGIE INST WASHINGTON DEPT PLANT BIOL 290 PANAMA ST STANFORD, CA 94305 USA].

A novel repetitive DNA sequence, R10hvcop. has been identified in the barley (Hordeum vulgare L.) genome. This 830 base pair (bp) DNA sequence has a 606-bp open reading frame and is present as approximately 1.96 x 10(5) copies per haploid barley genome. Southern blot analysis revealed that repetitive DNA elements containing R10hvcop and related sequences were dispersed within the barley chromosomes. Sequences similar to R10hvcop were also found in wheat (Triticum aestivum L.), rye (Secale cereale L.), and oat (Avena sativa L.) with copy numbers of 8 x 10(4), 1.39 x 10(5), and 7.9 x 10(4) per haploid genome, respectively. Sequences similar to R10hvcop were also present in the corn (Zen mays L. ssp. mays) genome, but they were not highly repeated. Barley, wheat, rye, oat, and corn showed species-specific restriction fragment length polymorphisms of R10hvcop and related sequences. Computer-based similarity searches revealed that R10hvcop is closely related to reverse transcriptase genes in retrotransposons and retrotransposon-like elements of several giant species and of Drosophila. The highly repetitive nature, interspersed distribution, and high degree of similarity to reverse transcriptase genes suggests that R10hvcop contains the sequence of a diverged reverse transcriptase gene. [References: 39].

1732 Livingston, DP. (1996) THE SECOND PHASE OF COLD HARDENING - FREEZING TOLERANCE AND FRUCTAN ISOMER CHANGES IN WINTER CEREAL CROWNS. *Crop Science. 36(6):1568-1573.* English. [USDA ARS SAA BOX 7629 840 METHOD RD UNIT 3 RALEIGH, NC 27695 USA].

Cold-hardening plants at above freezing temperatures significantly contributes to their overall winter hardiness. However, little research has been conducted on hardening at temperatures below freezing, before freezing injury results. To determine the effect of hardening at below freezing temperatures, barley (Hardeum vulgare L.) and oat (Avena sativa L.) were grown and hardened under controlled conditions and freeze tested after being held at -3 degrees C from 1 to 7 d. A significant hardening effect was observed after exposure to below freezing temperatures. The biggest change, a reduction of 7 degrees C in the temperature at which 50% of the population survives, occurred after 7 d at -3 degrees C in the winter hardy oat cultivar, Wintok. The additional hardening appeared related to changes in carbohydrate concentration. While wheat (Triticum aestivum L.) and rye (Secale cereale L.) wore not freeze tested, their changes in carbohydrates were even greater than oat and barley. In oat, the concentrations of all 15 fructan isomers of degree of polymerization 3 to 5 were lower after the below freezing treatment while the concentration of fructose and sucrose were higher. Some carbohydrate concentrations were highly correlated with freezing survival under these conditions, but the exact mechanisms behind this relationship are not understood. Controlled freeze tests which consistently quantitate the effect of individual mechanisms will allow plant breeders and geneticists to more effectively screen germplasm for winter hardiness genes. [References: 25].

1733 Lopatina, L.M.; Klochkov, S.A. (1995) **[Evaluation of genetic determination of spring wheat cultivars' homeostasis]. Otsenka geneticheskoj determinatsii gomeostaza sortov yarovoj pshenitsy.** *Doklady RASKhN (Russian Federation) (no.1) p. 9-12.* 6 ref. Russian. (AGRIS 97-002923).

The genotype's adaptive properties have been found to depend on the role of diverse genes in the determination of various plant properties under differing environmental limits. The genetic formula of a developing system has to be evaluated in the morphogenesis dynamics. For this purpose, the elementary unit, describing the system's organization is suitable. It is a modulus, consisting of three interrelated properties: a resulting and two componental ones. Such a division allows to study the genetic control of the morphogenetic effect within the limits of an intact system. The mechanisms and the qualitative forecasting of the multivariant realization of genetic systems, controlling the formation of yielding capacity properties in spring wheat cultivars and hybrids, have been shown.

1734 Loughman, R. (Department of Agriculture Western Australia, South Perth, W.A. (Australia)); Wilson, R.E.; Thomas, G.J. (1996) **Components of resistance to Mycosphaerella graminicola and Phaeosphaeria nodorum in spring wheats.** *Euphytica (Netherlands) v. 89(3) p. 377-385.* 21 ref. English. (AGRIS 97-018339).

1735 Lutz, J.; Katzhammer, M.; Stephan, U.; Felsenstein, F.G.; Oppitz, K.; Zeller, F.J. (Technische Univ. Muenchen, Freising (Germany). Inst. fuer Pflanzenbau und Pflanzenzuechtung) (1995) **Identification of powdery-mildew-resistance genes in common wheat (Triticum aestivum L. em. Thell.). 5. Old German cultivars and cultivars released in the former GDR.** *Plant Breeding (Germany) v. 114(1) p. 29-33.* 5 tables; 17 ref. English. (AGRIS 97-018320).

A total of 59 old wheat cultivars grown in Germany prior to 1960 were tested f or mildew response using a collection of 12 differential isolates of Erysiphe graminis DC f. sp. tritici Marchal (Blumeria graminis (DC) Speer t. sp. tritici). Nineteen cultivars did not possess any major resistance gene and 25 were characterized by susceptible or intermediate responses. Fifteen cultivars revealed isolate-specific response patterns that could not be attributed to known major resistance genes or gene combinations. Many of the old German cultivars inherited a mildewresistance gene from the Canadian cultivar 'Garnet', which is tentatively designated Ml-Ga. Cultivars 'Bretonischer Bartweizen' (designated Ml-Br) and 'Adlungs Alemannen' (designated Ml-Ad) appeared to carry unknown resistance genes. Among 18 winter wheat cultivars released in the former GDR, eight showed susceptibility to all isolates used. Cv. 'Borenos' carries resistance gene Pm3c. Five cultivars possess gene Pm4b, two cultivars gene pm5 and one cultivar a combination of genes Pm2 and Pm4b. Cultivar 'Zentos' was resistant to almost all isolates used. Its resistance might be conditioned by different unknown major resistance genes.

1736 Ma, Z.Q.; Zhao, Y.H.; Sorrells, M.E. (Cornell Univ., Ithaca (USA). Dept. of Plant Breeding and Biometry) (1995) **Inheritance and chromosomal locations of male fertility restoring gene transferred from Aegilops umbellulata Zhuk. to Triticum aestivum L.** *Molecular and*

General Genetics (Germany) v. 247(3) p. 351-357. 1 ill., 2 graphs, 5 tables; 33 ref. English. (AGRIS 97-017552).

Restriction fragment length polymorphism (RFLP) markers were used to map male fertility restoring gene that was transferred from chromosome 6U of Aegilops umbellulata Zhuk. to wheat. Segments of chromosome 6U bearing the gene that restore fertility to T. timopheevi Zhuk. male sterile cytoplasm were identified in all four translocation lines by two probes, BCD21 and BCD342. Lines 040-5, 061-1 and 061-4 are T6BL.6BS-6U translocations, while line 2114 is a T6AL.6AS-6U translocation. Line 2114 has a much larger 6U chromosomal segment and lower frequency of transmission of male gametes with the alien segment than the other three lines. The restoring gene carried by the 6U segment in 2114 showed high expressivity and complete penetrance. This restoring gene is designated Rf6. A homoeologous chromosome recombination mechanism is discussed for the alien gene transfer.

1737 Madic, M. (Faculty of Agriculture, Cacak (Yugoslavia)) (1996) **Inheritance of spike traits and grain yield in barley (Hordeum vulgare L.) hybrids. [A short version of master thesis].** Faculty of Agriculture, Belgrade - Zemun (Yugoslavia). *Review of Research Work at the Faculty of Agriculture (Yugoslavia) v. 41(1) p. 53-65.* 3 graphs; 13 tables; 21 ref. English. (AGRIS 97-002554).

Four genetically diverse varieties and lines of six-rowed and two-rowed barley were diallel crossed. In the inheritance of stem height in F1 and F2 generations and grain mass per plant dominant genes have greater effect, with over-dominance prevailing in most of the cross combinations. In the inheritance of the primary spike length as well as the number of spikelets per spike as to the F1, additive and non-additive genes play a significant role with the prevalence of additive ones, the mode of inheritance being partial dominance for greater spike length and greater number of spikelets in spike, respectively. The highest value of general combining ability was found in the variety NS-293 as regards spike length. High values for heritability were obtained for spike length (63.3) and grain mass per plant (70).

1738 Madre, M. (1995) **[Development of the cultivation and breeding of brewing barley in France]. Evolution de la culture et de la selection de l'orge de brasserie en France.** *BIOS BOISSONS (France) v. 26(255) p. 85-89.* Barley Malt Beer. English. (AGRIS 97-017488).

1739 Maier, F.J. (Hohenheim Univ., Stuttgart (Germany). Research Centre Biotechnology and Plant Breeding); Oettler, G. (1996) **Genetic variation of head blight resistance in triticale caused by Fusarium graminearum isolates of different deoxynivalenol production.** *Euphytica (Netherlands) v. 89(3) p. 387-394.* 29 ref. English. (AGRIS 97-018285).

1740 Maier, RM.; Zeltz, P.; Kossel, H.; Bonnard, G.; Gualberto, JM.; Grienenberger, JM. (1996) **RNA EDITING IN PLANT MITOCHONDRIA AND CHLOROPLASTS [Review].** *Plant Molecular Biology. 32(1-2):343-365.* English. [UNIV STRASBOURG 1 CNRS INST BIOL MOL PLANTES 12 RUE GEN ZIMMER F-67084 STRASBOURG FRANCE].

In the mitochondria and chloroplasts of higher plants there is an RNA editing activity responsible for specific C-to-U conversions and for a few U-to-C conversions leading to RNA sequences different from the corresponding DNA sequences. RNA editing is a post- transcriptional process which essentially affects the transcripts of protein coding genes, but has also been found to modify non-coding transcribed regions, structural RNAs and intron sequences. RNA editing is essential for correct gene expression: proteins translated from edited transcripts are different from the ones deduced from the genes sequences and usually present higher similarity to the corresponding non-plant homologues. Initiation and stop codons can also be created by RNA editing. RNA editing has also been shown to be required for the stabilization of the secondary structure of introns and tRNAs. The biochemistry of RNA editing in plant organelles is still largely unknown. In mitochondria, recent experiments indicate that RNA editing may be a deamination process. A plastid transformation technique showed to be a powerful tool for the study of RNA editing. The biochemistry as well as the evolutionary features of RNA editing in both organelles are compared in order to identify common as well as organelle-specific components. [References: 113].

1741 Marcial, L.; Sarrafi, A. (1996) **GENETIC ANALYSIS OF SOME CHLOROPHYLL FLUORESCENCE AND PRODUCTIVITY PARAMETERS IN BARLEY (HORDEUM VULGARE).** *Plant Breeding. 115(5):339-342.* English. [INRA ENSAT INP LAB BIOTECHNOL & AMELIORAT PLANTES 145 AVE MURET F-31076 TOULOUSE FRANCE].

Reciprocal crosses were made between five barley genotypes of diverse origin. Parents and 20 F(1)s were grown in a greenhouse in a randomized block design with three replications. Each replication consisted of one pot containing three plants. Chlorophyll fluorescence activity of the penultimate leaf (below the Bag leaf) of the main stem in each plant was measured at two stages of development (six-leaf stage and anthesis). At anthesis, and after measuring fluorescence parameters, a drought stress was applied. Yield components were measured at complete maturity. Statistical analysis for chlorophyll fluorescence parameters showed high genetic variability for the traits studied at both the six-leaf stage and anthesis, but most fluorescence parameters had decreased by anthesis. General and specific combining abilities of a diallel analysis were significant for most of the characters studied. General combining ability (GCA) values were usually more important than those of specific combining ability (SCA), showing the importance of additive genetic control for the fluorescence traits. Reciprocal effects were not significant for the fluorescence traits studied. A high genetic variability was also observed for yield components. Additive gene effects for plant weight, spike number, spike weight, number of grains per plant and 1000-grain weight were demonstrated. Potential photosynthetic activity (Rfd) at anthesis was positively correlated with plant weight, spike number per plant and 1000-grain weight. [References: 19].

1742 Mastebroek, H.D.; Balkema Boomstra, A.G.; Gaj, M. (Centre for Plant Breeding and Reproduction Research, Wageningen (Netherlands)) (1995) **Genetic analysis of powdery-mildew (Erysiphe graminis f.sp. hordei) resistance derived from wild barley (Hordeum vulgare ssp. spontaneum).** *Plant Breeding (Germany) v. 114(2) p. 121-125.* 5 tables; 18 ref. English. (AGRIS 97-017887).

The inheritance of resistance to powdery mildew was investigated in 20 accessions of Hordeum spontaneum and in 20 F4 lines derived from closses between the variety 'Aramir' and 13 accessions of H. spontaneum. Two resistance genes were detected in 17 accessions, and three resistance genes in one accession. In two accessions, only one resistance gene was present. The 20 breeding lines showed a large variation in infection type and infection level. The genetic relationship between the resistance genes detected was investigated in the seven most resistant F4 lines. These F4 lines were divided into three groups which carried different resistance genes. In two lines, the detected resistance gene was shown to be race-specific.

1743 Matus, A.; Slinkard, AE.; Vankessel, C. (1997) **GENOTYPE X ENVIRONMENT INTERACTION FOR CARBON ISOTOPE DISCRIMINATION IN SPRING WHEAT.** *Crop Science. 37(1):97-102.* English. [UNIV SASKATCHEWAN DEPT SOIL SCI SASKATOON SK S7N 0W0 CANADA].

Carbon isotope discrimination (CID) has been proposed as a parameter to indirectly select for improved transpiration efficiency (W) and grain yield in spring wheat (Triticum aestivum L.). Little information exists on the genotype x environment (G x E) interaction for CID in spring wheat. Therefore, to determine the magnitude of the G x E interaction for CID eight spring wheat genotypes were grown at five locations in both 1992 and 1993 in Saskatchewan, Canada. Tn addition, we measured genetic variability for CID and the magnitude of the phenotypic correlation between grain yield and CID. Samples were collected for CID determination from leaves at flowering, mature leaves, and mature kernels. The genotype x location (G x L) interaction for CID traits was non-significant. The significant genotype x year (G x Y) interaction for CID of mature leaves was a crossover type interaction, due to the genotype 'Lakhish'. The crossover genotype x location x year (G x L x Y) interaction for grain yield and the significant G x L x Y interaction for CID of leaves at flowering was at least partially due to the erratic response of the genotypes 'Genesis', 'Oslo', 'AC Miuto', and Lakhish. Genotypic differences for CID of leaves at flowering and CID of mature leaves were not significant. However, wheat genotypes differed in CID of kernels. The phenotypic correlations between grain yield and the three CID traits were not significant. These results suggest that among our selected sample of eight genotypes CID of leaves at flowering, CID of mature leaves, and CID of kernels could not be used to indirectly select for grain yield. [References: 25].

1744 Mayer, M.; Gland, A.; Ceccarelli, S.; Geiger, H.H. (Hohenheim Univ., Stuttgart (Germany). Inst. fuer Pflanzenzuechtung Saatgutforschung und Populationsgenetik) (1995) **Comparison of doubled haploid lines and F2 bulks for the improvement of barley in the dry areas of North Syria.** *Plant Breeding (Germany) v. 114(1) p. 45-49.* 4 tables; 23 ref. English. (AGRIS 97-017885).

Drought stress is the main factor limiting barley yields in West Asia and North Africa. This study compares the utility of doubled haploid lines (DHLs) and conventional F2 plant-derived bulks (F2Bs) in improving barley in stress environments. Double crosses were made, DHLs were developed by anther culture from double-cross F1 plants, and F2Bs were produced by bulking the offspring of F2 plants. Field tests were conducted in three drought-stressed environments. No major differences were observed in the mean performance of DHLs and F2Bs. For most traits, both the genotypic and the genotype x location interaction variances were higher in the DHL group, whereas heritabilities were similar. Higher gains from selection were predicted for the DHL group. Regression analysis of yield stability indicated a lower predictability of the DHL performance. The haploid technique can improve breeding populations from which varieties with stable yields can be developed. The costs involved are determined by the DHL production rate, which needs to be improved in many developing countries.

1745 Mcelroy, D.; Louwerse, JD.; Mcelroy, SM.; Lemaux, PG. (1997) **DEVELOPMENT OF A SIMPLE TRANSIENT ASSAY FOR AC/DS ACTIVITY IN CELLS OF INTACT BARLEY TISSUE.** *Plant Journal. 11(1):157-165.* English. [DEKALB GENET CORP 62 MARITIME DR MYSTIC, CT 06359 USA].

The development of a barley (Hordeum vulgare L.) transformation system made it possible to consider the use of maize Activator/Dissociation (Ac/Ds) transposable elements for gene tagging in transgenic barley plants. However, barley transformation is time-consuming, and therefore a simple transient assay for Ac/Ds activity in intact barley tissues was developed to test the components of a proposed gene tagging system, prior to their stable introduction into plants. in this assay, barley scutellar tissue is co-transformed with constructs containing the maize Ac transposase gene and an Escherichia coli uidA reporter gene (Gus), the expression of which is interrupted by a maize Ds element. In transformed barley scutellar cells, Ac transposase-mediated excision of the Ds element generates a functional Gus gene, leading to histochemically detectable GUS activity. Characterization of the excision products showed that they had a pattern of nucleotide deletions and/or transversions similar to that found in maize and other heterologous plant systems. In addition, although contrary to the situation observed in heterologous dicot systems, efficient Ds excision in barley a heterologous monocot system, appears to be inversely associated with Ac copy number, a finding similar to the Ac dosage effects observed in maize. The transient assay was used to demonstrate functional transposase activity in barley callus lines stably transformed with an Ac transposase gene. [References: 33].

1746 McIntosh, R.A. (Sydney Univ., Camden, N.S.W. (Australia). Plant Breeding Inst. Cobbitty); Arts, C.J. (1996) **Genetic linkage of the Yr1 and Pm4 genes for stripe rust and powdery mildew resistances in wheat.** *Euphytica (Netherlands) v. 89(3) p. 401-403.* 5 ref. English. (AGRIS 97-018341).

1747 McIntosh, R.A. (Sydney Univ., Camden, N.S.W. (Australia). Plant Breeding Inst. Cobbitty); Silk, J.; The, T.T. (1996) **Cytogenetic studies in wheat. 16. Monosomic analysis and linkage relationships of gene Yr15 for resistance to stripe rust.** *Euphytica (Netherlands) v. 89(3) p. 395-399.* 8 ref. English. (AGRIS 97-018340).

1748 Miller, T.E. (John Innes Centre, Norwich (United Kingdom)); Reader, S.M.; Purdie, K.A.; King, I.P. (1996) **Fluorescent in situ hybridization: a useful aid to the introduction of alien genetic variation into wheat.** *Euphytica (Netherlands) v. 89(1) p. 113-119.* 30 ref. English. (AGRIS 97-018355).

1749 Minkov, D. (Kompleksna Opitna Stantsiya, Yambol (Bulgaria)) (1995) **[Investigation of some winter soft wheat lines]. Prouchvane na nyakoi linii zimna meka pshenitsa.** Selskostopanska Akademiya, Sofia (Bulgaria). *Rasteniev"dni Nauki (Bulgaria). Plant Science v. 32(5) p. 78-80.* 4 tables; 6 ref. Bulgarian. (AGRIS 97-018318).

1750 Miranda, R. (1995) **[Wheat from cooperative producers: ACA cereal. nursery]. Trigos de los productores cooperativos: Criadero de cereales ACA.** *[Wheat breeding in Argentina: Thirty years of cooperative investigation with CIMMYT; Balcarce, Argentina; 7-8 Oct 1992]. El mejoramiento de trigo en Argentina: Treinta anos de investigacion cooperativa con el CIMMYT; Balcarce, Argentina; 7-8 Oct 1992. Kohli, M.M.; Nisi, J.E.; Rajaram, S. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 9-17.* CIMMYT. 1 table; 2 graphs. Spanish. (AGRIS 97-018302).

The wheat breeding program of ACA was started in 1976 with the germplasm donated by Ing. Hans Aage Olsen. The breeding station is located 35 km-from Bahia Blanca in the south of Buenos Aires province. The wheat region of 1. 5 million ha. is semi-arid with harsh winters and 312 mm of rainfall during the crop cycle. The program objectives are to achieve high industrial quality, disease resistance (rusts and septoria leaf blotch) and tolerance to abiotic stresses (drought, frost and haying off). Both traditional (local) and exotic (CIMMYT, European and Oregon State) germplasm is utilized. Based on the climatic conditions, ACA develops two types of germplasm: Facultative (not winter) for early seeding and spring for late seeding conditions. ACA breeding program has released five commercial varieties, of which only Cooperacion Bahia does not have CIMMYT germplasm. Three of them, Cooperacion Cabildo, Cooperacion Nanihue and Cooperacion Liquen are a cross of CIMMYT and a local germplasm while the fourth Cooperacion Calquin is a selection of Bobwhite; a CIMMYT cross. El Programa de Mejoramiento de trigo del Criadero ACA inicio sus actividades en el ano 1976 con germoplasma aportado por el Ing. Agr. Hans Aage Olsen. Sus instalaciones estan ubicadas a 35 km. de Bahia Blanca en el sur de la Provincia de Buenos Aires. Esta region triguera se caracteriza por ser una zona semi-arida que cubre una superficie de 1.5 millones de has. con inviernos rigurosos y un regimen de precipitacion durante el ciclo de cultivo de 312 mm. Los objetivos del programa de mejoramiento son: elevada calidad industrial, resistencia a enfermedades (royas, septoriosis de la hoja) y tolerancia a factores abioticos (sequias, heladas, arrebatamientos). El germoplasma utilizado es tradicional, origen CIMMYT, materiales facultativos europeos y materiales provenientes de la Universidad de Oregon, Estados Unidos. El Criadero, teniendo en cuenta las condiciones ambientales desarrolla dos tipos de trigos: facultativos (no invernales) para siembras tempranas y primaverales para siembras tardias. En cuanto a logros, el Criadero ACA ha lanzado al mercado cinco cultivares de los cuales solamente Cooperacion Bahia no ha participado germoplasma del CIMMYT; en los tres restantes, Cooperacion Cabildo, Cooperacion Nanihue y Cooperacion Liquen han participado trigos del CIMMYT y materiales locales y Cooperacion Calquin es una seleccion de la cruza Bobwhite.

1751 Mitchell, R.A.C. (Biochemistry and Physiology Department, IACR Rothamsted, Harpenden, Herts AL5 2JQ (United Kingdom)) (1996) **Predicting the effects of environmental change on winter wheat yield in genotypes with different flowering dates.** *Aspects of Applied Biology (United Kingdom) (no.45) p. 133-138.* 10 ref. Implications of 'Global environmental change' for crops in Europe, 1-3 April 1996, Churchill College, Cambridge, UK. English. (AGRIS 97-002915).

1752 Mitova, T. (Institut po Pochvoznanie i Agroekologiya "N. Pushkarov", Sofia (Bulgaria)) (1996) **[The role cultivar and species rotation for wheat yield changes]. Rolyata na sortovoto i vidovoto reduvane za izmenenie na dobiva ot pshenitsa.** Selskostopanska Akademiya, Sofia (Bulgaria). *Pochvoznanie, Agrokhimiya i Ekologiya (Bulgaria). Soil Science, Agrochemistry and Ecology v. 31(2) p. 26-30.* 4 ill., 2 tables; 10 ref. Bulgarian. (AGRIS 97-018317).

1753 Mohammad, F.; Windes, JM.; Souza, E. (1997) **TOTAL NON-STRUCTURAL CARBOHYDRATES IN WINTER WHEAT POPULATIONS SEGREGATING FOR SNOW MOLD TOLERANCE.** *Crop Science. 37(1):108-112.* English. [UNIV IDAHO DEPT PLANT SOIL & ENTOMOL SCI 1693 S 2700 W ABERDEEN, ID 83210 USA].

Evaluation of wheat (Triticum aestivum L.) for tolerance to snow mold (caused by Typhula idahoensis Remsberg) is difficult because of the irregular occurrence and distribution of the disease in the field, Some wheat genotypes tolerant to snow mold are known to accumulate high levels of total non-structural carbohydrates (TNC), a trait that could be utilized for rapid screening of snow mold tolerance, The objective was to determine the heritability of TNC and the correlation of TNC with survival under disease pressure in two hard red winter wheat populations segregating for snow mold tolerance. Whole-plant TNC content (excluding

roots), grain yield, and survival were measured in experiments planted near Tetonia, ID, an area prone to snow mold in wheat, Two experiments consisted of BC1F6 and BC1F7 lines derived from two crosses, (Manning'*2/'Survivor' and (Blizzard'*2/'Sumner'. The third (mixed) experiment consisted of selected lines from each cross. In 1992-1993, conditions were excellent for the occurrence of snow mold infection, but no obvious snow mold damage occurred in 1993-1994, Heritability estimates of TNC measured before snowfall were 64.7% for the Manning population, 82.6% for the Blizzard population, and 87.0% for the Mixed population. Heritability estimates for winter survival were nonsignificant because of differences in snow mold infection between the 2 yr, Correlation of fall TNC levels with spring 1993 survival was r = 0.55 (P < 0.01) in the Manning backcross population, nonsignificant for the Blizzard population, and r = 0.48 (P < 0.01) in the Mixed population, suggesting that accumulation of TNC is moderately correlated to snow mold tolerance. Levels of TNC in the fall had no significant line x year interaction. Selection based upon TNC would advance a population toward higher TNC levels and may indirectly increase tolerance to snow mold in some populations. [References: 19].

1754 Moieni, A.; Sarrafi, A. (INP ENSAT, Toulous (France). Lab. de Biotechnologie et Amelioraion des Plantes) (1995) **Genetic analysis for haploid-regeneration responses of hexaploid-wheat anther cultures.** *Plant Breeding (Germany) v. 114(3) p. 247-249.* 2 tables; 28 ref. English. (AGRIS 97-018327).

Genetic variability in response to anther culture was investigated in 49 winter hexaploid wheats, comprising 33 pure lines (F10) derived from a composite cross programme and their 16 parental genotypes. All genotypes were grown in a randomized block design with three replications in a controlled greenhouse. The number of embryoids and total plant regeneration per 100 anthers, as well as the numbers of green and albino plants regenerated per 100 embryoids, were measured. Significant genetic varability was observed among the 49 genotypes for all the traits studied. All traits showed high heritability. Among the genotypes compared, DC(2)30N and IBPT-40 gave the best results for the production of embryoids and IBPT-78 had the highest value for the production of green plants. The genotype IBPT-34 developed a large number of albino plants, and it should be useful as a parent in studies to determine the genetic control of albino plants in wheat.

1755 Morgan, JM.; Tan, MK. (1996) **CHROMOSOMAL LOCATION OF A WHEAT OSMOREGULATION GENE USING RFLP ANALYSIS.** *Australian Journal of Plant Physiology. 23(6):803-806.* English. [TAMWORTH CTR CROP IMPROVEMENT RMB 944 TAMWORTH NSW 2340 AUSTRALIA].

The chromosomal location of an osmoregulation gene locus (or) was examined by exploring genetic linkage to restriction fragment length polymorphism (RFLP) loci which have been mapped on group 7 chromosomes or located specifically on chromosome 7A. The osmoregulation gene had previously been located on chromosome 7A, but its specific position was unknown. Analysis of linkage with the RFLP loci suggested a probable position on the short arm approximately 13 cM towards the centromere from RFLP locus Xpsr119. The findings, which were based on a relatively small sample, are of a preliminary nature and require confirmation with a larger set of genetic stocks. [References: 15].

1756 Murai, K.; Ogihara, Y.; Tsunewaki, K. (Takarazuka Univ. and Sumitomo Chemical Co. Ltd., Hyogo (Japan). Takarazuka Research Center) (1995) **An EMS-induced wheat mutant restoring fertility against photoperiod-sensitive cytoplasmic male sterility.** *Plant Breeding (Germany) v. 114(3) p. 205-209.* 3 ill., 1 graph, 4 tables; 15 ref. English. (AGRIS 97-018326).

Triticum aestivum cv. 'Norin 26' with Aegilops crassa cytoplasm shows photoperiod-sensitive cytoplasmic male sterility (PCMS). This alloplasmic line is almost completely male-sterile under long-day conditions (over 15h), but highly male-fertile under short-day conditions (below 14.5h). To obtain male-fertile mutants against PCMS, seeds of the alloplasmic line were treated with ethyl methane sulfonate (EMS). The M(3) generation was evaluated for PCMS expression, and one fertility-restoring (FR-mutant) line showing high male fertility under the long-day conditions was selected. Reciprocal F1 hybrids between the FR-mutant and the alloplasmic 'Norin 26' showed male sterility under the long-day conditions, and continuous segregation with respect to the degree of fertility restoration occurred in their F2 generations. These results indicate that multiple recessive mutations with minor effects, induced in the nuclear genome, are involved in the fertility restoration. In fact, no restriction-fragment-length polymorphisms of mitochondrial DNA between the FR-mutant and the alloplasmic 'Norin 26' are found.

1757 Muranyi, I. (Godolloi Agrartudomanyi Egyetem, Kompolt (Hungary). Fleischmann Rudolf Agricultural Research Institut) (1995) **Results of winter and spring barley breeding at the GATE "Fleischmann Rudolf" Agricultural Research Institute.** *Hungarian Agricultural Research (Hungary) v. 4(1) p. 23-29.* English. (AGRIS 97-002548).

1758 Nachit, M.M.; Baum, M.; Impiglia, A.; Ketata, H. (CIMMYT, Centro Internacional de Mejoramiento de Maiz y Trigo, Mexico (Mexico)) (1995) **[Studies on some grain quality traits in durum wheat grown in Mediterranean environments]. Etudes sur certains caracteres de qualite du grain chez le ble dur plante en milieu mediterraneen.** Seminar on Durum Wheat Quality in the Mediterranean Region. Zaragoza (Spain). 17-19 Nov 1993. Durum Wheat Quality in the Mediterranean Region. La Qualite du Ble Dur dans la Region Mediterraneenne. Fonzo, N. di (Istituto Sperimentale per la Cerealicoltura, Foggia (Italy). Sezione Operativa di Foggia); Kaan, F. (INRA, Institut National de la Recherche Agronomique, Mauguio (France). Station de Genetique et d'Amelioration des Plantes. Domaine de Melgueil); Nachit, M. (ICARDA, International Center for Agricultural Research in the Dry Areas, Aleppo (Syria)). *Options Mediterraneennes. Serie A: Seminaires mediterraneens (CIHEAM); no. 22 p. 181-187.* CIHEAM-IAMZ. 8 tables; 18 ref. English. (AGRIS 97-002275).

Le programme conjoint de selection du ble dur (Triticum turgidum L. var. durum) du Centre International d'Amelioration du Mais et du Ble (CIMMYT) et du Centre International de la Recherche Agricole dans les Zones Seches (ICARDA) met en place des essais extensifs multilocaux dans les regions seches mediterraneennes pour tester la qualite du grain. Les essais multilocaux ont montre des interactions genotype-environnement (GE) significatives pour les parametres de la qualite du grain. Les hautes valeurs du test de sedimentation ont ete associees a la presence de gliadine gamma-45, tandis que les faibles valeurs le furent a la presence de gliadine gamma-42. En outre, 68, 9 pour cent des especes autochtones mediterraneennes de ble dur possedaient la gliadine gamma-45, 11, 1 pour cent possedaient la gliadine gamma-42 et 20 pour cent des especes autochtones montraient la presence des deux gliadines. La segregation F2 pour le croisement Jennah Khetifa/Cham 1 a ete differente concernant le ratio de co-dominance espere 1:2:1, montrant une legere dominance de gamma-45. Par contre, le croisement Hedba3/Cham 1 a repondu au ratio de segregation espere 1:2:1. En conditions irriguees, de hautes valeurs pour l'heritabilite au sens large ont ete enregistrees pour le poids du grain, le poids moyen des grains, la teneur en carotene, le test de sedimentation, et l'index de sedimentation; des valeurs moyennes ont ete montrees en ce qui concerne la teneur en proteine, et la vitrosite; et des valeurs tres faibles ont ete trouvees pour la stabilite et la tolerance au melange mesurees au farinographe. D'autre part, en conditions arides, les valeurs de l'heritabilite furent hautes pour la plupart des caracteres de qualite du grain. En conditions aussi bien irriguees que seches, la teneur en carotene, le test SDS, l'index SDS, le poids du grain, et le poids moyen des grains ont ete influences plus par les genotypes que par les milieux. Par contre, la teneur en proteine, la vitrosite, la stabilite au farinographe, et la tolerance au melange ont ete plus influencees par le milieu ou les interactions genotype-milieu.

1759 Nanda, G.S.; Chand, K.; Sohu, V.S.; Sharma, I. (Punjab Agricultural University, Ludhiana (India). Department of Plant Breeding) (1995) **Genetic analysis of karnal bunt resistance in wheat.** *Crop Improvement (India) v. 22(2) p. 189-193.* 3 tables; 4 ref. English. (AGRIS 97-002918).

1760 Nettevich, Eh.D.; Smolin, V.P.; Makarov, V.P. (1995) **[Specific features of yield formation of different spring barley variety types in conditions of Non-Chernozem Center of Russia]. Osobennosti formirovaniya urozhajnosti razlichnymi sortotipami yarovogo yachmenya v usloviyakh Nechernozemnogo tsentra Rossii.** *Doklady RASKhN (Russian Federation) (no.1) p. 3-5.* 5 ref. Russian. (AGRIS 97-002552).

Specific features of yield formation by 4 spring barley variety types-Moskovskij 121, Moskovskij 2, Zazerskij 85 and Risk were studied in conditions of Non-Chernozem Center during 10 years. Reasons of yielding capasity variability in different years and different vegetation conditions and responce to them of variety types also were considered.

1761 Nisi, J.E. (1995) [Wheat breeding at INTA, Argentina]. **Mejoramiento de trigo del INTA, Argentina.** *[Wheat breeding in Argentina: Thirty years of cooperative investigation with CIMMYT; Balcarce, Argentina; 7-8 Oct 1992]. El mejoramiento de trigo en Argentina: Treinta anos de investigacion cooperativa con el CIMMYT; Balcarce, Argentina; 7-8 Oct 1992. Kohli, M.M.; Nisi, J.E.; Rajaram, S. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 1-7.* CIMMYT. 2 tables; 1 fig. Spanish. (AGRIS 97-018301).

Wheat is one of the most important cereals in Argentina considering that during 1987-91 period it has been seeded on 5.1 million hectares producing over 10 million tons and with an average yield around 2 t/ha. Approximately 4.6 million tons is utilized for local consumption and the rest is exported primarily to Brazil (70 percent). The Argentine Wheat Region situated between latitudes of 31. and 40. south and longitude of 58. and 65 degrees west is characterized by its wide diversity in climates. The wheat crop is grown under rainfed conditions with several biotic and abiotic stresses. The major ones are fungal diseases, water and nutritional stress and late frosts. Achievement of the program has been the release of 32 varieties of bread wheat of which several cover a large area. The contribution of the breeding program to the yield gains has been at the rate of 2 percent per year. The cooperation between CIMMYT and INTA during the last 30 years has been very positive contributing to the improvement of productivity and yield stability. It has also been very important in training young scientists to help INTA Wheat Program achieve National and international relevance El trigo es uno de los cereales mas importantes de la Argentina, siendo la produccion del quinquenio 1987/91 de alrededor de 10millones de toneladas, con una superficie de 5, 1 millones de hectareas y un rendimiento aproximado a los 2000 kg/ha. Se destina para consumo interno 4, 6 millones de toneladas y el resto se exporta principalmente a Brasil en un 70 porciento. La region triguera Argentina se caracteriza por su amplia diversidad de ambientes, estando ubicada entre los 31. y 40. de latitud sur y los 58. y 65. de longitud oeste. El cultivo de trigo se realiza casi en su totalidad bajo condiciones de secano, siendo las principales limitantes de la produccion los factores bioticos y abioticos. Entre los primeros se destacan las enfermedades de origen fungico y en cuanto a los abioticos, los estres hidrico y nutricional y heladas tardias. Los logros del Programa fueron la obtencion de 32 cultivares de trigo pan, algunos de los cuales presentan amplia difusion. El aporte del mejoramiento en rendimiento se determino a traves de un ensayo de cultivares, siendo la tasa de incremento anual del 2 porciento. La cooperacion entre CIMMYT e INTA durante estos 30 anos fue altamente positiva contribuyendo a mejorar la productividad y estabilidad de los rendimientos y en la capacitacion de sus tecnicos haciendo que el Programa Trigo del INTA adquiera relevancia nacional e internacional.

1762 Ohm, HW.; Ratcliffe, RH.; Patterson, FL.; Cambron, SE. (1997) **RESISTANCE TO HESSIAN FLY CONDITIONED BY GENES H19 AND PROPOSED GENE H27 OF DURUM WHEAT LINE PI422297.** *Crop Science. 37(1):113-115.* English. [PURDUE UNIV DEPT AGRON W LAFAYETTE, IN 47907 USA].

The durum wheat (Triticum turgidum Desf.) line PI422297 has been reported to carry two genes that condition resistance to Hessian fly, Mayetiola destructor (Say) biotype L, gene H19 and an unnamed gene that is closely associated with gene H16. It is useful to identify the effects of genes that confer host resistance In parental source lines for wheat improvement. Our objectives were to determine the effectiveness of H19 to biotype L at several temperatures, and to determine the effectiveness of the second gene of PI422297 that is closely associated with gene Hid. In the present study, gene H19 was transferred from PI422297 to susceptible durum wheat line D6647 to separate H19 from other genes and to compare it with the other resistance gene in PI422297. Durum wheat lines homozygous for H19 were developed by identifying segregating backcross F-2 families and pedigree selection. In the Fs generation, lines homozygous for H19 were identified from testcrosses involving durum wheat line IN80164 (H16H16). Nearly all seedlings of the homozygous H19 lines were resistant at 19 degrees C, only 42 to 66% were resistant at 23 degrees C, and none were resistant at 26 degrees C. All, 89%, and 15% of PI422297 seedlings were resistant at 19, 23, and 26 degrees C, respectively. All seedlings of line IN80164 (H16H16) were resistant at 19 and 23 degrees C and 84 % were resistant at 26 degrees C. Thus, the second gene in PI422297 is not H16, and it is tentatively designated as H27. [References: 20].

1763 Okanami, M.; Meshi, T.; Tamai, H.; Iwabuchi, M. (Department of Botany, Faculty of Science, Kyoto University, Sakyo ku, Kyoto 606 01 (Japan)) (1996) **HALF-1, a bZIP-type protein, interacting with the wheat transcription factor HBP-1a contains a novel transcriptional activation domain.** *Genes to Cells (United Kingdom) v. 1(1) p. 87-99.* 43 ref. English. (AGRIS 97-002962).

1764 Ortelli, S.; Winzeler, H.; Winzeler, M.; Fried, PM.; Nosberger, J. (1996) **LEAF RUST RESISTANCE GENE LR9 AND WINTER WHEAT YIELD REDUCTION .1. YIELD AND YIELD COMPONENTS.** *Crop Science. 36(6):1590-1595.* English. [SWISS FED RES STN AGROECOL & AGR FAL RECKENHOLZ DEPT PLANT BREEDING RECKENHOLZSTR 191 CH-8046 ZURICH SWITZERLAND].

Leaf rust (Puccinia recondita Rob. ex Desm. f. sp. tritici) resistant near isogenic lines (Nn) of wheat (Triticum aestivum L.) have generally lower yields than the susceptible recurrent parent under disease free conditions. Analysis of growth and yield should increase our understanding of the reduced yielding ability of NIL. In a 3-yr held study, the yield components of the leaf rust susceptible cultivar Arina were compared with sir resistant hn, carrying the resistance gene Lr9 introduced from Aegilops umbellulata. The NIL were derived from two independently developed backcross populations with Arina as the recurrent parent. The hit were phenotypically very similar to Arina. At anthesis and at medium milk stage, the total aboveground dry matter was similar for the NIL and Arina. Differences in the dry matter accumulation appeared only after the medium milk stage. At maturity, the Nn had a 12% lower grain yield than Arina (5.88 t ha(-1)) with a range from 5 to 14%. The lower grain yield resulted from a 3 to 11% reduction in grain number per square meter and a 2 to 7% reduction in mean grain weight. The smaller grain number per square meter was the result of a 6% smaller tilter number per plant and a 2% smaller grain number per ear. Artificially reducing grain number per ear suggested that both a reduced supply of assimilates and a diminished capacity to incorporate assimilates in the grain caused the reduced grain yield of the ML. Deleterious effects of alien genes linked with the Lr9 gene from Aegilops umbellulata cannot be ruled out. However, the small differences within and between the NIL of the two Lr9 populations for the parameters tested suggest a direct relation between the yield depression and the leaf rust resistance conferred by the Lr9 gene. [References: 35].

1765 Ortelli, S.; Winzeler, M.; Winzeler, H.; Nosberger, J. (1996) **LEAF RUST RESISTANCE GENE LR9 AND WINTER WHEAT YIELD REDUCTION .2. LEAF GAS EXCHANGE AND ROOT ACTIVITY.** *Crop Science. 36(6):1595-1601.* English. [SWISS FED RES STN AGROECOL & AGR FAL RECKENHOLZ DEPT PLANT BREEDING RECKENHOLZSTR 191 CH-8046 ZURICH SWITZERLAND].

The introduction of resistance genes from wild relatives into wheat (Triticum aestivum L.) may have detrimental effects on yield. In earlier experiments, we observed a 12% yield reduction in leaf rust (Puccinia recondita Rob. ex Desm. f. sp. tritici) resistant near isogenic lines (NIL) carrying the resistance gene Lr9 compared with the susceptible recurrent parent Arina. The aim of this study was to End physiological mechanisms for this yield reduction. Two NIL and Arina were investigated in held experiments. In a first experiment, CO2 exchange rate (CER), transpiration, stomatal conductance (g(s)), and leaf intercellular CO2 concentration (C-i) of the flag leaf were determined after ear emergence. In a second experiment, root activity was estimated from the beginning of stem elongation to early dough stage by the application of Rb and Sr at two soil depths. The Nn and Arina had a similar CER in the morning, but in the afternoon, CER was 7 to 20% lower for the ML compared with Arina. Differences between the NIL and Arina were larger under dry soil conditions. The CER was closely correlated with g(s) and C-i indicating that CO2 uptake was restricted by g(s). Roots of the NIL took up 15 to 20% less Sr at the 25- to 40-cm soil depth and 12% less Rb at 10-cm soil depth compared with Arina. The reduced Sr and Rb uptake indicated less root activity for the NIL. It is concluded that lower root activity in the resistant NIL led to water stress and reduced CO2 assimilation. Such stress periods may reduce grain number and grain size of the rust resistant NIL. [References: 32].

1766 Penner, GA.; Tekauz, A.; Reimer, E.; Scoles, GJ.; Rossnagel, BG.; Eckstein, PE.; Legge, WG.; Burnett, PA.; Ferguson, T.; Helm, JF. (1996) **THE GENETIC BASIS OF SCALD RESISTANCE IN WESTERN CANADIAN BARLEY CULTIVARS.** *Euphytica. 92(3):367-374.* English.

[AGR & AGRI FOOD CANADA RES STN 195 DAFOE RD WINNIPEG MB R3T 2M9 CANADA].

The genetic basis of resistance to scald (Rhynchosporium secalis) within barley breeding populations is poorly understood. The design of effective genetically based resistance strategies is predicated on knowledge of the identity of the resistance genes carried by potential parents. The resistance exhibited by a broad selection of western Canadian barley lines was investigated by evaluating their reactions to five R. secalis isolates. Results were compared to the resistance exhibited by previously characterized lines. This comparison, combined with pedigree analysis indicated that there are two different resistance genes present in western Canadian cultivars. These genes were shown to be independent through analysis of a segregating population derived from a cross between Falcon and CDC Silky. This evidence, along with observed linkage of the gene in CDC Silky with an allele specific amplicon developed for a Rhynchosporium secalis resistance locus on chromosome 3, provides evidence that the gene in Falcon is the Rh2 gene derived from Atlas, and the gene(s) in CDC Silky is located within the Rh/Rh3/Rh4 cluster and is similar to the Rh gene in Hudson. [References: 19].

1767 Perez, B.A. (1995) **[Reaction to Puccinia recondita f. sp. tritici and P. graminis f. sp. tritici of lines and cultivars of wheat. Another material of interest in Argentina in 1991/92]. Reaccion a Puccinia recondita f. sp. tritici y Puccinia graminis f. sp. tritici de lineas y cultivares de trigo otro material de interes en Argentina en 1991/92.** *[Wheat breeding in Argentina: Thirty years of cooperative investigation with CIMMYT; Balcarce, Argentina; 7-8 Oct 1992]. El mejoramiento de trigo en Argentina: Treinta anos de investigacion cooperativa con el CIMMYT; Balcarce, Argentina; 7-8 Oct 1992. Kohli, M.M.; Nisi, J.; Rajaram, S. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 123-136.* CIMMYT. 6 tables; 3 graphs. Spanish. (AGRIS 97-018313).

Various genes of resistance to the leaf rust, Puccinia recondita f.sp tritici (Prt) and stem rust, Puccinia graminis f. sp tritici (Pgt) have been derived from the related species of hexaploid wheat Triticum aestivum. First embryos derived from the intergeneric crosses Triticum aestivum/Aegilops squarrosa and interspecific crosses Triticum aestivum / Triticum timopheevii and the reciprocal cross Triticum timopheevii / Triticum aestivum were obtained through hybridization at Institute of Genetics, Castelar in 1992. The verification of these crosses was done in 1993. The virulence population of the Prt and Pgt in the wheat area of Argentina during 1991-92 was characterized by avirulence on TcLrl 9, TcLr35, Puck Charrua, Buck Poncho, Cocker 762, Coop. Calquin, Coop, Nanihue, Don Ernesto INTA, Klein Criollo, PPOINTA Federal and seven unregistered lines. Varios genes de resistencia a roya de la hoja (Puccinia recondita f. sp. tritici) y roya del tallo (Puccinia graminis f. sp. tritici) han sido derivados de especies afines a trigo y han sido efectivos contra estas enfermedades por un considerable periodo de tiempo. Este estudio utilizo la coleccion de germoplasma del Instituto de Genetica, INTA, Castelar para determinar la utilidad de las especies Aegilops spp, Triticum timopheevii y Triticum monococcum como donantes de resistencia para las royas en Argentina. Las pruebas de invernaculo mostraron que las entradas de Triticum monococcum y Triticum timopheevii podian ser utiles silo como donantes de genes de resistencia a roya de la hoja. Por otro lado, fue observada gran variabilidad de resistencia para las dos royas en las especies de Aegilops. De las lineas isogenicas probadas a nivel de campo, la resistencia de TcLr 19 y TcLr2 1 fue considerada efectiva en Argentina. En roya del tallo, la resistencia de lineas isogenicas portadoras de Sr24, Sr25, Sr26 y Sr27 fue altamente efectiva. Dentro del ensayo Cono Sur de royas, la resistencia de Coker 762 para las dos royas puede ser muy util para los programas de mejoramiento. Entre las variedades comerciales la resistencia de Buck Charrua, Buck Poncho, Cooperacion Calquin, Cooperacion Nanihue, Don Ernesto INTA, Klein Criollo y PROINTA Federal es destacable.

1768 Persson, G. (Svaloef Weibull AB, Svaloev (Sweden)); Staahl, Aa.; Johansson, L.Aa.; Johansson, H. (1996) **[Barley as starch raw material for the food industry]. Korn som staerkelseraavara foer livsmedelsindustrin.** *Sveriges Utsaedesfoerenings Tidskrift (Sweden) v. 106(3) p. 79-86.* 12 ref. Swedish. (AGRIS 97-017901).

1769 Plaschke, J. (Institute of Plant Genetics and Crop Plant Research, Gatersleben (Germany)); Boerner, A.; Wendehake, K.; Ganal, M.W.; Roeder, M.S. (1996) **The use of wheat aneuploids for the chromosomal assignment of microsatellite loci.** *Euphytica (Netherlands) v. 89(1) p. 33-40.* 23 ref. English. (AGRIS 97-018346).

1770 Polidoro, O.; Calzolari, A.; Conta, H. (1995) **[Wheat breeding in the north Buenos Aires regional center]. Mejoramiento de trigo en centro-norte de la provincia de Buenos Aires.** *[Wheat breeding in Argentina: Thirty years of cooperative investigation with CIMMYT; Balcarce, Argentina; 7-8 Oct 1992]. El mejoramiento de trigo en Argentina: Treinta anos de investigacion cooperativa con el CIMMYT; Balcarce, Argentina; 7-8 Oct 1992. Kohli, M.M.; Nisi, J.E.; Rajaram, S. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 73-83.* CIMMYT. 3 tables. Spanish. (AGRIS 97-018308).

The north Buenos Aires Regional Center serves approximately to.5 million hectares situated between the latitudes of 33. and 36. south and longitude of 57. and 64. west. Wheat in winter and soybean, maize and to a smaller extent sunflower in summer integrate a sequence of crops in the agriculture and mixed farming systems. During the last 20 years, the wheat area, production and yield have increased by 56.3, 114.4 and 37.4 percent respectively. This represents a gain of 30.5 kg/ha/year in yield. The increased use of double cropping wheat soybean in agriculture and utilization of conservation tillage practices have led to the development of short cycle varieties with quick maturity and high biomass yield El area de influencia del Centro Regional Buenos Aires Norte abarca 10, 5 millones de hectareas y se encuentra ubicada entre los 33. y 36 latitud sur y entre los 57. y 64 longitud oeste. El trigo, junto con la soja, el maiz y en menor medida con el girasol y el sorgo, integra la secuencias de cultivos en los sistemas de produccion agricola y mixtos. La superficie de siembra, la produccion y los rendimientos de trigo se incrementaron en un 56, 3 porciento, 114, 4 porciento y 37, 4 porciento, respectivamente, durante los ultimos 20 anos. Lo que hace una ganancia en rendimiento de 30, 5 kg/ha/ano. El mayor uso de la agricultura, el doble cultivo anual trigo/soja y labranzas conservacionistas, llevo a que el objetivo de mejora sea la obtencion de variedades de ciclo corto, con rapida madurez y alto rendimiento de biomasa. En cuanto al rendimiento, se espera un incremento de alrededor del 15 porciento y una mayor estabilidad, durante los proximos 10 anos. Es necesario contar a corto y mediano plazo con materiales que presenten resistencia frente a patogenos como Fusarium spp., Septoria spp. y Drechslera spp. Enfermedades que se encuentran en amplia expansion. Otro factor muy importante es la calidad comercial e industrial que se ha notado un desmejoramiento, producido en parte por el mejoramiento genetico y en mayor medida por los factores climaticos, de manejo y sanitarios. Se libera la primer variedad del criadero en el ano 1927, llegando a un total de 10 cultivares hasta el presente ano. En la actualidad, el 85 porciento del germoplasma utilizado en cruzas, es foraneo y el resto es tradicional argentino. El 44, 3 porciento de las cruzas realizadas en Pergamino llegaron a lineas avanzadas y solo el 3, 6 porciento de los cruzamientos del CIMMYT, tuvieron el mismo destino. La colaboracion permanente en aporte de material genetico, en capacitacion y asistencia tecnica, fue de gran utilidad para el programa de mejoramiento, pero en especial para el incremento de rendimiento y la resistencia a royas.

1771 Potz, H. (Martin Luther Universitaet Halle Wittenberg, Hohenthurm (Germany). Inst. fuer Pflanzenzuechtung und Pflanzenschutz); Schubert, V.; Houben, A.; Schubert, I.; Weber, W.E. (1996) **Aneuploids as a key for new molecular cloning strategies: development of DNA markers by microdissection using Triticum aestivum-Aegilops markgrafii chromosome addition line B.** *Euphytica (Netherlands) v. 89(1) p. 41-47.* 21 ref. English. (AGRIS 97-018347).

1772 Pretorius, Z.A.; Kloppers, F.J. (Orange Free State Univ., Bloemfontein (South Africa). Dept. of Plant Pathology) (1996) **Seedling and adult plant resistance to leaf rust in the wheat cultivar Tugela.** *South African Journal of Plant and Soil (South Africa) v. 13(4) p. 115-119.* 4 tables; 1 fig., 16 ref. English. (AGRIS 97-018380).

1773 Radhu, A.S.; Solanki, Y.P.S.; Sethi, S.K.; Singh, I. (CCS Haryana Agricultural University, Hissar (India)) (1995) **Genetic diversity in some Indian and exotic wheat varieties.** *Crop Improvement (India) v. 22(2) p. 214-217.* 1 tables; 6 ref. English. (AGRIS 97-002919).

1774 Ramos, V.; Silvero S, O. (1995) **[Wheat breeding in the province of Entre Rios]. Mejoramiento de trigo en la provincia de Entre Rios.** *[Wheat breeding in Argentina: Thirty years of cooperative investigation with CIMMYT; Balcarce, Argentina; 7-8 Oct 1992]. El mejoramiento de trigo en Argentina:*

Treinta anos de investigacion cooperativa con el CIMMYT; Balcarce, Argentina; 7-8 Oct 1992. Kohli, M.M.; Nisi, J.E.; Rajaram, S. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 97-102. CIMMYT. 2 tables. Spanish. (AGRIS 97-018310).

The total area of the region under the influence of INTA Parana is 7.7 million hectares of which approximately 14 percent is arable. The region is located in the Northeast of Argentina and has warm climate of the plains with abundant precipitation except during the winter. The heterogeneity of the soils (molisols and vertisols) is characteristic. The yields on the farm have been increasing consistently to the extent that average yield in 1972 was 1060 kg/ha which increased to 1956 kg/ha during the last decade and to 2600 kg/ha during the last season. The majority of this increase in yield is due to improved varieties and better management practices. The objectives of the Breeding Program are to achieve high yield and yield stability for the Parana region. At present, 80 percent of the germplasm is of CIMMYT origin, 15 local, and the remaining from other sources. The six varieties released by the Program are from the selections of the CIMMYT segregating materials. A collaboration from CIMMYT has been constant, very important and reciprocal with our program. El area de influencia de la EEA Parana abarca 7.7 millones de hectareas con una superficie cultivable del 14. Esta ubicada en el noreste de la Argentina y posee un clima templado de llanura, con precipitaciones abundantes excepto en invierno. Es caracteristica la heterogeneidad de los suelos (molisoles y vertisoles). Los rendimientos de trigo en campo de productor fueron incrementandose; asi en el ano 1972 era de 1060 kg/ha, en el ultimo decenio fue de 1956 kg/ha y en la ultima campana de 2600 kg/ha. Esta mejora en la produccion se debe a la mejora genetica y al manejo de cultivo. El objetivo del programa de mejoramiento es la obtencion de variedades de trigo de alto potencial y estabilidad de rendimiento en la mencionada area. En la actualidad el 80 porciento del germoplasma es proveniente del CIMMYT, el 15 porciento locales y el resto de otros origenes. Las 6 variedades obtenidas provienen de seleccion de material segregante del CIMMYT. La colaboracion del CIMMYT es permanente, muy importante y reciproca con nuestro programa.

1775 Rasmussen, S.K. (Risoe National Lab., Roskilde (Denmark). Dept. of Plant Genetics, Environmental Science and Technology); Dahl, S.W.; Noergaard, A.; Hejgaard, J. (1996) **A recombinant wheat serpin with inhibitory activity.** *Plant Molecular Biology (Netherlands) v. 30(3) p. 673-677.* 12 ref. English. (AGRIS 97-018336).

1776 Rejesus, RM.; Smale, M.; Vanginkel, M. (1996) **WHEAT BREEDERS PERSPECTIVES ON GENETIC DIVERSITY AND GERMPLASM USE - FINDINGS FROM AN INTERNATIONAL SURVEY.** *Plant Varieties & Seeds. 9(3):129-147.* English. [CIMMYT ECON PROGRAM LISBOA 27 APARTADO POSTAL 6-641 MEXICO CITY 06600 DF MEXICO].

Wheat breeders working in national wheat research programmes around the world, and particularly those in developing countries, are concerned that in the future scientific advance may be limited because wheat genetic diversity is not available for their use. Those surveyed use advanced lines and released varieties more often than other types of germplasm in their crosses, but they use wild relatives and landraces in the pursuit of specific breeding objectives, such as disease resistance, tolerance of abiotic stress, and grain quality. CIMMYT germplasm is used at least as often in breeding for disease resistance as for yield. The crossing blocks in developing countries contain larger sections of landrace materials and lines from CIMMYT International Nurseries, and as a result, may be more genetically diverse in terms of types and geographical origin of parent materials than those used in high-income countries, or the FSU and Eastern Europe. All of the wheat breeders surveyed in high-income countries stated that their country uses varietal protection, as compared with only half of those in developing countries. Responses suggest that the establishment of global regimes for varietal protection would reduce the exchange of useful materials among developing nations as well as between developing and industrialized nations. [References: 23].

1777 Resta, P.; Zhang, HB.; Dubcovsky, J.; Dvorak, J. (1996) **THE ORIGINS OF THE GENOMES OF TRITICUM BIUNCIALE, T-OVATUM, T-NEGLECTUM, T-COLUMNARE, AND T-RECTUM (POACEAE) BASED ON VARIATION IN REPEATED NUCLEOTIDE SEQUENCES.** *American Journal of Botany. 83(12):1556-1565.* English. [LAWRENCE LIVERMORE NATL LAB DEPT AGRON & RANGE SCI DAVIS, CA 95616 USA].

The origins of the genomes of allotetraploid species Triticum biunciale, T. ovatum, T. neglectum, and T. columnare, and allohexaploid T. rectum were investigated by examining the presence of specific restriction fragments of repeated nucleotide sequences in DNAs of the polyploid species. The restriction fragments were detectable either in a single diploid Triticum species (unique characters) or a group of diploid species (unique shared characters). The analysis showed that Triticum biunciale and T. ovatum are closely related. In both species, one pair of genomes is closely related to the genome of T. umbrellulatum and the other is a modified genome of T. comosum. The same genome formula, UUM degrees M degrees, is proposed for T. biunciale and T. ovatum. Potential reasons for the modification of the M degrees genome are discussed. Triticum neglectum and T. columnare are also closely related to each other and have the same genomes. They share the U genome with T. biunciale and T. ovatum, but their second pair of genomes is unrelated to the M degrees genome. No relationship was found of this genome to a genome of any extant diploid species of Triticum or any phylogenetic lineage lending to the extant diploid species. This unknown genome is designated X(t). The proposed genome formula for T. neglectum and T. columnare is UUX(t)X(t). Hexaploid T. rectum originated from hybridization of one of the tetraploid species with the formula UUX(t)X(t), likely T. neglectum, with T. uniaristatum (genome N), and its genome formula is UUX(t)X(t)NN. [References: 37].

1778 Richards, RA. (1996) **DEFINING SELECTION CRITERIA TO IMPROVE YIELD UNDER DROUGHT.** *Plant Growth Regulation. 20(2):157-166.* English. [CSIRO DIV PLANT IND POB 1600 CANBERRA ACT 2601 AUSTRALIA].

The many selection criteria that have been proposed to increase drought resistance of-our crops have had little, if any, impact on improving crop yields in dry environments. There are several likely reasons for this lack of success. Some of these are: (i) criteria proposed have been related more to survival mechanisms under drought than to productivity, (ii) criteria are inappropriate to the target environment, and (iii) criteria are temporal and are therefore likely to have minimal impact on growth and yield over the entire Lifecycle. Another important reason, is that breeders have not been convinced the proposed criteria will be successful as they are too difficult to measure. On the other hand, empirical breeding programmes to improve yield under drought have been successful. Surprisingly, some of the greatest successes have been achieved by breeding in environments where water is non-limiting. This paper reviews breeding approaches to improve yield under drought. It focuses on critical factors that must be considered to identify likely plant attributes that can be targeted. These factors, their link with yield, the nature of the target environment, the level of organisation where the trait is expressed are discussed. Three quite different examples are given to emphasize the above considerations and which show substantial promise in targeting traits to improve yield under drought. They are drought at flowering, improving transpiration efficiency and improving early leaf area development. [References: 44].

1779 Robinson, J.; Lindqvist, H.; Jalli, M. (1996) **GENES FOR RESISTANCE IN BARLEY TO FINNISH ISOLATES OF RHYNCHOSPORIUM SECALIS.** *Euphytica. 92(3):295-300.* English. [AGR RES CTR FINLAND INST CROP & SOIL SCI PLANT BREEDING RES SECT JOKIOINEN 31600 FINLAND].

Twenty Finnish isolates of Rhynchosporium secalis (Oud.) J.J. Davis, the causal agent of scald, were taken from infected barley (Hordeum vulgare L.) plants and inoculated on to seedlings of a differential series of barley containing a range of major genes for resistance to the fungus, as well as on to six Nordic B-row spring barleys and three winter ryes (Secale cereale L.). These fungal isolates derived from four sites and three host varieties. Disease development was monitored on two leaves of seedlings in the greenhouse employing a standard scale, and on adult plants in the field by assessing the diseased area on the three uppermost leaves. A comparison was also made between the pathogenicity and virulence of ten Finnish and ten Canadian R. secalis isolates. The Finnish isolates varied in virulence, but with the exception of Algerian (CI 1179) seedlings and adult La Mesita (CI 7565) all seedlings and adult plants of the entire differential series were resistant to all isolates. Canadian isolates were, on average, less virulent than Finnish isolates. All the Nordic checks were susceptible to all Finnish and seven Canadian isolates, but differences in the degree of susceptibility were evident. Isolates of R. secalis from barley were non-pathogenic on rye, isolates from Elymus repens L. were non-pathogenic on barley and rye, and isolates from rye were only pathogenic on rye. Finnish R. secalis

isolates contain no redundant pathogenic diversity. The differential series represents a useful, but as yet untapped, source of resistance to R. secalis for Finnish barley breeders. [References: 18].

1780 Rothnie, HM. (1996) **PLANT MRNA 3'-END FORMATION** [Review]. *Plant Molecular Biology. 32(1-2):43-61.* English. [FRIEDRICH MIESCHER INST POB 2543 CH-4002 BASEL SWITZERLAND].

Our understanding of how the 3' ends of mRNAs are formed in plants is rudimentary compared to what we know about this process in other eukaryotes. The salient features of plant pre-mRNAs that signal cleavage and polyadenylation remain obscure, and the biochemical mechanism is as yet wholly uncharacterised. Nevertheless, despite the lack of universally conserved cis-acting motifs, a common underlying architecture is emerging from functional analyses of plant poly(A) signals, allowing meaningful comparison with components of poly(A) signals in other eukaryotes. A plant poly(A) signal consists of one or more near-upstream elements (NUE), each directing processing at a poly(A) site a short distance downstream of it, and an extensive far-upstream element (FUE) that enhances processing efficiency at all sites. By analogy with other systems, a model for a plant 3'-end processing complex can be proposed. Plant poly(A) polymerases have been isolated and partially characterised. These, together with hints that some processing factors are conserved in different organisms, opens promising avenues toward initial characterisation of the trans-acting factors involved in 3'-end formation of mRNAs in higher plants. [References: 133].

1781 Rouiller, M. (Institut Francais des Boissons de la Brasserie Malterie, Vandoeuvre les Nancy (France)) (1995) **[The Brewer-Maltster Barley Committee (CBMO) and the qualification of malting barley varieties in France]. Le CBMO [Brewer-Maltster Barley Committee] et la qualification des orges brassicoles en France.** *BIOS BOISSONS (France) v. 26(255) p. 97-98.* Barley Malt Beer. English. (AGRIS 97-002244).

1782 Rudd, J. (South Dakota State University.); Farber, B. (1996) **Spring wheat breeding.** *Plant science pamphlet (USA) (no. 84) p. 8-9.* English. (AGRIS 97-018257).

1783 Rui, M.; Zheng, DS.; Fan, L. (1996) **THE CROSSABILITY PERCENTAGES OF 96 BREAD WHEAT LANDRACES AND CULTIVARS FROM JAPAN WITH RYE.** *Euphytica. 92(3):301-306.* English. [CHINESE ACAD SCI INST GEOG BEIJING 100101 PEOPLES REPUBLIC OF CHINA].

Crossability of bread wheat (Triticum aestivum L.) from Japan with rye (Secale cereale L.) was investigated by controlled pollination. No normal seeds were produced, but numbers of shrivelled and small seeds with embryos were used to estimate crossability amongst the 96 accessions, viz: 0-10% (29), 10-30% (23), 30-50% (11), 50-90% (33). The investigation for the pedigrees of varieties with more than 50% crossability percentages showed that the kr alleles of some accessions derived from common ancestors. [References: 18].

1784 Ruiz, M.; Carrillo, J.M. (Universidad Politecnica, Madrid (Spain). Escuela Tecnica Superior de Ingenieros Agronomos. Dept. de Genetica) (1995) **Relationships between different prolamin proteins and some quality properties in durum wheat.** *Plant Breeding (Germany) v. 114(1) p. 40-44.* 1 ill., 4 tables; 25 ref. English. (AGRIS 97-018386).

The objective of this paper was to study the differences between some prolamin variants coded at the loci Glu-3/Gli-1, Glu-1 and Gli-A2 and their relative roles in durum-wheat quality. F3 lines from four durum wheat crosses ('Abadia' x 'Mexicali', 'Oscar' x Ardente', 'Oscar x Mexicali' and 'Alaga' x 'C. of Balazote') were analysed for gliadin and glutenin composition by electrophoresis. Whole-grain-derived samples were analysed for SDS sedimentation (SDSS) value, mixing properties, and contents of protein and vitreousness. The glutenin patterns LMW-2, LMW-2 and LMW-2 (CB) at Glu-B3/Gli-B1 were associated with better gluten quality than were LMW-1 and LMW-2*. The glutenin subunits LMW4 and LMW3+15 at Glu-A3/Gli-A1 and HMW-1 showed better mixing properties than LMW7+12, LMW5 and the null phenotype, respectively. The HMW glutenin subunits 20+8 at Glu-B1 showed a negative association with gluten quality, but the rest of the HMW glutenin subunits and alpha-gliadins did not show any influence on gluten quality. Correlations between theresults of the SDSS test and the mixograph were highly significant, buno correlation was found between these results and protein and vitreousness contents. The results are discussed in relation to the development of durum wheat varieties with improved qualities.

1785 Sah, B.P. (National Wheat Research Programme, Bhairahawa, Rupandehi (Nepal)) (1996) **Varietal development works in normal season wheat for rainfed environment of Terai/Tars and lower valleys of Nepal, 1995/96.** National Winter Crops Research Workshop. Siddharthanagar, Bhairahawa (Nepal). 12-15 Sep 1996. *Summary of the wheat research reports. National Wheat Research Programme (Nepal) p. 15-54.* National Wheat Research Programme. 27 tables. English. (AGRIS 97-018115).

1786 Sawhney, R.N. (Indian Agricultural Research Institute, New Delhi, India.) (1995) **Genetics of wheat-rust interaction.** *Plant breeding reviews (USA) v. 13 p. 293-343.* references. English. (AGRIS 97-017910).

1787 Scarisbrick, D.; Meikle, S. (Wye College, University of London, Ashford, Kent (United Kingdom)) (1996) **The success of cereal breeding (part II).** *Agronomist (United Kingdom) (spring) p. 8-9.* 3 ref. English. (AGRIS 97-002932).

1788 Shewry, P.; Tatham, A. (University of Bristol, Bristol (United Kingdom). AFRC, Institute of Arable Crops Research, Department of Agricultural Sciences); Barcelo, P.; Lazzeri, P. (AFRC Institute of Arable Crops Research, Harpenden Herts (United Kingdom). Rothamsted Experimental Station) (1995) **[Molecular and cellular techniques in wheat improvement]. Techniques moleculaires et cellulaires pour l'amelioration du ble.** Seminar on Durum Wheat Quality in the Mediterranean Region. Zaragoza (Spain). 17-19 Nov 1993. Durum Wheat Quality in the Mediterranean Region. La Qualite du Ble Dur dans la Region Mediterraneenne. Fonzo, N. di (Istituto Sperimentale per la Cerealicoltura, Foggia (Italy). Sezione Operativa di Foggia); Kaan, F. (INRA, Institut National de la Recherche Agronomique, Mauguio (France). Station de Genetique et d'Amelioration des Plantes. Domaine de Melgueil); Nachit, M. (ICARDA, International Center for Agricultural Research in the Dry Areas, Aleppo (Syria)). *Options Mediterraneennes. Serie A: Seminaires mediterraneens (CIHEAM); no. 22 p. 227-240.* CIHEAM-IAMZ. 4 ill.; bibliography p. 236-240. English. (AGRIS 97-002280).

L'application du genie genetique a l'amelioration du ble presente deux pre-requis. Le premier est la disponibilite de methodes de transfert de genes en s'assurant qu'ils s'expriment au niveau desire et suivent la demarche correcte de specificite du tissu et de regulation du developpement. Le second est la connaissance des caracteres d'interet au niveau moleculaire et la disponibilite des genes qui se pretent a la manipulation de ces caracteres. Le present article resume la situation actuelle de la recherche en matiere de genie genetique des bles durs et tendres en insistant sur les possibilites de manipuler la resistance aux conditions adverses biotiques et abiotiques, ainsi que sur la qualite du grain pour la fabrication du ble et des pates.

1789 Sibikeev, S.N.; Sibikeeva, Yu.E.; Elesin, V.A. (1994) **[Study of F1 hybrids between common wheat and Aegilops speltoides and Triticum militinae]. Izuchenie gibridov F1 mezhdu myagkoj pshenitsej i vidami Aegilops speltoides Tausch.i Triticum militinae Zhuk et Migusch.** *Doklady RASKhN (Russian Federation) (no.5) p. 3-5.* 10 ref. Russian. (AGRIS 97-002922).

1790 Singh, S.; Sethi, G.S. (Punjab Agricultural University, Faridkot (India). Regional Research Station) (1995) **Effect of parental genotype on in vitro rescue of durum wheat x ray hybrid embryos.** *Crop Improvement (India) v. 22(2) p. 146-149.* 1 tables; 4 ref. English. (AGRIS 97-002924).

1791 Snape, J.W. (John Innes Centre, Norwich (United Kingdom)); Quarrie, S.A.; Laurie, D.A. (1996) **Comparative mapping and its use for the genetic analysis of agronomic characters in wheat.** *Euphytica (Netherlands) v. 89(1) p. 27-31.* 16 ref. English. (AGRIS 97-018345).

1792 Spoor, W. (Edinburgh School of Agriculture (United Kingdom)); Simmonds, N.W. (1993) **Pot trials as an adjunct to cereal breeding and evaluation of genetic resources.** *Field Crops Research (Netherlands) v. 35(3) p. 205-213.* 13 ref. English. (AGRIS 97-017882).

1793 Stankov, I.; Stankova, P. (Institut po Introduktsiya i Rastitelni Resursi "K. Malkov", Sadovo (Bulgaria)); Tsvetanov, S. (1995) **[Biological and ecological characteristics of new hexaploid triticale varieties and lines].**

Biologichni i stopanski kachestva na novi sortove i linii kheksaploidni tritikale. Selskostopanska Akademiya, Sofia (Bulgaria). *Rasteniev"dni Nauki (Bulgaria). Plant Science v. 32(6) p. 102-104.* 2 tables; 3 ref. Bulgarian. (AGRIS 97-018283).

1794 Steefenson, B.J.; Jin, Y.; Rossnagel, B.G.; Rasmussen, J.B.; Kao, K. (North Dakota State Univ., Fargo (USA). Dept. of Plant Pathology) (1995) **Genetics of multiple disease resistance in a doubled-haploid population of barley.** *Plant Breeding (Germany) v. 114(1) p. 50-54.* 3 tables; 29 ref. English. (AGRIS 97-017886).

The barley accession Q21861 possesses resistance to the stem-rust (Puccinia graminis f.sp. tritici), leaf-rust (Puccinia hordei), and powdery-mildew (Blumeria graminis f.sp. hordei) pathogens. An anther-culture-derived doubled-haploid population was produced from F1 plants from a cross of this accession and the susceptible breeding line SM89010 as a means of rapidly and efficiently determining the genetics of multiple disease resistance. The doubled-haploid population segregated 1:1 (resistant:susceptible) for resistance to the stem rust pathotype QCC indicating the involvement of a single resistance gene, rpg4. Two-gene (3:1) and one-gene (1:1) segregation ratios were observed for resistance to the stem-rust pathotype MCC at low (23 to 25 degrees C) and high (27-29 degrees C) temperature, respectively. These different segregation patterns were due to a pathotype x temperature interaction exhibited by rpg4 and Ppg1, another stem-rust-resistance gene present in Q21861. One-gene and two-gene segregation ratios were observed in reaction to the leaf rust and powdery mildew pathogens. These data demonstrate the utility of doubled haploid populations for determining the genetics of multiple disease resistance in barley.

1795 Stelmakh, A.F. (Plant Breeding and Genetics Inst., Odessa (Ukraine)); Avsenin, V.I. (1996) **Alien introgression of spring habit dominant genes into bread wheat.** *Euphytica (Netherlands) v. 89(1) p. 65-68.* 12 ref. English. (AGRIS 97-018349).

1796 Stojanovic, S. (Institut za istrazivanja u poljoprivredi "Srbija", Kragujevac (Yugoslavia). Centar za strna zita); Stojanovic, J.; Jerkovic, Z.; Milijic, S.; Jevtic, R. (1995) **[The effectiveness of resistance genes derived from Aegilops spp. to wheat rusts]. Efikasnost gena otpornosti poreklom od Aegilops spp. prema prouzrokovacima rdja psenice.** *Zastita bilja (Yugoslavia) v. 46(4) p. 259-265.* 3 tables; 23 ref. Serbian. (AGRIS 97-002905).

In this paper resistance of nearly isogenic lines with genes Sr32, Sr33, Lr9, Lr21 and Lr22 derived from Aegilops squarrosa and Aegilops umbellulata is presented. The genes Sr32 and Sr33 showed good effectiveness to different pathotypes of wheat stem rust in seedling stage. But, in adult stage lines with this genes were moderately resistant to very susceptible in Kragujevac and Zajecar (Serbia, Yugoslavia). The most effective was gene Lr9. In the population of wheat leaf rust there is no alleles of virulence to this gene. The lines with other two genes (Lr21 and Lr22) were susceptible in Novi Sad (Serbia, Yugoslavia) and moderately susceptible in Kragujevac (Serbia, Yugoslavia).

1797 Stojanovic, S. (Institut za istrazivanja u poljoprivredi "Srbija", Kragujevac (Yugoslavia). Centar za strna zita); Stojanovic, J.; Jevtic, R. (1995) **[Efficiency of the barley resistance genes to powdery mildew]. Efikasnost gena otpornosti jecma prema prouzrokovacu pepelnice.** *Zastita bilja (Yugoslavia) v. 46(3) p. 183-187.* 1 table; 12 ref. Serbian. (AGRIS 97-002555).

The barley powdery mildew is widely spread in Serbia (Yugoslavia). Good results in the control of this disease could be realized by growing of resistant cultivars. Investigation was carried out during 1991-1992 in five locations (Kragujevac, Zajecar, Krusevac, Vrsac and Pec) in Serbia, Yugoslavia. Artificial inoculation was made only in Kragujevac (Serbia, Yugoslavia). The results show that the genes ml-05, Ml-a16, Ml-a17, Ml-a18, and Ml-a19 were the most effective. There are no virulence alleles to this genes in the population. The genes Ml-a, Ml-a3, Ml-a9, Ml-a13, Ml-p and Ml-at had the middle efficiency (coefficient of infection 2.2-9.8). The other genes (Ml-a6, Ml-a8, Ml-a12, Ml-g, Ml-c, Ml-k, Ml-nn, Ml-41/145, Ml-h and Ml-La) were not effective.

1798 Stojanovic, S. (Institut za istrazivanja u poljoprivredi "Srbija", Kragujevac (Yugoslavia). Centar za strna zita); Stojanovic, J.; Jevtic, R. (1994) **[Selection for resistance to powdery mildew in wheat]. Selekcija psenice na otpornost prema prouzrokovacu pepelnice.** Treci jugoslovenski kongres o zastiti bilja. Vrnjacka Banja (Yugoslavia). 3-7 Oct 1994. *Plant protection today and tomorrow: [selected papers from the third Yugoslav congress about plant protection, Vrnjacka Banja (Yugoslavia), October 3-7, 1994]. Sestovic, M.; Neskovic, N.K.; Peric, I. (eds.). Zastita bilja danas i sutra: [odabrani radovi sa Treceg jugoslovenskog kongresa o zastiti bilja, Vrnjacka Banja (Jugoslavija), 3-7. oktobra 1994] p. 71-77.* Drustvo za zastitu bilja Srbije. 2 tables; 19 ref. Serbian. (AGRIS 97-002904).

By crossing susceptible commercial cultivars (Kragujevcanka 56, Jugoslavija, Balkan, Kavkaz, Posavka 2, Skopljanka, Partizanka and Biserka) and Pm genes donor (FR 845, FR 8119, SC 780934, D-12, GA 83021, P 596-III/16 and P 518-I/5), 156 new lines were created. The pedigree method was used with the progenies. These studies showed that the inheritance of resistance was dominant. The resistance of donors was controlled by one, two or three dominant genes. In some combinations complementary effect of genes was found. Indicators of productivity of hybrids were also studied. The most important were the lines made by crossing Skopljanka x FR 845, Partizanka x FR 845 and Jugoslavija x FR 8119. Lines with good resistance and high productivity were separated for further investigation.

1799 Storlie, EW.; Xie, H.; Talbert, LE. (1996) **TALL OFF-TYPES IN SEMIDWARF SPRING WHEAT WITH HEIGHT-REDUCING GENES RHT1 AND RHT2.** *Crop Science. 36(6):1521-1522.* English. [MONTANA STATE UNIV DEPT PLANT SOIL & ENVIRONM SCI BOZEMAN, MT 59717 USA].

An objective of wheat (Triticum aestivum L.) breeding and seed purification programs is to develop uniform cultivars. However, lack of uniformity may occur due to outcrossing, mechanical mixtures, or aneuploidy. We were interested in the prevalence of aneuploidy resulting in tall off-types in semidwarf wheat cultivars. Rht1 and Rht2 are the most common height-reducing genes deployed, and reside on chromosomes 4B and 4D, respectively. In this study, tall off-types were selected from 11 cultivars representing Rht1 and Rht2 genotypes. The chromosomal constitution of the tall off-types were determined based on phenotypic and cytogenetic analysis of offspring. Six cultivars with Rht1 genotypes produced an average frequency of 0.15% monosomic 4B plants that averaged from 16 to 22% taller than the height of euploid plants. Five cultivars with Rht2 genotypes produced an average frequency of 0.06% monosomic 4D plants that averaged 12 to 18% taller than the height of euploid plants. Our results indicate that tall off-types resulting from monosomic 4B and 4D conditions occur in several semidwarf cultivars. However, the frequency and phenotypic effect are greater in semidwarf cultivars with Rht1. Thus, use of Rht2 to cause semidwarf habit may help minimize the problem of tall off-types. [References: 7].

1800 Subhani, G.M. (Maize and Millets Research Inst., Yousafwala (Pakistan)); Khan, N.; Chaudhry, A.S.; Ibrahim, M. (Wheat Research Inst., AARI, Faisalabad (Pakistan)) (1995) **Genetic studies in bread wheat (Triticum aestivum L.).** *Journal of Agricultural Research (Pakistan) v. 33(1) p. 65-69.* 1 table, 15 ref. English. (AGRIS 97-018368).

Broad sense heritability (BSH), narrow sense heritability (NSH) and genetic advance as a percent of mean (GA) were computed during 1988-89 for plant height, peduncle length, tillers per plant, grains per spike, 1000-grain weight and grain yield per plant in two wheat crosses viz. Faisalabad85 x JUNCO and JUNCO x (PIMA/SAKHA). BSH, NSH and GA for grain yield were 75.35, 73.30 and 48.37 percent, respectively in a cross Faisalabad85 x JUNCO. Similar values were 72.72, 35.15 and 47.20 percent in the crosses of JUNCO x (PIMA/SAKHA). Tillers per plant and grains per spike in Faisalabad85 x JUNCO and grains per spike and 1000-grain weight in JUNCO x (PIMA/SAKHA) showed relatively higher NSH and GA, respectively. Therefore, these crosses can be used for indirect selection for grain yield in segregating generations.

1801 Takeda, K. (Okayama Univ., Kurashiki (Japan). Research Inst. for Bioresources) (1996) **Inheritance of sensitivity to the insecticide diazinon in barley and the geographical distribution of sensitive varieties.** *Euphytica (Netherlands) v. 89(3) p. 297-304.* 16 ref. English. (AGRIS 97-017894).

1802 Takumi, S. (1996) **HYGROMYCIN-RESISTANT CALLI GENERATED BY ACTIVATION AND EXCISION OF MAIZE AC/DS TRANSPOSABLE ELEMENTS IN DIPLOID AND HEXAPLOID WHEAT CULTURED CELL LINES.** *Genome. 39(6):1169-1175.* English.

[ISHIKAWA AGR COLL RES INST AGR RESOURCES LAB GENET RESOURCES NONOICHI ISHIKAWA 921 JAPAN].

To investigate the activation and transposition of maize transposable elements in wheat cultured cells, plasmid DNAs containing the maize Ac/Ds elements located between the CaMV 35S promoter and a hygromycin B resistance gene (hph) were introduced into two wheat (Triticum aestivum and Triticum monococcum) cultured cell lines by microprojectile bombardment. In the first experiment, hph was activated by excision of the Ac element, which encodes transposase, in the two wheat cell lines. In the second experiment, the Ds element was excised by a stabilized Ac element, lacking inverted repeats of the Ac element and located on another plasmid, and therefore leading to activation of hph. After selection of bombarded cells by hygromycin B, many resistant calli were recovered in both wheat cell lines. The integration of hph and the Ac transposase gene was confirmed by PCR and genomic Southern analysis. The stable expression of hph and the transposase gene was also assessed by Northern blot and reverse transcriptase PCR analysis, respectively. Moreover, characteristic sequence alterations were found at Ac/Ds excision sites. These findings indicate that the maize Ac/Ds transposable elements are activated and excised by expression of the Ac transposase gene in both diploid and hexaploid wheat cells. [References: 23].

1803 Tanimoto, S.; Matsubara, Y. (Saga Univ. (Japan). Faculty of Agriculture, Genetic Engineering Lab.) (1995) **Transgenic barley (Hordeum vulgare L.) by electroporation of protoplasts.** *Plant Cell Reports (Germany) v. 15(3-4) p. 301-304.* 3 ill., 2 tables; 25 ref. English. (AGRIS 97-017890).

1804 Tibbot, B.K. (Wisconsin Univ., Madison, WI (USA). Dept. of Agronomy); Skadsen, R.W. (1996) **Molecular cloning and characterization of a gibberellin-inducible, putative alpha-glucosidase gene from barley.** *Plant Molecular Biology (Netherlands) v. 30(2) p. 229-241.* Bibliography (56 ref.). English. (AGRIS 97-017892).

1805 Tombetta, E.E.; Cuniberti, M.B. (1995) **[Industrial and commercial quality of wheat cultivars]. Calidad industrial y comercial de cultivares de trigo.** *[Wheat breeding in Argentina: Thirty years of cooperative investigation with CIMMYT; Balcarce, Argentina; 7-8 Oct 1992]. El mejoramiento de trigo en Argentina: Treinta anos de investigacion cooperativa con el CIMMYT; Balcarce, Argentina; 7-8 Oct 1992. Kohli, M.M.; Nisi, J.; Rajaram, S. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 113-121.* CIMMYT. 6 tables; 2 graphs. Spanish. (AGRIS 97-018312).

Since its initiation, the wheat breeding programs in Argentina have considered industrial quality as a primary objective for improvement. The varieties that have been released satisfy internal and external market needs but Argentina must develop different types of qualities as it occurs in other exporting countries. Different studies demonstrate that Argentine varieties are genetically capable of meeting the requirements set by the milling and baking industries. However, Argentine wheat production can improve certain quality characteristics which are greatly affected by the climatic variation among years. The lack of soil fertility in certain areas combined with the harvest of high yields have decreased industrial quality. Poor grain handling post- harvest also affects quality. Efforts should continue to keep improving the genetic aspects of quality as well as that of crop management. Desde sus comienzos, los programas de mejoramiento de trigo en Argentina, tuvieron a la calidad como uno de los caracteres prioritarios en la mejora. Los cultivares difundidos satisfacen las necesidades de los mercados internos y externos, pero se deberia contar con diferentes tipos de calidad como ocurre en los demas paises exportadores. Diferentes estudios en variedades argentinas demuestran que estas geneticamente responden a los calidades genetica y el manejo del cultivo.

1806 Troxler, J.; Azelvandre, P.; Zala, M.; Defago, G.; Haas, D. (1997) **CONJUGATIVE TRANSFER OF CHROMOSOMAL GENES BETWEEN FLUORESCENT PSEUDOMONADS IN THE RHIZOSPHERE OF WHEAT.** *Applied & Environmental Microbiology. 63(1):213-219.* English. [UNIV LAUSANNE LAB BIOL MICROBIENNE CH-1015 LAUSANNE SWITZERLAND].

Bacteria released in large numbers for biocontrol or bioremediation purposes might exchange genes with other microorganisms. Two model systems were designed to investigate the likelihood of such an exchange and some factors which govern the conjugative exchange of chromosomal genes between root-colonizing pseudomonads in the rhizosphere of wheat. The first model consisted of the biocontrol strain CHA0 of Pseudomonas fluorescens and transposon facilitated recombination (Tfr). A conjugative IncP plasmid loaded, vith transposon Tn5, in a CHA0 derivative carrying a chromosomal Tn5 insertion, promoted chromosome transfer to auxotrophic CHA0 recipients in vitro. A chromosomal marker (pro) was transferred at a frequency of about 10(-6) per donor on wheat roots under gnotobiotic conditions, provided that the Tfr donor and recipient populations each contained 10(6) to 10(7) CFU per g of root. In contrast, no conjugative gene transfer was detected in soil, illustrating that the root surface stimulates conjugation. The second model system was based on the genetically well-characterized strain PAO of Pseudomonas aeruginosa and the chromosome mobilizing IncP plasmid R68.45. Although originally isolated from a human wound, strain PAO1 was found to be an excellent root colonizer, even under natural, nonsterile conditions. Matings between an auxotrophic R68.45 donor and auxotrophic recipients produced prototrophic chromosomal recombinants at 10(-4) to 10(-5) per donor on wheat roots in artificial soil under gnotobiotic conditions and at about 10(-6) per donor on wheat roots in natural, nonsterile soil microcosms after 2 weeks of incubation. The frequencies of chromosomal recombinants were as high as or higher than the frequencies of R68.45 transconjugants, reflecting mainly the selective growth advantage of the prototrophic recombinants over the auxotrophic parental strains in the rhizosphere. Although under field conditions the formation of chromosomal recombinants is expected to be reduced by several factors, we conclude that chromosomal genes, whether present naturally or introduced by genetic modification, may be transmissible between rhizosphere bacteria. [References: 71].

1807 Varughese, G. (International Maize and Wheat Improvement Center, El Batan, Edo. Mex., Mexico.); Pfeiffer, W.H.; Pena, R.J. (1996) **Triticale: a successful alternative crop. 2.** *Cereal foods world (USA) v. 41(7) p. 635-645.* references. English. (AGRIS 97-018286).

1808 Villareal, R.L. (International Wheat and Maize Improvement Center, Mexico, D.F. (Mexico)); Toro, E. del; Rajaram, S.; Mujeeb Kazi, A. (1996) **The effect of chromosome 1AL/1RS translocation on agronomic performance of 85 F(2)-derived F(6) lines from three Triticum aestivum L. crosses.** *Euphytica (Netherlands) v. 89(3) p. 363-369.* 26 ref. English. (AGRIS 97-018338).

1809 Villareal, RL.; Mujeebkazi, A.; Rajaram, S. (1996) **INHERITANCE OF THRESHABILITY IN SYNTHETIC HEXAPLOID (TRITICUM TURGIDUM X T-TAUSCHII) BY T-AESTIVUM CROSSES.** *Plant Breeding. 115(5):407-409.* English. [CIMMYT INT MAIZE & WHEAT IMPROVEMENT CTR LISBOA 27 APDO POSTAL 6-641 DELEG CUAUHTEMOC MEXICO CITY 06600 DF MEXICO].

Triticum tauschii provides breeders with a valuable source of resistance and tolerance genes. Elucidation of the inheritance of traits in this species that hinder its use in breeding programmes is therefore of interest to wheat breeders. Inheritance of threshability was investigated in the crosses of four non-free-threshing (NFT) synthetic hexaploids (Triticum turgidum x T. tauschii) and two free-threshing(FT) T. aestivum cultivars during four crop seasons over 3 years at El Batan and Ciudad Obregon, Mexico. The parents, their F-1 hybrids and individual F-2 plant-derived F-3 progenies of the crosses revealed that 'Altar 84'/T. tauschii (219), 'Chen'/T. tauschii (205), 'Chen'/T. tauschii (224), and 'Duergand'/T. tauschii (214) have independently segregating loci with two dominant alleles controlling threshability. Intercrosses among the synthetics, except 'Altar 84'/T. tauschii(219), showed the genes to be allelic to each other. The cross between the FT cultivars showed no segregation in the F-3 generation, indicating common recessive genes. Based on these findings, population sizes of the synthetic-derived breeding materials should be increased to improve the chances of selecting FT desirable plants in the programme. [References: 15].

1810 Vincenzi, M. de; Dessi, M.R.; Luchetti, R.; Pogna, N.; Redaelli, R.; Galterio, G. (Laboratorio di Metabolismo e Biochimica Patologica, Istituto Superiore di Sanita, Viale Regina Elena 299, 00161 Rome (Italy)) (1996) **Toxicity of bread wheat lines lacking prolamins encoded by the Gli-B1/Gli-B5/Glu-B3 and Gli-D1/Glu-D3 loci in coeliac disease as determined by their agglutinating activity.** *ATLA, Alternatives to Laboratory Animals (United Kingdom) v. 24(1) p. 39-48.* 33 ref. English. (AGRIS 97-002965).

1811 Wang, S.Y. (Michigan State Univ., East Lansing, MI (USA). Dept. of Crop and Soil Sciences); Ward, R.W.; Ritchie, J.T.; Fischer, R.A.; Schulthess, U. (1995) **Vernalization in wheat. 2. Genetic variability for the interchangeability of plant age and vernalization duration.** *Field Crops Research (Netherlands) v. 44(2-3) p. 67-72.* 25 ref. English. (AGRIS 97-018334).

1812 Ward, M.P.; Abberton, M.T.; Forde, B.G.; Sherman, A.; Thomas, W.T.B.; Wray, J.L. (St. Andrews Univ. (United Kingdom). School of Biological and Medical Sciences Plant Sciences Lab. Research Division of Environmental and Evolutionary Biology) (1995) **The Nir1 locus in barley is tightly linked to the nitrite reductase apoprotein gene Nii.** *Molecular and General Genetics (Germany) v. 247(5) p. 579-582.* 2 ill., 1 graph; 22 ref. English. (AGRIS 97-017884).

pBNiR1, a cDNA clone encoding part of the barley nitrite reductase apoprotein, was isolated from a barley (cv. Maris Mink) leaf cDNA library using the 1.85 kb insert of the maize nitrite reductase cDNA clone pCIB808 as a heterologous probe. The cDNA insert of pBNiR1 is 503 bp in length. The nucleotide coding sequence could be aligned with the 3' end of other higher plant nitrite reductase apoprotein cDNA sequences but diverges in the 3' untranslated region. The whole-plant barley mutant STA3999, previously isolated from the cultivar Tweed, accumulates nitrite after nitrate treatment in the light, has very much lowered levels of nitrite reductase activity and lacks detectable nitrite reductase cross-reacting material due to a recessive mutation in a single nuclear gene which was designated Nir1. STA3999 has the characteristics expected of a nitrite reductase apoprotein gene mutant. Here pB-NiR1 was used in RFLP analysis to determine whether the mutation carried by STA3999 is linked to the nitrite reductase apoprotein gene locus Nii. An RFLP was identified between the wild-type barley cultivars Tweed (major hybridising band of 11.5 kb) and Golden Promise (major hybridising band of 7.5 kb) when DraI-digested DNA was probed with the insert from the partial barley nitrite reductase cDNA clone, pBNiR1. DraI-digested DNA from the mutant STA3999 also exhibited a major hybridising band of 11.5 kb after hybridisation with the insert from pBNiR1. F1 progeny derived from the cross between the cultivar Golden Promise and the homozygous nir1 mutant STA3999 were heterozygous for these bands as anticipated. Co-segregation of the Tweed RFLP band of 11.5 kb and the mutant phenotype was scored in an F2 population of 312 plantsdrived from the cross between Golden Promise and mutant STA3999.

1813 Winzeler, M.; Winzeler, H.; Keller, B. (Swiss Federal Research Station for Agronomy, Zuerich (Switzerland). Dept. of Plant Breeding) (1995) **Endopeptidase polymorphism and linkage of the Ep-D1c null allele with the Lr19 leaf-rust-resistance gene in hexaploid wheat.** *Plant Breeding (Germany) v. 114(1) p. 24-28.* 2 ill., 2 tables; 35 ref. English. (AGRIS 97-018319).

The aim of this study was to test whether the null allele Ep-D1c of the endopeptidase Ep-D1 can be used as a marker for the Lr19 leaf rust resistance gene. The frequency of Ep-D1c was determined in 1134 winter wheat, spring wheat and spelt breeding lines and varieties. Only eight lines were found to carry Ep-D1c. Six of these lines originated from crosses with RL6040, the gene donor for Lr19. The other two lines were leaf-rust susceptible in the seedling stage and therefore did not carry Lr19. The genetic distance between Ep-D1c and Lr19 was determined in a reciprocal cross between the lines FAP75184 (Ep-D1c, Lr19) and FAP75106 (Ep-D1a, leaf-rust susceptible in the seedling stage). Out of 840 F2 seedlings screened, 162 were homozygous for Ep-D1c. From 150 of these F2 plants, F3 seedlings were screened for segregation for leafrust resistance with isolates avirulent on Lr19. Only one F2 plant produced susceptible F3 progeny indicating a recombination event between Ep-D1c and Lr19. From these data, a genetic distance of 0.33+-0.33cM between Ep-D1c and Lr19 was calculated. The results show that Ep-D1c is a useful marker for a practical breeding programme allowing the rapid identification of plants homozygous for Lr19.

1814 Worland, A.J. (John Innes Centre, Norwich (United Kingdom). Dept. of Cereals) (1996) **The influence of flowering time genes on environmental adaptability in European wheats.** *Euphytica (Netherlands) v. 89(1) p. 49-57.* 24 ref. English. (AGRIS 97-018348).

1815 Wu, Y.; Schwarz, PB.; Doehlert, DC.; Dahleen, LS.; Horsley, RD. (1997) **RAPID SEPARATION AND GENOTYPIC VARIABILITY OF BARLEY (HORDEUM VULGARE L) LIPOXYGENASE ISOENZYMES.** *Journal of Cereal Science. 25(1):49-56.* English. [N DAKOTA STATE UNIV DEPT CEREAL SCI FARGO, ND 58105 USA].

Two lipoxygenase (LOX) activities in a crude extract of germinated barley were readily resolved by fast protein liquid chromatography (FPLC:) on a Mono Q HR 5/5 anion-exchange column. Separation was achieved in 25 min, and recovery of activity was consistently greater than 90%. The two LOX activities were identified as LOX-1 and LOX-2 by isoelectric focusing and by comparison with the chromatographic properties of purified LOS-I and LOX-2. The activities of the two isoenzymes and total LOX activity varied significantly among the cultivars, although the ratio of LOX-1/LOX-2 was fairly constant. Significant variation in LOX activity between cultivars suggests that the LOX activity in malting barley cultivars might be reduced through breeding. The established separation procedure may be useful for screening barley lines for LOX-null-allele mutations, and may enhance the prospect of mapping genes that affect LOX activity or levels. (C) 1997 Academic Press Limited [References: 19].

1816 Xia, X.C.; Hsam, S.L.K.; Stephan, U.; Yang, T.M.; Zeller, F.J. (Beijing Agricultural Univ. (China). Dept. of Agronomy) (1995) **Identification of powdery-mildew-resistance genes in common wheat (Triticum aestivum L.). 6. Wheat cultivars grown in China.** *Plant Breeding (Germany) v. 114(2) p. 174-175.* 1 table; 9 ref. English. (AGRIS 97-018324).

A total of 26 common wheat cultivars and advanced breeding lines grown in China were tested with a set of 11 differential powdery-mildew isolates. Seven cultivars were susceptible. Another seven cultivars showed the response pattern of resistance gene Pm2, either individually or in combination with genes Pm3d or Pm4a. Five cultivars expressed the resistance of gene Pm4b singly or in combination with Pm6. Another four cultivars exhibited the response patterns of genes Pm5, Pm6 and Pm8, respectively. Three cultivars, which included one breeding line with a pair of substituted chromosomes from Haynaldia villosa, presumably carrying the resistance gene Pm21, showed resistance-response patterns to all the isolates tested.

1817 Yadav, S.C.; Shivaramu, H.S.; Kandpal, B.K. (National Bureau of Soil Survey and Land Use Planning, Nagpur (India)) (1996) **Performance of wheat (Triticum aestivum) genotype on swell-shrink soils.** *Indian Journal of Agricultural Sciences (India) v. 66(7) p. 422-425.* 3 tables; 5 ref. English. (AGRIS 97-002920).

1818 Yamamori, M.; Nakamura, T.; Nagamine, T. (Japan International Research Center for Agricultural Sciences, Okinawa (Japan). Okinawa Sub Tropical Station) (1995) **Polymorphism of two waxy proteins in the emmer group of tetraploid wheat, Triticum dicoccoides, T. dicoccum, and T. durum.** *Plant Breeding (Germany) v. 114(3) p. 215-218.* 1 ill., 1 graph, 2 tables; 21 ref. English. (AGRIS 97-018381).

Gel-electrophoretic analyses detected polymorphism of two waxy (Wx) proteins. Wx-A1 and Wx-B1, in 334 accessions of the emmer group of tetraploid wheat, Triticum dicoccoides, Triticum dicoccum and Triticum durum. The null allele for the Wx-A1 protein (Wx-Alb) was found in one accession of T. dicoccoides and seven of T. dicoccum, but it was not present in those T. durum accessions analysed. The null allele for the Wx-B1 protein (Wx-B1 b) did not occur in three emmer-wheat species. Wx-A1 and Wx-B1 proteins showing alteration in mobility in SDS-PAGE gel or in isoelectric points were found in five accessions and considered to be the products of new alleles, Wx-Ald Wx-Ale and/or Wx-Bld. Densitometric analysis of Wx protein bands revealed that Wx-A1 was present in smaller amounts than Wx-B1 in almost all accessions.

1819 Zeuli, P.L.S.; Sergio, L.; Perrino, P (Universita della Basilicata, Potenza (Italy). Dept. Biologia. Difesa e Biotecnologie Agro Forestali) (1995) **Changes in the genetic structure of wheat germplasm accessions during seed rejuvenation.** *Plant Breeding (Germany) v. 114(3) p. 193-198.* 1 ill., 3 graphs, 1 table; 25 ref. English. (AGRIS 97-018329).

Changes in the genetic structure of wheat accessions caused by interspecific competition during periodic seed rejuvenation at a gene-bank were studied. Electrophoretic patterns (Acid-PAGE) of gliadin storage proteins were used to discriminate bread from durum wheat and to identify bread-wheat genotypes. Bread wheat shows high selective advantage over durum wheat and its frequency increased up to 100 after seven rejuvenation cycles. The number of bread-wheat genotypes identified in each entry varied from five to 13, but only a few prevailed

and these were different in each accession. In most cases, bread wheat was already present in the field sample collected, but at low frequency. In one case, 'seed flow' was thought to have occurred at a very low rate among neighbouring plots. The implication of these findings for genetic resources conservation are: 1. Mixtures of wheat species within the same germplasm accession must be avoided; 2. Only in some cases are low planting densities effective in reducing competition; and 3. The genetic structure of accessions in the gene banks must be monitored.

1820 Zhang, XY.; Dong, YS.; Wang, RRC. (1996) **CHARACTERIZATION OF GENOMES AND CHROMOSOMES IN PARTIAL AMPHIPLOIDS OF THE HYBRID TRITICUM AESTIVUM X THINOPYRUM PONTICUM BY IN SITU HYBRIDIZATION, ISOZYME ANALYSIS, AND RAPD.** *Genome. 39(6):1062-1071.* English. [UTAH STATE UNIV USDA ARS FOREST & RANGE RES LAB LOGAN, UT 84322 USA].

Genomic in situ hybridization (GISH) and Southern hybridization of genome-specific RAPD markers were used to demonstrate that the E genome (including E(e) and E(b) from Thinopyrum elongatum and Thinopyrum bessarabicum, respectively) and the St genome (from Pseudoroegneria species) were the two basic genomes in Thinopyrum ponticum. GISH also revealed that the centromeric region may be the critical area that discriminates the St genome from the E genome in Th. ponticum. Of the seven partial amphiploids isolated from backcrossed progenies of Triticum aestivum x Thinopyrum ponticum hybrids, two (lines 693 and 7631) have eight pairs of chromosomes from the E(e) and (or) E(b) genomes. Four partial amphiploids (lines 784, 68, 7430, and 40767-1) have an incomplete St genome, i.e., six pairs of chromosomes of St and one pair of chromosomes from E(e) or E(b) In a heptaploid individual of the partial amphiploid 40767-2, there were four pairs of St chromosomes, one pair of St/1B Robertsonian translocation chromosomes, one pair of St/E translocation chromosomes, and one pair of E(e) or E(b) chromosomes. The isoelectric focusing of Est-5, Est-4, beta-Amy-1, alpha-Amy-1, and alpha-Amy-2 and the RAPD data generated with 24 decamer primers on five partial amphiploids (lines 784, 693, 7631, 68, and 7430) indicated that lines 693 and 7631 had identical genomes from Th. ponticum. The partial amphiploid 784 probably had a set of chromosomes completely different from those of 693 and 7631. These results indicate that genome recombination usually occurred during the formation of new polyploid lines. [References: 28].

1821 Zhou, H.; Arrowsmith, J.W.; Fromm, M.E.; Hironaka, C.M.; Taylor, M.L.; Rodriguez, D.; Pajeau, M.E.; Brown, S.M.; Santino, C.G.; Fry, J.E. (Monsanto Company, St. Louis, Missouri (USA)) (1995) **Glyphosate-tolerant CP4 and GOX genes as a selectable marker in wheat transformation.** *Plant Cell Reports (Germany) v. 15(3-4) p. 159-163.* 2 ill., 2 tables; 29 ref. English. (AGRIS 97-018330).

1822 Zorinyants, S.E.; Nosov, A.V.; Badaeva, E.D.; Smolenskaya, I.N.; Badaev, N.S. (Russian Academy of Sciences, Moscow (Russian Federation). K. A. Timiryazev Inst. of Plant Physiology) (1995) **Cytogenetic analysis of a long-term Triticum timopheevii (Zhuk.) Zhuk. cell suspension culture.** *Plant Breeding (Germany) v. 114(3) p. 219-225.* 1 ill., 4 graphs, 4 tables; 34 ref. English. (AGRIS 97-018287).

In vitro culturing of plant cells can cause changes in karyotype. Chromosome variations following long-term propagation in suspension culture of Triticum timopheevii (Zhuk.) Zhuk. were studied by routine staining and C-banding. The culture was highly heterogeneous with respect to the number and structure of chromosomes. The modal class cells had a lower chromosome number than T. timopheevii (2n = 28). This data was confirmed by cytophotometric analysis of nuclear-DNA content. Frequencies of chromosome loss varied for different homoeologous groups. A' genome chromosomes tended to be preferentially eliminated in cells of different ploidy levels. Deletions, insertions, translocations, telocentric chromosomes, isochromosomes and dicentrics and their derivatives were observed in cultured cells. Chromosomes of various homoeologous groups differed in the frequencies and spectra of re-arrangements, but most aberrations occurred in the G-genome chromosomes. In vitro chromosome modifications did not correspond to in vivo variation. Presumably, this difference was caused by differences in the mechanisms of adaptation to the environment at the levels of the cell and the whole organism. G-genome chromosomes were more frequently involved in this process, both in vivo and in vitro.

F50 PLANT STRUCTURE

1823 Evert, R.F.; Russin, W.A.; Botha, C.E.J. (Wisconsin Univ., Madison (USA). Dept. of Botany) (1996) **Distribution and frequency of plasmodesmata in relation to photoassimilate pathways and phloem loading in the barley leaf.** *Planta (Germany) v. 198(4) p. 572-579.* 4 ill., 1 table; 37 ref. English. (AGRIS 97-018553).

1824 Gilroy, S. (1996) **SIGNAL TRANSDUCTION IN BARLEY ALEURONE PROTOPLASTS IS CALCIUM DEPENDENT AND INDEPENDENT.** *Plant Cell. 8(12):2193-2209.* English. [PENN STATE UNIV DEPT BIOL 208 MUELLER LAB UNIVERSITY PK, PA 16802 USA].

Gibberellic acid (GA) increases Ca2+ and calmodulin (CaM) levels in barley aleurone cells, and abscisic acid (ABA) antagonizes the GA effect, These alterations in cytoplasmic Ca2+ and CaM have been suggested to be central regulators of the secretory response of the barley aleurone, Using microinjection of caged Ca2+, Ca2+ chelators, and CaM, we mimicked or blocked these hormonally induced changes in Ca2+ and CaM and assessed their effects on GA and ABA action, Although mimicking GA-induced changes in Ca2+ and CaM did not mimic GA action, blocking these changes did prevent GA stimulation of secretion. The induction of the amylase gene by CA was, however, unaffected. Similarly, blocking the decrease in Ca2+ normally caused by ABA in these cells blocked ABA action, except that induction of Em gene transcription by ABA was unaffected. These results suggest that GA and ABA signals are transduced by Ca2+- and CaM-dependent and Ca2+- and CaM-independent systems in the aleurone cell. [References: 55].

1825 Wenzel, CL.; Chandler, PM.; Cunningham, RB.; Passioura, JB. (1997) **CHARACTERIZATION OF THE LEAF EPIDERMIS OF BARLEY (HORDEUM VULGARE L HIMALAYA).** *Annals of Botany. 79(1):41-46.* English. [CSIRO DIV PLANT IND GPO BOX 1600 CANBERRA ACT 2601 AUSTRALIA].

The cell types of mature leaves of barley (Hordeum vulgare L. 'Himalaya') are described. Blade and sheath epidermal cell types were characterized according to their position relative to the veins, stomatal rows, and sclerenchyma cells. Cells over Veins were further classified according to the size of vein. Cell lengths of the approx. 15 different cell types ranged from approximately 50 mu m to over 2 mm. The principal difference in cell length between the abaxial and adaxial surfaces was seen for cells lying between the veins; on the adaxial surface these cells (bulliform cells) were about 200 mu m long whereas those on the abaxial surface were over 2 mm in length. Total file number across the blade width was the same on the abaxial and adaxial surfaces. However, there were more cells lying over veins than between Veins on the adaxial surface, and vice versa for the abaxial surface. The detailed description of leaf epidermal cell types of barley in this study provides the basis for comparison with mutants which differ in leaf length (Wenzel et al., Annals of Botany 79: 45-50, 1997). (C) 1997 Annals of Botany Company [References: 13].

1826 Wenzel, CL.; Chandler, PM.; Cunningham, RB.; Passioura, JB. (1997) **COMPARATIVE LEAF EPIDERMAL ANATOMY OF MUTANTS OF BARLEY (HORDEUM VULGARE L HIMALAYA) WHICH DIFFER IN LEAF LENGTH.** *Annals of Botany. 79(1):47-52.* English. [COOPERAT RES CTR PLANT SCI GPO BOX 475 CANBERRA ACT 2601 AUSTRALIA].

We wished to determine the nature of differences in epidermal cell numbers and dimensions between leaves of different length in mutants of barley (Hordeum vulgare L. 'Himalaya'). Three comparisons were made: leaf one (L1) vs. leaf four (L4); wild type us. nine dwarf mutants and wild type us. a slender mutant. L1 was shorter than L4, and for most lines this was associated with a change in epidermal cell number for the blade, and in both cell number and length for the sheath. Compared to wild type, the smaller leaves of dwarf plants generally had shorter and fewer cells in both blade and sheath. The blade of slender plants was the same length (L1) or longer (L4) than wild type, while the sheath was longer than that of wild type for both L1 and L4. Slender plants had longer but fewer cells than the wild type along the blade of L1, and shorter but more cells for the blade of L4. In the sheath, slender plants had longer and more (LI) or fewer (L4) cells than did the wild type. For L1, variation in blade width amongst the barley lines was associated with a change in file width and file number. For L4, blade width varied only with file number, except for slender plants where narrow blades were associated with reduced file

width. Hence there was no consistent correlation between changes in cell size or cell(or file) number with changes in leaf length or width. Differences depended on the leaf (L1 vs. L4), leaf part (blade us. sheath), and the nature of the mutation (dwarf vs. slender). (C) 1997 Annals of Botany Company [References: 17].

F60 PLANT PHYSIOLOGY AND BIOCHEMISTRY

1827 **EBC METHOD 3.2.1 (BARLEY) - 3.2.1 TOTAL NITROGEN OF BARLEY - DUMAS COMBUSTION METHOD** (1996) *Monatsschrift fur Brauwissenschaft. 49(11-12):329-330.* English.

1828 Aach, H.; Boese, G.; Graebe, J.E. (Goettingen Univ. (Germany). Botanischer Garten, Pflanzenphysiologisches Inst.) (1995) **ent-Kaurene biosynthesis in a cell-free system from wheat (Triticum aestivum L.) seedlings and the localisation of ent-kaurene synthetase in plastids of three species.** *Planta (Germany) v. 197(2) p. 333-342.* 4 ill., 8 tables; 40 ref. English. (AGRIS 97-019000).

1829 Archambault, DJ.; Zhang, GC.; Taylor, GJ. (1996) **ACCUMULATION OF AL IN ROOT MUCILAGE OF AN AL-RESISTANT AND AN AL-SENSITIVE CULTIVAR OF WHEAT.** *Plant Physiology. 112(4):1471-1478.* English. [UNIV ALBERTA DEPT BIOL SCI EDMONTON AB T6G 2E9 CANADA].

To estimate rates of Al accumulation within the symplasm, all apoplastic pools of Al need to be eliminated or accounted for. We have developed a revised kinetic protocol that allows us to estimate the contribution of mucilage-bound Al to total, nonexchangeable Al, and to eliminate the mucilage as an apoplastic pool of Al. By comparing the Al content of excised root tips (2 cm) of wheat (Triticum aestivum L.) with and without the removal of the mucilage (using a 10-min wash in 1 M NH4Cl), we found that Al bound to the mucilage accounted for approximately 25 to 35% of Al remaining after desorption in citric acid. The kinetics of Al uptake into mucilage were biphasic, with a rapid phase occurring in the first 30 min of uptake, followed by a linear phase occurring in the remainder of the experimental period (180 min). By adopting a step for removal of mucilage into our existing kinetic protocol, we have been able to isolate a linear phase of uptake with only a slight deviation from linearity in the first 5 min. Although we cannot unambiguously identify this phase of uptake as uptake into the symplasm, we believe this new protocol provides us with the most accurate quantitative estimate of symplastic Al yet available. [References: 26].

1830 Arif, H.; Ahmad, N. (University of Agriculture, Faisalabad (Pakistan). Dept. of Crop Physiology) (1994) **Turgor pressure variations in wheat leaf tissues.** *Journal of Agricultural Research (Pakistan) v. 32(3) p. 267-271.* 2 tables, 14 ref. English. (AGRIS 97-019005).

A complete study of plant water relations needs a detailed knowledge of heterogeneity of different parameters of plant water relations within each tissue of various plant organs such as leaf and root. In this context, turgor pressure was studied comprehensively to check such variations in wheat leaf epidermis. There was an ascending trend in turgor pressure values from growing zone to mature zone of the leaf. This trend changed with cell positions and their age. It indicates presence of longitudinal variations in turgor pressures. However, turgor pressure values were almost similar on both abaxial and adaxial sides of the same leaf. It indicates the absence of any horizontal variation. Other study concluded that absolute results should only be drawn on the basis of the data obtained at smaller resolutions such as in single cells. But not on the one obtained at whole organ level unlike the past.

1831 Aufhammer, W.; Pieper, HJ.; Kasser, J.; Schafer, V.; Senn, T.; Kubler, E. (1996) **THE SUITABILITY OF GRAINS FROM CEREAL CROPS WITH DIFFERENT N SUPPLY FOR BIOETHANOL PRODUCTION.** *Journal of Agronomy & Crop Science-Zeitschrift fur Acker und Pflanzenbau. 177(3):185-196.* German. [UNIV HOHENHEIM INST PFLANZENBAU & GRUNLAND FRUWITTHSTR 23 D-70599 STUTTGART GERMANY].

The properties of grains of different small grain cereals, produced under increasing N-supply levels, for conversion into bioethanol were investigated. Grain material of winterwheat, -rye and -triticale, two cultivars each, was used. At two locations, field experiments comprising several N-fertilization levels between 0 and 180kg N/ha were conducted. The main parameters analysed were the bioethanol output (l bioethanol/dt grain dry matter) and the bioethanol yield (l bioethanol/ha), both under addition and without addition of technical enzymes. Furthermore, the falling numbers, the protein content and the autoamylolytic quotient (AAQ) were determined. AAQ means the autoamylolytic bioethanol output related to the output under addition of technical enzymes. With a rising N-supply, yields/ha and the protein contents of grain increased differently. Combined with increasing protein contents, decreasing bioethanol outputs were measured, particularly with wheat, to a smaller extent with triticale, and to an even lesser extent with rye. Only with wheat were the AAQ-values significantly reduced as a consequence of rising N-supply levels. In interaction with growing conditions, cultivars and N-levels, the bioethanol yields/ha of rye and triticale equalled or even surpassed the yields of wheat, particularly under autoamylolytic-conversion processing conditions. [References: 22].

1832 Badiani, M.; Paolacci, AR.; Miglietta, F.; Kimball, BA.; Pinter, PJ.; Garcia, RL.; Hunsaker, DJ.; Lamorte, RL.; Wall, GW. (1996) **SEASONAL VARIATIONS OF ANTIOXIDANTS IN WHEAT (TRITICUM AESTIVUM) LEAVES GROWN UNDER FIELD CONDITIONS.** *Australian Journal of Plant Physiology. 23(6):687-698.* English. [UNIV VITERBO DIPARTIMENTO AGROBIOL & AGROCHIM VIA SC LELLIS I-01100 VITERBO ITALY].

Water-soluble antioxidants, glycolate oxidase activity and net photosynthesis were measured from seedling establishment to physiological maturity, in healthy, expanded, uppermost leaves collected weekly from wheat (Triticum aestivum L. cv. Yecora Rojo) plants growing under near-optimum field conditions. Most of the antioxidants fluctuated in a cyclic, non-regular manner throughout the season, the strongest oscillations being shown by glutathione and by H2O2-scavenging enzymes. Time series analysis revealed significant correlation among the seasonal profiles of those antioxidants participating in the 'ascorbate-glutathione cycle'. Their seasonal changes were also synchronised with those of both midday maximal net CO2 assimilation rate and of glycolate oxidase activity. This could confirm, over the whole of plant ontogeny and in field-grown plant material, the connections among photosynthetic activity and the plant cell antioxidant network and could suggest that similar mechanisms intervene in the integrated control of active oxygen generated during photorespiration. Peaks of antioxidant levels concentrated during certain periods of the plant growing season. Since no evidence of environmental stress was concurrently observed, it is suggested that a higher antioxidant capacity could be required in order to face endogenous and transient oxidative strain associated with definite plant developmental stages, namely juvenility, floral induction, stem elongation, anthesis and senescence. [References: 41].

1833 Barabas, B. (Godolloi Agrartudomanyi Egyetem, Godollo (Hungary). Kozponti Laboratorium) (1995) **[Experiences in determination of moisture and protein contents of wheat by means of NIR method]. Tapasztalatok buza nedvesseg- es feherjetartalmanak NIR modszerrel torteno meresenel.** *Elelmiszervizsgalati Kozlemenyek (Hungary) v. 41(4) p. 281-288.* Hungarian. (AGRIS 97-003836).

Accuracy of NIR method for determination of the moisture and protein contents of wheat grains were studied under Hungarian conditions. 700 samples were analyzed over 10 years. Accuracy of measurement corresponded to 0.2 and 0.3 percent with moisture and protein content, respectively. Extreme errors of measurement could be detected by the Mahalanobis-distance derived from the reflectance data. A calibration equation was introduced, that could be corrected for measuring the content of wheat from various years.

1834 Ben Hammouda, M. (University of Missouri, Columbia, MO.); Kremer, R.J.; Minor, H.C.; Sarwar, M. (1995) **A chemical basis for differential allelopathic potential of sorghum hybrids on wheat.** *Journal of chemical ecology (USA) v. 21(6) p. 775-786.* references. English. (AGRIS 97-003793).

The basis for differential allelopathic potentials among sorghum (Sorghum bicolor L. Moench) hybrids was investigated by conducting quantitative and qualitative studies of their phenolic contents. Total phenolic content in sorghum plant parts varied within hybrids, among hybrids, and between growing seasons. Inhibition of wheat (Triticum aestivum L.) radicle growth was positively associated ($r = 0.66$) with concentrations of total phenolics contained in plant parts. Extracts from culms contributed the highest proportion of toxicity from sorghum plants, inhibiting radicle growth up to 74.7. Concentrations of five phenolic acids, p-hydroxybenzoic (POH), vanillic (VAN), syringic (SYR), p-coumaric

(PCO), and ferulic (FER), differed in all plant parts of the three sorghum hybrids. Concentrations of POH, VAN, and SYR were consistently higher than PCO and FER. PCO and FER were absent from some plant parts, with FER being the most frequently missing. Inhibition of wheat radicle growth was found to be positively associated with the concentration of each phenolic acid. Vanillic acid was most highly associated (r = 0.44) with inhibition. Thus, above-ground sorghum tissues contained phenolic acids that contributed to allelopathic potential. Additionally, sorghum roots exuded POH, VAN, and SYR that may enhance the overall allelopathic potential of sorghum during growth and after harvest when residues remain on the soil surface or are incorporated prior to planting a subsequent crop.

1835 Berbert, PA.; Stenning, BC. (1996) **ANALYSIS OF DENSITY-INDEPENDENT EQUATIONS FOR DETERMINATION OF MOISTURE CONTENT OF WHEAT IN THE RADIOFREQUENCY RANGE.** *Journal of Agricultural Engineering Research. 65(4):275-286.* English. [UNIV FED VICOSA DEPT ENGENHARIA AGR BR-36571000 VICOSA MG BRAZIL].

The accuracy of determination of the moisture content of grain and seeds by estimation of their dielectric properties is well known to be dependent on the density of the samples. Where measurement involves the use of bulk samples of whole grain, as in a parallel plate or concentric cylinder capacitor, if the temperature is held constant, it is the bulk density which primarily influences the measured value of material of a given moisture content. A range of mechanical and electrical means of minimising this effect has been put forward by previous authors. The present paper reviews the electrically based solutions; these have been investigated and an analysis made of their effectiveness in minimising the density dependence of the measured dielectric values for static samples. A range of excitation frequencies from 500 kHz to 5 MHz was employed in laboratory experiments on hard winter wheat, Triticum aestivum L., varieties Mercia, Hereward, and Hussar, which were preconditioned to moisture contents from 10 to 22% wet basis. The bulk density of the samples was controlled between 665 and 873 kg/m(3) in a concentric cylinder capacitor. Of the models investigated for the correlation of the dielectric parameters of static samples of grain and moisture content, the most satisfactory in terms of the size of the errors involved, was the single frequency method based on the density-independence of the function [(epsilon' - 1)/epsilon "]. Non-linear regression analysis using data from varieties Mercia and Hereward yielded an equation capable of estimating wheat moisture content with a standard error of calibration of about 0.3 percentage point for moistures ranging from 11 to 22% at 1 MHz. The two-frequency, two-parameter method involving the measurement of the permittivity and the natural logarithm of the loss factor, also provided a result which is well within the performance expected of commercial moisture meters. (C) 1996 Silsoe Research Institute [References: 18].

1836 Berbert, PA.; Stenning, BC. (1996) **ON-LINE MOISTURE CONTENT MEASUREMENT OF WHEAT.** *Journal of Agricultural Engineering Research. 65(4):287-296.* English. [UNIV FED VICOSA DEPT ENGENHARIA AGR BR-36571000 VICOSA MG BRAZIL].

A method has been developed which allows continuous measurement of the moisture content of a stream of hard winter wheat to an accuracy acceptable for normal grain drying operations. A test rig was designed and constructed to allow measurements to be made, on-line, of grain flowing through a sensing device. All sets of experiments were conducted at room temperature (19-24 degrees C), where the relative humidity varied from 50% to 65%. The dielectric properties were measured using wheat samples with bulk densities ranging from 625 to 891 kg/m(3). A series of simultaneous measurements of capacitance and conductance at 0.5 MHz on varieties Slejpner, Mercia, and Hereward, varying in moisture content from 11.5-21.5%, w.b., revealed that the function [(epsilon'-1)/epsilon "] was practically independent of mass flow rate in the range from 2.0-14.4 kg s(-1) m(-2) Non-linear regression models were used to correlate moisture content with. the function [(epsilon'-1)/epsilon "]. The individual calibration equations developed for each variety could estimate moisture content with standard errors of calibration of 0.5 percentage point (Slejpner), and 0.4 percentage point (Mercia and Hereward). The maximum error of moisture estimation was 1.3 percentage points, and occurred for a sample of variety Slejpner at 21.8% moisture content. The maximum error never exceeded 0.7 percentage point for varieties Mercia and Hereward. The limitation of moisture contents to the range from 11.5 to 16.3% led to a linear relation between moisture content and the function [(epsilon'-1)/epsilon "], reducing the standard errors of calibration to the surprisingly low value of 0.1 percentage point moisture. (C) 1996 Silsoe Research Institute [References: 12].

1837 Boivin, P. (Institut Francais des Boissons de la Brasserie Malterie, Vandoeuvre les Nancy (France)); Kohl, S.; Clarmagirand, V. (1995) **[Barley endogenous phytohormones and malting performance]. Phytohormones: les nouveaux marqueurs de la qualite germinative de l'orge brassicole.** *BIOS BOISSONS (France) v. 26(255) p. 119-124.* 23 ref., 8 graph. English. (AGRIS 97-018583).

1838 Bush, D.S. (Rutgers Univ., Newark, New Jersey (USA). Dept. of Biological Sciences) (1996) **Effects of gibberellic acid and environmental factors on cytosolic calcium in wheat aleurone cells.** *Planta (Germany) v. 199(1) p. 89-99.* 9 ill., 1 table; 36 ref. English. (AGRIS 97-019003).

1839 Bush, D.S.; Wang, T. (Rutgers Univ., Newark, New Jersey (USA). Dept. of Biological Sciences) (1995) **Diversity of calcium-efflux transporters in wheat aleurone cells.** *Planta (Germany) v. 197(1) p. 19-30.* 9 ill., 2 tables; 37 ref. English. (AGRIS 97-018999).

1840 Choi, CH.; Mathews, AP. (1996) **TWO-STEP ACID HYDROLYSIS PROCESS KINETICS IN THE SACCHARIFICATION OF LOW-GRADE BIOMASS .1. EXPERIMENTAL STUDIES ON THE FORMATION AND DEGRADATION OF SUGARS.** *Bioresource Technology. 58(2):101-106.* English. [KWANDONG UNIV DEPT ENVIRONM ENGN KANGREUNG 210701 SOUTH KOREA].

Two-step acid hydrolysis studies were performed on various types of low-grade biomass, such as bakery waste, grain dust wood chips and wheat straw These wastes contain predominantly starch, cellulose, hemicellulose, or combinations of these carbohydrates. The hydrolysis conditions for each step were determined by using pure starch and cellulose as substrates. Starch and hemicellulose were hydrolyzed at 132 degrees C for 40 min using 2% H2SO4 Cellulose was hydrolyzed at 132 degrees C for 70 min using 15% H2SO4 Dilute acid hydrolysis of bakery waste provided 92% conversion to glucose with no xylose in the hydrolyzate. In the case of wood chips, grain dust and wheat straw, substantial quantities of xylose were obtained at the end of the second hydrolysis step. Bakery waste has good potential for use as a feedstock for the production of chemicals due to the high yield of almost 80 g glucose/100 g substrate. Twostep hydrolysis gave 40-50 g of total sugars/100 g of substrates in the case of wood chips, grain dust and wheat straw. The observed trends for starch and cellulose hydrolysis indicate that the conversion of biomass to sugars can be maximized by using a two-step hydrolysis process. Copyright (C) 1997 Elsevier Science Ltd. [References: 12].

1841 Collis, B.E.; Plum, S.A.; Farrar, J.F.; Pollock, C.J. (School of Biological Sciences, University of Wales Bangor, Bangor, Gwynedd LL57 2UW (United Kingdom)) (1996) **Root growth of barley at elevated CO2.** *Aspects of Applied Biology (United Kingdom) (no.45) p. 181-185.* 7 ref. Implications of 'Global environmental change' for crops in Europe, 1-3 April 1996, Churchill College, Cambridge, UK. English. (AGRIS 97-003444).

1842 Eriksson, J.; Oborn, I.; Jansson, G.; Andersson, A. (1996) **FACTORS INFLUENCING CD-CONTENT IN CROPS - RESULTS FROM SWEDISH FIELD INVESTIGATIONS.** *Swedish Journal of Agricultural Research. 26(3):125-133.* English. [SWEDISH UNIV AGR SCI DEPT SOIL SCI POB 7014 S-75007 UPPSALA SWEDEN].

In this paper we review results from 20 years of Swedish field studies focussed on evaluating the influence of soil Cd-content on Cd-levels in agricultural crops. These investigations have been performed on fields subject to normal agricultural management where P-fertilizers and atmospheric deposition are the main Cd-sources. At present, these sources are roughly of equal size. Statistical analysis of the sampled material shows that the Cd-content (extractable in boiling 2M HNO3) of the soil (positive relation) and soil pH (negative relation) are the main soil factors influencing the uptake of Cd by plants from Swedish soils. In wheat, the soil Cd-level is the most important factor. Uptake is also positively correlated with precipitation during the growing season. Budget calculations show that soil Cd-contents are still increasing. Furthermore, there are areas in Sweden with elevated soil Cd-levels where Cd-contents of 5-10% of the wheat lots produced are near or above limit values (0.1 mg kg(-1)) for tolerable contents for cereals. Liming has limited value as a

measure for decreasing uptake since wheat soils generally have the near neutral pH value considered as optimal for most crops. We conclude that the level of Cd in soil is an important and decisive factor determining its uptake and that there are areas where a further increase in soil Cd-levels should be avoided. To further efforts to decrease the input of Cd to soil we suggest that the declaration of the Cd-contents of all P-fertilizers be made mandatory. It is also necessary to make "Cd-free" P-fertilizer available on the market. It could be used on soils high in plant-available Cd and for crops that require large doses of P-fertilizer or that naturally take up large amounts of this metal. A further reduction in emissions of Cd to the atmosphere is also necessary to get a balance between the input and output of Cd with regard to agricultural soils. [References: 40].

1843 Fouquin, G. (Malteries Soufflet, Nogent sur Seine (France)); Boutier, A.; Le Bail, M.; Savary, C. (1996) **[New signposts for keeping track of the "nitrogen process in barley" [jubil test, foliar diagnosis, prediction of proteins]]. Nouveaux indicateurs pour le suivi du process azote dans l'orge [test jubil, diagnostic foliaire, prediction du taux de proteines].** *BIOS BOISSONS (France) v. 27(261) p. 83-84.* Barley Malt Beer. English. (AGRIS 97-003117).

1844 Fredlund, K.; Asp, NG.; Larsson, M.; Marklinder, I.; Sandberg, AS. (1997) **PHYTATE REDUCTION IN WHOLE GRAINS OF WHEAT, RYE, BARLEY AND OATS AFTER HYDROTHERMAL TREATMENT.** *Journal of Cereal Science. 25(1):83-91.* English. [COLL KALMAR DEPT NAT SCI POB 905 S-39129 KALMAR SWEDEN].

Whole grains of different cereals have traditionally been prepared with water and heat prior to dehulling, but knowledge of the effect on nutritional properties is limited. The aim of the present study was to investigate if phytate reduction occurred during hydrothermal treatment of whole grains. Wheat, rye, hulled and dehulled barley, hulled oats and naked oats were incubated with either water or acetate buffer (pH 4.8) at 55 degrees C for 24h with the exception of oats, which were incubated at 37 degrees C. Phytate in wheat, rye and barley was reduced by 46-77 % when water was used and by 84-99 % when acetate buffer was used. The phytate reduction in oats was considerably less, 8-26 %, but, after grinding and soaking, phytate was reduced by 72-77 % in dehulled oats and by 88-91% in naked oats. Citric acid and citrate buffer was used for pH adjustment in some experiments, and their use resulted in less phytate reduction than when acetate and lactic acid were used. Wet-steeping of naked oats and naked barley in water al 53-57 degrees C for 20-30 min reduced the bacterial counts by 99.97 %, and the addition of acid prevented bacterial growth during the incubations. It was concluded that cereals with reduced phytate content and good hygienic quality can be developed and produced using hydrothermal treatment of whole grains. (C) 1997 Academic Press Limited [References: 32].

1845 Habash, D.Z.; Paul, M.J.; Parry, M.A.J.; Keys, A.J.; Lawlor, D.W. (IACR Rothamsted, Harpenden, Hertfordshire (United Kingdom). Biochemistry and Physiology Dept.) (1995) **Increased capacity for photosynthesis in wheat grown at elevated CO2: the relationship between electron transport and carbon metabolism.** *Planta (Germany) v. 197(3) p. 482-489.* 6 ill., 2 tables; 22 ref. English. (AGRIS 97-019001).

1846 Hansen, NC.; Jolley, VD.; Berg, WA.; Hodges, ME.; Krenzer, EG. (1996) **PHYTOSIDEROPHORE RELEASE RELATED TO SUSCEPTIBILITY OF WHEAT TO IRON DEFICIENCY.** *Crop Science. 36(6):1473-1476.* English. [BRIGHAM YOUNG UNIV DEPT AGRON & HORT 259 WIDB PROVO, UT 84602 USA].

Some wheat (Triticum aestivum L. emend, Thell.) genotypes when grazed by livestock and subsequently used for grain production develop Fe deficiency chlorosis and decline in grain yield. Wheat is known to release phytosiderophores (compounds involved in Fe mobilization and uptake) in response to Fe deficiency stress. These studies conducted in environmental growth chambers correlated the release of phytosiderophore from the roots of eight wheat genotypes with field chlorosis scores from Oklahoma grazing trials. Plants were grown hydroponically in low Fe nutrient solutions and phytosiderophore release was measured with an Fe-binding assay, Since grazing exacerbates Fe deficiency chlorosis development, the eight genotypes were tested both with and without clipping. Phytosiderophore release with time was summed to improve correlation compared with individual daily measurements. The field chlorosis scores and the sum of the first six phytosiderophore release measurements (Days 6 to II after imposition of low Fe treatment) from unclipped wheat were not correlated (r = -0.17, P = 0.70), but the sum of the Last five days (13 to 17) was highly correlated with field chlorosis scores (r = -0.82, P = 0.01). Clipping did not greatly improve the relationship (r = -0.83, P = 0.008). Correlation coefficients were more consistent for individual days when plants were clipped, Three-day sums of phytosiderophore release provided good correlations when data were collected in the latter stages of Fe deficiency development (Day II). Identification of chlorosis resistant lines by monitoring phytosiderophore release will by-pass years of field trials and should be implemented by plant breeders where wheat is managed concurrently for forage and grain production on calcareous soils. [References: 19].

1847 Hylton, C.M.; Denyer, K.; Keeling, P.L.; Chang, M. T.; Smith, A.M. (John Innes Centre, Norwich (United Kingdom)) (1996) **The effect of waxy mutations on the granule-bound starch synthases of barley and maize endosperms.** *Planta (Germany) v. 198(2) p. 230-237.* 5 ill., 1 table; 24 ref. English. (AGRIS 97-018760).

1848 Igamberdiev, AU.; Zhou, GQ.; Malmberg, G.; Gardestrom, P. (1997) **RESPIRATION OF BARLEY PROTOPLASTS BEFORE AND AFTER ILLUMINATION.** *Physiologia Plantarum. 99(1):15-22.* English. [UMEA UNIV DEPT PLANT PHYSIOL S-90187 UMEÅ SWEDEN].

Respiratory O-2 consumption was investigated in dark-adapted barley (Hordeum vulgare L. cv. Gunilla) protoplasts and after illumination for 10 min at high and very low CO2 in the presence of respiratory and photorespiratory inhibitors. In dark-adapted protoplasts no difference was observed between inhibitor treatments in high and very low CO2. The respiratory rate increased somewhat after illumination and a difference in responce to inhibitors was in some cases observed between high and very low CO2. Thus, the operation of the mitochondrial electron transport chain is affected following a period of active photosynthesis. In all situations tested, oligomycin inhibited respiratiory O-2 uptake indicating that respiration of mitochondria in protoplasts is not strictly ADP limited. Antimycin A inhibited respiration more in dark-adapted protoplasts than after illumination whereas SHAM gave the opposite response. Rotenone inhibited respiration both in dark adapted protoplasts (about 30%) and after illumination where the inhibition was much greater in very low CO2 (50%) than in high CO2 (10%). After iilumination in very low CO2, SHAM + rotenone inhibited respiration almost completely (70%). Photorespiratory inhibitors had very small effect on O-2 consumption in darkness. After illumination the effect of aminoacetonitrile (AAN) was also very low whereas a-hydroxypyridine-2-methane sulphonate (HPMS) in photorespiratory conditions inhibited O-2 uptake much stronger (35%). The addition of glyoxylate enhanced respiration in the presence of HPMS up to the control level suggesting that alternative pathways of glyoxylate conversion might be operating. The differences in inhibitor responses may reflect fine mechanisms for the regulation of energetic balance in the plant cell which consists of switching from electron transport coupled to ATP production to non-coupled transport. Photorespiratory flux is also very flexible, and the suppression of glycine decarboxylation can induce bypass reactions of glyoxylate metabolism. [References: 33].

1849 Johansson, CG. (1996) **DETERMINATION OF TOTAL NITROGEN IN BARLEY AND MALT BY COMBUSTION METHOD - COLLABORATIVE TRIAL.** *Monatsschrift fur Brauwissenschaft. 49(11-12):326-328.* English.

A combustion method, relying on the Dumas principle, for the determination of total nitrogen in barley and malt, has been collaboratively tested by the Analysis Committee of the European Brewery Convention. Repeatability, r(95), and reproducibility, R(95), values were 0.063 and 0.116% of dry matter, respectively, for samples with nitrogen contents in the range 1.23 to 1.86% N of dry matter. There was no significant difference between these values for barley and malt. The Analysis Committee approved The adoption of the combustion method for inclusion in Analytica EBC as an alternative method. [References: 4].

1850 Kader, JC. (1997) **LIPID-TRANSFER PROTEINS - A PUZZLING FAMILY OF PLANT PROTEINS [Review].** *Trends in Plant Science. 2(2):66-70.* English. [UNIV PARIS 06 LAB PHYSIOL CELLULAIRE & MOL URA CNRS 2135 4 PL JUSSIEU F-75252 PARIS 05 FRANCE].

Lipid transfer proteins are small, basic proteins, and have been purified from various plant sources, They are able to transfer lipids between membranes in vitro and, on the basis of this, were initially thought to participate in the intracellular flux of lipids during membrane synthesis.

However, the finding that these proteins are located in the cell wall and can be secreted has led to the suggestion that they are not required for intracellular lipid transport. Instead, they may be involved in cutin biosynthesis, surface wax formation, pathogen-defence reactions, or the adaptation of plants to environmental changes. [References: 36].

1851 Kerstiens, G. (1996) **CUTICULAR WATER PERMEABILITY AND ITS PHYSIOLOGICAL SIGNIFICANCE [Review].** *Journal of Experimental Botany. 47(305):1813-1832.* English. [UNIV LANCASTER INST ENVIRONM & BIOL SCI DIV BIOL SCI LANCASTER LA1 4YQ ENGLAND].

Cuticles act as solution-diffusion membranes for water transport. Diffusion in pores does not contribute to cuticular transpiration. An extensive literature survey of cuticular permeances (P) and minimum leaf conductances (g(min)) to water is presented. The two variables cannot be distinguished with most experimental techniques. Results from different experiments are in good agreement with each other for some species, for example, Fagus sylvatica L., but not for others, such as Picea abies (L.) Karst. In a data set of 313 values of P or g(min) from 200 species, distributions of results obtained with different techniques were found to differ significantly. Likely reasons include water loss from incompletely closed or incompletely sealed stomata, and the dependence of P on moisture content of the cuticle and on storage time of isolated cuticles. Contrasting evidence for an interaction between cuticular transpiration and stomatal sensitivity to air humidity is presented. The occurrence of unusually high g(min) in trees growing at the alpine treeline and its physiological significance are discussed. It is shown that g(min) is of little value as a predictor for drought resistance of crops, with the possible exception of Sorghum bicolor L. Moench. Possible water uptake from fog or dew across cuticles is considered briefly. [References: 160].

1852 Kervinen, J. (University of Helsinki, Finland.); Tormalamgas, K.; Runeberg Roos, P.; Guruprasad, K.; Blundell, T.; Teeri, T.H. (1994) **Structure and possible function of aspartic proteinases in barley and other plants.** *Aspartic proteinases : structure, function, biology, and biomedical implications p. 241-254.* Plenum Press. references. Paper presented at the Proceedings of the Fifth International Conference on Aspartic Proteinases, September 19-24, 1993, Gifu, Japan. English. (AGRIS 97-018801).

1853 Kluge, M.; Grambow, HJ.; Sicker, D. (1997) **(2R)-2-BETA-D-GLUCOPYRANOSYLOXY-4, 7-DIMETHOXY-2H-1, 4-BENZOXAZIN-3(4H)-ONE FROM TRITICUM AESTIVUM.** *Phytochemistry. 44(4):639-641.* English. [UNIV LEIPZIG INST ORGAN CHEM TALSTR 35 D-04103 LEIPZIG GERMANY].

(2R)-2-beta-D-Glucopyranosyloxy-4, 7-dimethoxy-2H-1, 4-benzoxazin-3(4H)-one was isolated from Triticum aestivum for the first time. The absolute configuration was determined as the 2R-type by spectroscopic methods. Copyright (C) 1997 Elsevier Science Ltd. [References: 24].

1854 Lee, J.; Vogt, T.; Schmidt, J.; Parthier, B.; Lobler, M. (1997) **METHYLJASMONATE-INDUCED ACCUMULATION OF COUMAROYL CONJUGATES IN BARLEY LEAF SEGMENTS.** *Phytochemistry. 44(4):589-592.* English. [INST PFLANZENBIOL WEINBERG 3 D-06120 HALLE GERMANY].

The effect of methyljasmonate on the induction of phenolic components in barley leaf segments was investigated. RP-HPLC of methanol extracts showed that three compounds accumulate to high concentrations in response to methyljasmonate treatment. Two of them were identified as N-(E)-4-coumaroylputrescine and N-(E)-4-coumaroylagmatine by UV-spectroscopy and mass spectrometry. Copyright (C) 1997 Elsevier Science Ltd. [References: 26].

1855 Lehmann, J.; Atzorn, R.; Brueckner, C.; Reinbothe, S.; Leopold, J.; Wasternack, C.; Parthier, B. (Institute of Plant Biochemistry, Halle (Germany)) (1995) **Accumulation of jasmonate, abscisic acid, specific transcripts and proteins in osmotically stressed barley leaf segments.** *Planta (Germany) v. 197(1) p. 156-162.* 6 ill.; 36 ref. English. (AGRIS 97-018758).

1856 Massiah, A.J.; Hartley, M.R. (Warwick Univ., Coventry (United Kingdom). Dept. of Biological Sciences) (1995) **Wheat ribosome-inactivating proteins: Seed and leaf forms with different specificities and cofactor requirements.** *Planta (Germany) v. 197(4) p. 633-640.* 7 ill.; 48 ref. English. (AGRIS 97-019002).

1857 Moore, J.; Bamforth, CW.; Kroon, PA.; Bartolome, B.; Williamson, G. (1996) **FERULIC ACID ESTERASE CATALYSES THE SOLUBILIZATION OF BETA-GLUCANS AND PENTOSANS FROM THE STARCHY ENDOSPERM CELL WALLS OF BARLEY.** *Biotechnology Letters. 18(12):1423-1426.* English. [BRF INT NUTFIELD RH1 4HY SURREY ENGLAND].

Two separate, highly purified ferulic acid esterases from a fungal and bacterial source are both capable of releasing beta-glucan and pentosans from the cell walls of the starchy endosperm of barley. This suggests that ester linkages involving ferulic acid contribute to the integrity of such walls. [References: 15].

1858 Nagarajan, S.; Gambhir, PN.; Gupta, NK.; Pande, PC. (1996) **DYNAMICS OF DRY MATTER ACCUMULATION IN THE DEVELOPING GRAINS OF THREE WHEAT GENOTYPES WITH CONTRASTING GRAIN WEIGHT.** *Journal of Agronomy & Crop Science-Zeitschrift fur Acker und Pflanzenbau. 177(4):269-273.* English. [IARI REG STN KARNAL PUNJAB INDIA].

The accumulation of dry matter and its major components was studied in developing grains of two bold seeded (Selection-111 and IWP-5308) and one small seeded (kalyansona) wheat genontypes grown in pot culture condition. It was observed that in kalyansona, a sharp reduction in grain water content during the critical stage of grain enlargement limits its size resulting in compact filling of grains. In the developing grains of Selection-111 and IWP-5308, the high rate of dry matter accumulation was associated with their larger grain sink size. However, their lower grain density compared to kalyansona could be explained on the basis of non-complementation between synthetic component and grain size (structural component). This non-complementation may be due to relatively higher thermosensitive synthetic mechanism in the bold seeded genotypes. [References: 10].

1859 Nedel, JL.; Ullrich, SE.; Pan, WL. (1997) **DRY MATTER AND NITROGEN ACCUMULATION BY STANDARD HEIGHT AND SEMI-DWARF BARLEY ISOTYPES.** *Pesquisa Agropecuaria Brasileira. 32(2):155-164.* English. [UFPEL FAC AGRON DEPT FITOTECN CAIXA POSTAL 354 BR-96001970 PELOTAS RS BRAZIL].

To assess nitrogen movement from the soil into the plant and within the plant, studies of dry matter and N accumulation are necessary. The objective of this experiment was to study the effect of 30, 60, 90 and 120 kg of N/ha on dry matter and N accumulation by four standard height-semi-dwarf normal mutant malting barley isotype pairs (Morex, Hazen, Norbert, Andre) and two check cultivars: Steptoe and Klages. Considerable differences among genotypes on dry matter accumulation until anthesis and dry matter lost during grain filling period were observed. Genotypic differences for pre-anthesis (range: 36.6 to 52.9 mg N/plant) and post-anthesis (range: -2.3 to 10.8 mg N/plant)N accumulation and in total N accumulation (range: 69 to 149.2 mg N/plant in 1987 and 41.3 to 56.5 mg N/ha in 1989) were observed. Within the isotype pairs, consistent differences were detected for post-anthesis and total N accumulation both favoring the standard isotypes. These differences were not affected by fertilizer N levels. Genotypic differences in N remobilization into the grain were also observed. Relationship between N and dry matter partitioning are discussed. [References: 26].

1860 Nedel, JL.; Ullrich, SE.; Pan, WL. (1997) **NITROGEN USE BY STANDARD HEIGHT AND SEMI-DWARF BARLEY ISOTYPES.** *Pesquisa Agropecuaria Brasileira. 32(2):147-153.* English. [UFPEL FAC AGRON DEPT FITOTECN CAIXA POSTAL 354 BR-96001970 PELOTAS RS BRAZIL].

Considering that a substantial amount of N applied in cereal production may be lost by leaching or erosion, the development of cultivars with increased efficiency to utilize N and more efficient N management practices are desirable. The objective of this experiment was to study the effect of 30, 60, 90 and 120 kg of N/ha on N use by four standard height semi-dwarf normal-mutant malting barley isotype pairs (Morex, Hazen, Norbert, Andre). Genotypic differences in N remobilization in the grain, remobilization efficiency, utilization efficiency and uptake efficiency and N use efficiency were observed. The standard isotypes with few exceptions had higher values for all of these N traits. Nitrogen remobilization in the grain increased with increasing N fertilization while N utilization and N use efficiency decreased in both standard and semi-dwarf isotypes. Nitrogen use and grain yield relations are discussed. [References: 28].

1861 Pal, S.K.; Verma, U.N.; Singh, M.K.; Thakur, R. (Birsa Aagricultural University, Ranchi (India)) (1996) **Heat-unit requirment for phenological development of wheat (Triticum aestivum) under different levels of irrigation, seeding date and fertilizer.** *Indian Journal of Agricultural Sciences (India) v. 66(7) p. 397-400.* 2 tables; 8 ref. English. (AGRIS 97-003838).

1862 Plum, S.A.; Farrar, J.F.; Stirling, C. (University of Wales, Bangor, Gwynedd LL57 2UW (United Kingdom)) (1996) **Carbon partitioning in barley following manipulation of source and sink.** *Aspects of Applied Biology (United Kingdom) (no.45) p. 177-180.* 8 ref. Implications of 'Global environmental change' for crops in Europe, 1-3 April 1996, Churchill College, Cambridge, UK. English. (AGRIS 97-003443).

1863 Pritchard, P.E.; Bhandari, D.G. (Campden and Chorleywood Food Research Association, Chorleywood, Hertfordshire WD3 5SH (United Kingdom)) (1996) **The influence of nitrogen fertilisers on the expression of functional proteins in wheat.** *HGCA Project Report (United Kingdom); no. 121 35 p.* Home Grown Cereals Authority. 27 ref. English. (AGRIS 97-003605).

1864 Psenakova, T.; Luxova, M.; Gasparikova, O. (Slovenska Akademia Vied, Bratislava (Slovakia). Botanicky Ustav) (1995) **Oxygen uptake of germinating wheat embryos using salicylhydroxamic acid (SHAM).** *Biologia (Slovakia). Sect. Botany v. 50(1) p. 105-107.* 1 ill., 11 ref. English. (AGRIS 97-003839).

The titration curves of respiration rates throughout imbibition and germination of isolated wheat embryos (Triticum durum, cv. Appulo) were determined. From these curves the appropriate salicylhydroxamic acid (SHAM) concentrations needed to inhibit the cyanide-resistant alternative pathway, without any side effects, were estimated for each stage: 5 mmol l** (-1) for 30 minutes, 10 mmol l** (-1) for 3, 6, 12 and 48 hours and 15 mmol l** (-1) for 24 hours.

1865 Rascio, A.; Russo, M.; Difonzo, N. (1997) **SIMPLIFIED PROCEDURE FOR ESTIMATING TISSUE AFFINITY FOR BOUND WATER IN DURUM WHEAT.** *Crop Science. 37(1):275-277.* English. [IST SPERIMENTALE CEREALICOLTURA SS 16 KM 675 I-71100 FOGGIA ITALY].

Bound water has been studied intensively in relation to abiotic stress tolerance, but investigations of its role as a component of drought resistance in crop plants have been hampered by lack of rapid, inexpensive, and reliable methods capable of processing large populations in a short time. We investigated the possibility of estimating thermodynamic properties of strongly bound water in wheat leaves (Triticum durum Desf.) using a simplified analysis of water sorption, which made use of 39 paired isotherm curves constructed at 5 and 20 degrees C, and thermodynamic parameters derived from them. Tissue affinity for strongly bound water (expressed as average differential enthalpy = Delta (H) over bar) was compared with measurements of the difference in water sorbed (DWS) by the leaves at 5 and 20 degrees C at relative humidities of 7, 11, 33, and 43%. Measurement of DWS at 33% relative humidity gave the best estimate of Delta (H) over bar, and therefore constituted a reliable, inexpensive, simplified method for the evaluation of tissue affinity for strongly bound water. [References: 18].

1866 Rudorff, BFT.; Mulchi, CL.; Lee, EH.; Rowland, R.; Pausch, R. (1996) **EFFECTS OF ENHANCED O-3 AND CO2 ENRICHMENT ON PLANT CHARACTERISTICS IN WHEAT AND CORN.** *Environmental Pollution. 94(1):53-60.* English. [UNIV MARYLAND DEPT AGRON H J PATTERSON HALL COLLEGE PK, MD 20742 USA].

The effects of CO2 enrichment and O-3 induced stress on wheat (Triticum aestivum L.) and corn (Zea mays L.) were studied in field experiments using open-top chambers to simulate the atmospheric concentrations of these two gases that are predicted to occur during the coming century. The experiments were conducted at Beltsville, MD, during 1991 (wheat and corn) and 1992 (wheat). Crops were grown under char coal filtered (CF) air or ambient air +40 nl liter(-1) O-3 (7 h per day, 5 days per week) having ambient CO2 concentration (350 mu l liter(-1) CO2) or +150 mu l liter(-1) CO2 (12 h per day). Averaged over O-3 treatments, the CO2-enriched environment had a positive effect on wheat grain yield (26% in 1991 and 15% in 1992) and dry biomass (15% in 1991 and 9% in 1992). Averaged over CO2 treatments, high O-3 exposure had a negative impact on wheat grain yield (-15% in 1991 and -11% in 1992) and drill biomass (-11% in 1991 and -9% in 1992). Averaged over CO2 treatments, high O-3 exposure decreased corn grain yield by 9%. No significant interactive effects were observed for either crop. The results indicated that CO2 enrichment had a beneficial effect in wheat (C-3 crop) but not in corn (C-4 crop). It is likely that the O-3-induced stress will be diminished under increased atmospheric CO2 concentrations; however, maximal benefits in crop production in wheat in response to CO2 enrichment will not be materialized under concomitant increases in tropospheric O-3 concentration. Copyright (C) 1996 Elsevier Science Ltd. [References: 60].

1867 Ruiz, M.; Carrillo, JM. (1996) **GLI-B3/GLU-B2 ENCODED PROLAMINS DO NOT AFFECT SELECTED QUALITY PROPERTIES IN THE DURUM WHEAT CROSS ABADIA X MEXICALI 75.** *Plant Breeding. 115(5):410-412.* English. [UNIV POLITECN MADRID CIUDAD UNIV UNIDAD GENET ESCUELA TECN SUPER INGN AGRON E-28040 MADRID SPAIN].

A study was made of the effects of the Gli-B3/Glu-B2 encoded prolamins on durum-wheat quality. Twenty-six F-3 lines from the durum wheat cross 'Abadia' x 'Mexicali 75' were analysed electrophoretically for prolamin composition and for the following quality parameters: SDS sedimentation value. mixing properties, and percentage grain protein and percentage vitreous kernels. The results showed that the presence or absence of the Gli-B3/Glu-B2 encoded prolamins did not result in any significant difference in the quality characteristics of the F-3 lines; however. as expected, the LMW glutenins encoded at Glu-B3 showed large differences and are therefore the major prolamins influencing durum wheat gluten quality. [References: 15].

1868 Schuurink, RC.; Bakhuizen, R.; Libbenga, KR.; Boulanger, F.; Sinjorgo, KMC. (1997) **DORMANT BARLEY ALEURONE SHOWS HETEROGENEITY AND A SPECIFIC CYTODIFFERENTIATION.** *Journal of Cereal Science. 25(1):27-36.* English. [TNO DEPT PLANT BIOTECHNOL RUL WASSENAARSEWEG 64 NL-2333 AL LEIDEN NETHERLANDS].

In response to gibberellic acid, aleurone layers isolated from dormant barley (Hordeum distichum L. cl. Triumph) kernels produced significantly less alpha-amylase than aleurones from non-dormant kernels. Light microscopical investigations using the dye acridine orange as well as electron microscopical studies showed that the relatively low alpha-amylase production by aleurones from dormant kernels appears to be due to tile majority of the cells remaining quiescent after GA(3) incubation. The cells that did show ultrastructural signs of GA(3)-induced activation occurred in clusters that spanned ail three cell layers of the dormant aleurone. These cells showed a characteristic ultrastructure, which was different from that described previously for GA, incubated non-dormant aleurone layers. abundant. The presence of alpha-amylase in the Golgi could be demonstrated by immune-gold labelling in these cells. Remarkably, most endosperm-facing aleurone cells in the activated clusters showed no cell wall degradation. This cytodifferentiation pattern could be mimicked in aleurone cells from non-dormant grains by imbibition of the grains in abscisic acid (ABA) prior to GA, incubation. These data support the notion of heterogeneity of aleurone cells with respect to GA, sensitivity, and suggest that ABA is involved in the impaired GA(3) response of aleurone cells from dormant barley. (C) 1997 Academic Press Limited [References: 40].

1869 Scott, P.; Lyne, R.L.; Rees, T. ap (Cambridge Univ. (United Kingdom). Dept. of Plant Sciences) (1995) **Metabolism of maltose and sucrose by microspores isolated from barley (Hordeum vulgare L.).** *Planta (Germany) v. 197(3) p. 435-441.* 2 ill., 6 tables; 31 ref. English. (AGRIS 97-018759).

1870 Sharma, B.D.; Kar, S.; Sarkar, S. (Indian Institute of Technology, Kharagpur (India). Department of Agricultural and Food Engineering) (1995) **Prediction of water extraction pattern of wheat roots under varying moisture and nitrogen levels.** *Journal of the Indian Society of Soil Science (India) v. 43(4) p. 674-676.* 4 tables; 4 ref. English. (AGRIS 97-003837).

1871 Southan, MD.; Copeland, L. (1996) **PHYSICAL AND KINETIC PROPERTIES OF ACETOHYDROXYACID SYNTHASE FROM WHEAT LEAVES.** *Physiologia Plantarum. 98(4):824-832.* English. [UNIV SYDNEY DEPT AGR CHEM & SOIL SCI SYDNEY NSW 2006 AUSTRALIA].

Acetohydroxyacid synthase (AHAS, EC 4.1.3.18; also known as acetolactate synthase), which catalyses the first reaction common to the

biosynthesis of the branched-chain amino acids, L-valine, L-leucine and L-isoleucine, and is the target of several classes of herbicides, has been studied in hydroponically-grown seedlings of wheat (Triticum aestivum L. cv. Vulcan). Enzyme activity was greater in leaves than roots, reaching a maximum between 4 and 6 days after germination. AHAS was associated with the chloroplasts after centrifugation in a density gradient. A preparation of the enzyme was obtained from wheat leaves which gave a single band after electrophoresis in native gels but was resolved by denaturing sodium dodecyl sulphate-polyacrylamide gel electrophoresis into three polypeptide bands of molecular mass 58, 57 and 15 kDa. The native molecular mass was approximately 128 kDa. AHAS had optimum activity at pH 7 and did not require the addition of flavin adenine dinucleotide (FAD), thiamine pyrophosphate (TPP) and MgCl2 for activity. The enzyme did not display typical hyperbolic kinetics, in that the double reciprocal plot of activity against pyruvate concentration was non-linear. The concentration of pyruvate that gave half of the maximum activity was 4 mM. Sulfonylurea and imidazolinone herbicides were potent inhibitors of wheat leaf AHAS, with 50% inhibition bring observed at concentrations of 0.6 and 0.3 mu M for chlorsulfuron and metsulfuron methyl, respectively, and at 2.5, 5 and 10 mu M for imazaquin, imazethapyr and imazapyr. Inhibition by bath classes of compounds was reversed by removal of the inhibitor. Progress curves of product formation against time in the presence of the herbicides were non-linear and based on the assumption that inhibition by the sulfonylureas was of the slow, tight-binding type, estimates of 0.17 and 0.1 nM were obtained for the dissociation constants of chlorsulfuron and metsulfuron methyl, respectively, from the steady-state enzyme-inhibitor complex. [References: 41].

1872 Sutton, KH.; Bietz, JA. (1997) **VARIATION AMONG HIGH MOLECULAR WEIGHT SUBUNITS OF GLUTENIN DETECTED BY CAPILLARY ELECTROPHORESIS.** *Journal of Cereal Science. 25(1):9-16.* English. [NEW ZEALAND INST CROP & FOOD RES PRIVATE BAG 4704 CHRISTCHURCH NEW ZEALAND].

Capillary electrophoresis (CE) in conjunction with a selective precipitation procedure, was used to reveal biochemical variation among Glu-1 HMW-glutenin subunits in wheat cultivars. The heterogeneity that was observed parallelled that recognized previously using SDS-PAGE, although some differences in relative mobility of protein bands were observed. Modifications of the CE method introduced in this paper allow the resolution of all HMW-glutenin subunits commonly found in wheat cultivars worldwide. On comparison of the results presented in this paper with those in current literature the inclusion of the precipitation step in the preparation of the HMW-glutenin subunits for CE analysis appears to give cleaner samples, with fewer interfering gliadin and LMW-glutenin subunits. The technique could be used, in conjunction with SDS-PAGE and/or RP-HPLC, in breeding programs to confirm the HMW-glutenin subunit composition of parents and promising selections and/or to establish the presence of 'unusual' HMW-glutenin subunits. When glutenin subunits From two New Zealand cultivars were analysed qualitatively, Otane, a good breadmaking cultivar, showed relatively higher concentrations of HMW-glutenin subunits than did Karamu, a poor bread making cultivar, closely parallelling results obtained previously for these cultivars using RP-HPLC. (C) 1997 Academic Press Limited [References: 20].

1873 Swanson, SJ.; Jones, RL. (1996) **GIBBERELLIC ACID INDUCES VACUOLAR ACIDIFICATION IN BARLEY ALEURONE.** *Plant Cell. 8(12):2211-2221.* English. [UNIV CALIF BERKELEY DEPT PLANT & MICROBIAL BIOL BERKELEY, CA 94720 USA].

The roles of gibberellic acid (GA(3)) and abscisic acid (ABA) in the regulation of vacuolar pH (pH(v)) in aleurone cells of barley were investigated using the pH-sensitive fluorescent dye 2', 7'-bis(2-carboxyethyl)-5(6)-carboxyfluorescein (BCECF). BCECF accumulated in vacuoles of aleurone cells, but sequestration of the dye did not affect its sensitivity to pH. BCECF-loaded aleurone cells retained their ability to respond to both GA(3) and ABA. The pH(v) of freshly isolated aleurone cells is 6.6, but after incubation in GA(3), the pH(v) fell to 5.8. The pH(v) of cells not incubated in hormones or in the presence of ABA showed little or no acidification. The aleurone tonoplast contains both vacuolar ATPase and vacuolar pyrophosphatase, but the levels of pump proteins were not affected by incubation in the presence or absence of hormones. We conclude that GA(3) affects the pH(v) in aleurone cells by altering the activities of tonoplast H+ pumps but not the amounts of pump proteins. [References: 48].

1874 Vasanthan, T.; Bhatty, RS.; Tyler, RT.; Chang, P. (1997) **ISOLATION AND CATIONIZATION OF BARLEY STARCHES AT LABORATORY AND PILOT SCALE.** *Cereal Chemistry. 74(1):25-28.* English. [UNIV ALBERTA DEPT AGR FOOD & NUTR SCI EDMONTON AB T6G 2P5 CANADA].

Prime barley starches were isolated in the laboratory by a conventional extraction procedure from regular (Condor), waxy (SB89528), and high amylose (Glacier) barleys; cationized; and evaluated as wet-end additives in papermaking. The cationized barley starches showed functionality (contribution to paper strength) comparable that of to a commercial grade cationic corn starch. The laboratory evaluation was followed by a pilot plant study in which an air-classified starch-rich fraction from Condor barley was purified by a short wet-extraction procedure. The starch obtained was then cationized, using a slightly different procedure than that used in the laboratory. Mass balances for starch extraction and cationization were obtained for the pilot plant study. The cationized barley starch needs evaluation in a Canadian paper mill. [References: 12].

1875 Virtanen, A.; Peltonen, J. (1996) **POST-HARVEST EVALUATION OF NITROGEN SUFFICIENCY FOR SMALL-GRAIN CEREALS BY MEASURING GRAIN PROTEIN CONCENTRATION.** *Journal of Agronomy & Crop Science-Zeitschrift fur Acker und Pflanzenbau. 177(3):153-160.* English. [PLANT PROD INSPECT CTR DEPT SEED TESTING POB 111 FIN-32201 LOIMAS FINLAND].

Nitrogen (N) fertilizer is an important and expensive input in small-grain cereal production, and growers therefore should aim to optimize its use. Possibilities for using grain protein concentration for post-harvest evaluation of N sufficiency were determined in this study. Field experiments including spring wheat (Triticum aestivum L), spring barley (Hordeum vulgare L.) and spring oats (Avena sativa L.), and various rates of N fertilizer application were conducted in southern and western-Finland over 2 years. Grain yield and grain protein were positively correlated and fitted quadratic regression models. Both critical and optimum levels for grain protein concentration were determined by Cate-Nelson analysis. Critical values were 12.2 for wheat, 10.2 for barley and 10.9 for oats, and corresponding optimum values were 13.3, 11.1 and 12.7, respectively. The accuracy of the method was tested using results from on-farm spring wheat trials. The results indicated that N fertilizer uptake and grain yield were best in fields where grain protein concentration exceeded the critical values but not the optimum. Growers should use more intensive N fertilization management if grain protein concentration does not exceed critical values. Grain protein concentrations above optimum values indicate over-fertilization for maximum grain yield. Analysing previous research data to identify the "critical level" of grain protein concentration is not difficult, and will provide growers, extension personnel, and fertilizer dealers with a cost effective means of evaluating the efficiency of N use by the crop and for developing N fertilization recommendations. [References: 16].

1876 White, E.M.; McMichael, A.C.; Milford, G.F.H. (Plant Testing Station, Crossnacreevy, Castlereagh, Belfast BT6 9SH (United Kingdom)) (1995) **Effects of site and nitrogen management on growth and grain quality for malting of winter barley.** *HGCA Project Report (United Kingdom); no. 119 202 p.* Home Grown Cereals Authority. 30 ref. English. (AGRIS 97-003264).

1877 Zwar, J.A.; Chandler, P.M. (CSIRO, Canberra (Australia). Div. of Plant Industry) (1995) **Alpha-amylase production and leaf protein synthesis in a gibberellin-responsive dwarf mutant of 'Himalaya' barley (Hordeum vulgare L.).** *Planta (Germany) v. 197(1) p. 39-48.* 7 ill., 4 tables; 33 ref. English. (AGRIS 97-018757).

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1878 Baier, M.; Bilger, W.; Wolf, R.; Dietz, KJ. (1996) **PHOTOSYNTHESIS IN THE BASAL GROWING ZONE OF BARLEY LEAVES.** *Photosynthesis Research. 49(2):169-181.* English. [UNIV WURZBURG JULIUS VON SACHS INST BIOWISSENSCH MITTLERER DALLENBERGWEG 64 D-97082 WURZBURG GERMANY].

Cell proliferation, elongation, determination and differentiation mainly take place in the basal 5 mm of a barley leaf, the so-called basiplast. A

considerable portion of cDNAs randomly selected from a basiplast cDNA Library represented photosynthetic genes such as CP29, RUBISCO-SSU and type I-LHCP II. Therefore, we became interested in the role of the basiplast in establishing photosynthesis. (1) Northern blot analysis revealed expression of photosynthetic genes in the basiplast, although at a low level. Analysis of basiplasts at different developmental stages of the leaves revealed maximal expression of photosynthetic genes during early leaf development. The activity of these genes shows that plastid differentiation involves the development of the photosynthetic apparatus even at this early state of leaf cell expansion. (2) This conclusion was supported by the fact that chlorophylls and carotenoids are synthesized in the basiplast. The qualitative pattern of pigment composition was largely similar to that of fully differentiated green leaves. (3) The transition from proplastids to chloroplasts progressed in the basal 5 mm of the leaf, so that the number of grana lamellae per thylakoid stack increased with distance from the meristem from zero to about five. (4) Photosynthetic function was studied by chlorophyll a-fluorescence measurements. In dark-adapted 8-day-old primary leaves, the fluorescence ratio (F-P - F-o)/F-P was little decreased in basiplasts as compared to leaf blades. During steady state photosynthesis, the ratio (F-M' - F-o)/F-M' was high in the leaf blade (0.5), but low in the sheath (0.25) and in the basiplast (0.18), indicating the existence of functional, albeit low light-adapted chloroplasts in the basiplast. (5) Further on, chlorophyll a fluorescence analysis in relation to seedling age revealed efficient photosynthetic performance in the basiplast of 3- to 6-day-old seedlings which later-on differentiates into leaf blade as compared to the basiplast of 7- to 12-day-old seedlings which develops into leaf sheath and finally ceases to grow. The leaf age dependent changes in basiplast photosynthesis were reflected by changes in pigment contents and LHCP II expression both of which also revealed a maximum in the basiplast of 4-day-old seedlings. [References: 45].

1879 Bughio, N.; Takahashi, M.; Yoshimura, E.; Nishizawa, NK.; Mori, S. (1997) **LIGHT-DEPENDENT IRON TRANSPORT INTO ISOLATED BARLEY CHLOROPLASTS.** *Plant & Cell Physiology. 38(1):101-105.* English. [UNIV TOKYO DEPT APPL BIOL CHEM LAB PLANT MOL PHYSIOL BUNKYO KU YAYOI 1-1-1 TOKYO 113 JAPAN].

Translocation studies of Fe-59(III)-epihydroxymugineic acid in intact barley plants revealed that Fe transport from leaf veins to mesophyll cells is light-regulated. Similarly, Fe absorption studies with isolated chloroplasts showed that the Fe influx is light-dependent whereas its efflux occurred in the dark. [References: 18].

1880 Busch, MA.; Bottger, M. (1997) **NET PROTON SECRETION AS A PARAMETER FOR NITRATE UPTAKE.** *Protoplasma. 196(1-2):65-68.* English. [UNIV HAMBURG INST ALLGEMEINE BOT OHNHORSTSTRASSE 18 D-22609 HAMBURG GERMANY].

Nitrate uptake and its link to net proton secretion in wheat (Triticum aestivum L. cv. Tassilo, Caribo, and Astron) were investigated using a pH-stat system. Since nitrate is taken up in symport with protons, nitrate and proton fluxes should be correlated. Nitrate concentration in the medium, measured by HPLC, decreased in a linear manner. The addition of nitrate caused a drop in net proton secretion rate to negative values (net proton influx). Once nitrate concentration had been lowered to a well defined level, net proton secretion rate started to recover. This critical nitrate concentration depended on the initial nitrate concentration in the medium. A technique to derive nitrate uptake rates from time courses of net proton secretion was developed and is described. Briefly, this method requires the initial nitrate concentration and the time until the minimal net proton secretion rate is achieved. Results determined with this technique were found in excellent agreement to simultaneous direct measurements of nitrate uptake by HPLC. Measurement of net proton secretion therefore can be used as a parameter for nitrate uptake and as a screening method for uptake efficiency. This method was used to compare three varieties of a high nitrogen efficiency breeding line of wheat. The originally less nitrogen efficient variety outperformed the actually sold cultivar in nitrate uptake rate. [References: 21].

1881 Castelli, F.; Contillo, R.; Miceli, F. (1996) **NON-DESTRUCTIVE DETERMINATION OF LEAF CHLOROPHYLL CONTENT IN FOUR CROP SPECIES.** *Journal of Agronomy & Crop Science-Zeitschrift fur Acker und Pflanzenbau. 177(4):275-283.* English. [MIRAAF IST SPERIMENTALE TABACCO I-37051 BOVOLONE VR ITALY].

A recent non-destructive technique allows estimation of leaf chlorophyll content using the portable SPAD-502 chlorophyll meter. Measurements were taken on four species (winter wheat, maize, soyabean and tobacco) subjected to different nitrogen regimes or senescence status and the non-destructive readings were compared with analytical results obtained by solvent extraction. In general, the relationship between the SPAD measurement and the analytical result was not linear and species was a factor in three out of four crops. Linear, quadratic and exponential curve fitting are presented; only the interpolation with a polynomial exponential function adequately describes the whole data set. The presence of statistically non-significant differences between the estimated values of wheat and maize on the one hand and significant points of difference between those of tobacco and soyabean on the other suggests distinct behaviour patterns for monocots and dicots. This type of response may be explained by differences in the optical properties of pigments with differing spatial distributions (sieve effect) and therefore by in vivo and in vitro different procedures and the structural diversity of leaves belonging to the two subclasses. [References: 25].

1882 Chernyad'ev, I.I. (1995) **[Photosynthesis in water-stressed wheat: protective effects of cytokinins]. Fotosintez pshenitsy pri vodnom stresse i zashchitnoe vliyanie tsitokininov.** *Prikladnaya biokhimiya i mikrobiologiya (Russian Federation) v. 31(6) p. 650-656.* 40 ref. Russian. (AGRIS 97-004028).

The intensity of photosynthetic CO2 assimilation, the activity of ribulose-1, 5-bisphospshate carboxylase/oxygenase (Rubisco), the contents of chlorophylls a and b, and the size of the endogenous pool of free abscisic acid were studied in winter wheat Triticum aestivum L. subjected to water stress induced by discontinuing irrigation (for 10 days) or administering 1, 2, or 3 polyethylene glycol-6000 (for 7-14 days). Photosynthetic CO2 assimilation and the activity Rubisco were considerably suppressed. These effects correlated with the increase in the pool of free abscisic acid in above-ground and underground organs of the plant. The chlorophyll a/b ratio decreased because of predominant decreases in the level of chlorophyll a. Photosynthetic CO2 assimilation increased over 7 days of recovery (when irrigation was resumed) but did not return to the baseline level. The cytokinin 6-benzylaminopurine, as well as Thidiazuron and Cartolin-2 (the latter produced a stronger effect than the former), which both act as cytokinins, considerably decreased the inhibitory effects of water stress on photosynthesis.

1883 Chirko, CP.; Gold, MA.; Nguyen, PV.; Jiang, JP. (1996) **INFLUENCE OF ORIENTATION ON WHEAT YIELD AND PHOTOSYNTHETIC PHOTON FLUX DENSITY (Q(P)) AT THE TREE AND CROP INTERFACE IN A PAULOWNIA-WHEAT INTERCROPPING SYSTEM.** *Forest Ecology & Management. 89(1-3):149-156.* English. [MICHIGAN STATE UNIV DEPT FORESTRY E LANSING, MI 48824 USA].

An on-farm field research study to characterize wheat yield in plots oriented 2.5 m east (E), west (W), and north (N) from the canopy of a north-south row of 11-year-old Paulownia trees was conducted at Zhengzhou, Henan Province, PR China. Wheat yield was higher on the east orientation compared with the west and north as determined by total grain weight and 1000-grain weight. Measured photosynthetic photon flux density (Q(p)) was higher on E orientation during critical stages of wheat development. Soil pH, soil organic matter, available nitrogen, phosphorus, and air temperature parameters did not affect yield differences. In a second, related study, yield data from plots with and without plastic root barriers, placed to a depth of 1 m between the tree and winter wheat yield plots located 2.5 m E or W of the tree row, indicated that tree and crop root interaction had no effect on total grain weight or 1000-grain weight. However, there was a significant increase in yield of the E orientation as compared with the W. [References: 18].

1884 Fecenko, J.; Lozek, O.; Mazur, B.; Mazur, K. (1997) **RESORPTION OF MACRONUTRIENTS AND CADMIUM IN DEPENDENCE ON APPLICATION OF SODIUM HUMATE.** *Rostlinna Vyroba. 43(1):43-47.* Czech. [UNIV AGR NITRA SLOVAKIA].

In conditions of three-years lasting pot trial the effect of sodium humate in integrity with liquid nitrogen fertilizer DAM 390 as exerted on resorption of macronutrients and cadmium. It was found that sodium humate (treatment 3) affected significantly uptake of macronutrients. Barley grain withdrew more nitrogen by 38.9%. Uptake of other nutrients was higher by 30% on average compared with treatment 2 (NPK). Difference of high significance was attained in all investigated nutrients. Slight, statistically insignificant reduction in nutrient concentration in grain in connection with humate application is conditioned by higher

grain yield by 39.5%. Significant increase of the yield indicates that sodium humate stimulates intake of nutrients and their utilization for yield formation. Analogous results were determined also in uptake of nutrients by roots of spring barley. Sodium humate affected significantly the content of cadmium in grain and straw. Owing to its retardation action one fifth of cadmium in grain and one half in straw in treatment 3 compared with the control treatment 2. Cadmium application in treatments 4 and 5 resulted in highly significant increase of cadmium uptake in all organs of plants (grain, straw, roots). Good results of sodium humate action start to be used in production of liquid commercial fertilizers. [References: 12].

1885 Gahoonia, T.S. (Royal Veterinary and Agricultural Univ., Frederiksberg, Copenhagen (Denmark). Dept. of Agricultural Sciences); Nielsen, N.E. (1996) **Variation in acquisition of soil phosphorus among wheat and barley genotypes.** *Plant and Soil (Netherlands) v. 178(2) p. 223-230.* 40 ref. English. (AGRIS 97-019146).

1886 Gilmore, AM. (1997) **MECHANISTIC ASPECTS OF XANTHOPHYLL CYCLE-DEPENDENT PHOTOPROTECTION IN HIGHER PLANT CHLOROPLASTS AND LEAVES.** *Physiologia Plantarum. 99(1):197-209.* English. [AUSTRALIAN NATL UNIV RES SCH BIOL SCI PHOTOBIOENERGET GRP GPO BOX 475 CANBERRA ACT 2601 AUSTRALIA].

Higher plants must dissipate absorbed light energy that exceeds the photosynthetic capacity to avoid molecular damage to the pigments and proteins that comprise the photosynthetic apparatus. Described in this minireview is a current view of the biochemical, biophysical and bioenergetic aspects of the primary photoprotective mechanism responsible for dissipating excess excitation energy as heat from photosystem II (PSII). The photoprotective heat dissipation is measured as nonphotochemical quenching (NPQ) of the PSII chlorophyll a (Chi a) fluorescence. The NPQ mechanism is controlled by the trans thylakoid membrane pH gradient (Delta pH) and the special xanthophyll cycle pigments. In the NPQ mechanism, the de-epoxidized endgroup moieties and the trans-thylakoid membrane orientations of antheraxanthin (A) and zeaxanthin (Z) strongly affect their interactions with protonated chlorophyll binding proteins (CPs) of the PSII inner antenna. The CP protonation sites and steps are influenced by proton domains sequestered within the proteo-lipid core of the thylakoid membrane. Xanthophyll cycle enrichment around the CPs may explain why changes in the peripheral PSII antenna size do not necessarily affect either the concentration of the xanthophyll cycle pigments on a per PSII unit basis or the NPQ mechanism. Recent time-resolved PSII Chi a fluorescence studies suggest the NPQ mechanism switches PSII units to an increased rate constant of heat dissipation in a series of steps that include xanthophyll de-epoxidation, CP-protonation and binding of the xanthophylls to the protonated CPs; the concerted process can be described with a simple two-step, pH-activation model. The xanthophyll cycle-dependent NPQ mechanism is profoundly influenced by temperatures suboptimal for photosynthesis via their effects on the trans-thylakoid membrane energy coupling system. Further, low temperature effects can be grouped into either short term (minutes to hours) or long term (days to seasonal) series of changes in the content and composition of the PSII pigment-proteins. This minireview concludes by briefly highlighting primary areas of future research interest regarding the NPQ mechanism. [References: 71].

1887 Greenwood, D.J.; Rahn, C.; Draycott, A.; Vaidyanathan, L.V.; Paterson, C. (Horticulture Research International, Wellesbourne, Warwick, CV35 9EF (United Kingdom)) (1996) **Modelling and measurement of the effects of fertilizer-N and crop residue incorporation on N-dynamics in vegetable cropping.** *Soil Use and Management (United Kingdom) v. 12(1) p. 13-24.* 33 ref. English. (AGRIS 97-003923).

1888 Huckelhoven, R.; Schuphan, I.; Thiede, B.; Schmidt, B. (1997) **BIOTRANSFORMATION OF PYRENE BY CELL CULTURES OF SOYBEAN (GLYCINE MAX L), WHEAT (TRITICUM AESTIVUM L), JIMSONWEED (DATURA STRAMONIUM L), AND PURPLE FOXGLOVE (DIGITALIS PURPUREA L).** *Journal of Agricultural & Food Chemistry. 45(1):263-269.* English. [RHEIN WESTFAL TH AACHEN INST BIOL ECOL ECOTOXICOL ECOCHEM 5 WORRINGER WEG 1 D-52056 AACHEN GERMANY].

The metabolism of the four-ringed polycyclic aromatic hydrocarbon (PAH) pyrene was investigated using cell suspension cultures of soybean, wheat, purple foxglove, and jimsonweed and callus cultures of soybean and foxglove. In all species, nonextractable residues were found (soybean, jimsonweed, and foxglove suspensions, < 10% of applied C-14; soybean and foxglove callus cultures, 20-25%; wheat, 30-40%); soluble metabolites were detected in only foxglove and wheat. About 90% of applied pyrene was transformed in wheat. Corresponding data from soybean and foxglove callus cultures were about 30% and those from soybean, jimsonweed, and foxglove suspensions about 7%. In foxglove, 1-hydroxypyrene methyl ether was identified as the main metabolite, whereas a complex mixture of carbohydrate conjugates of 1-hydroxypyrene was found in wheat. Due to the present results, crop and wild plants may be metabolic sinks for PAHs in the environment. Concentrations and toxicological implications of 1-hydroxypyrene, its derivatives, and analogous metabolites of other PAHs should be investigated. [References: 38].

1889 Kaetterer, T. (Swedish Univ. of Agricultural Sciences, Uppsala (Sweden). Dept. of Ecology and Environmental Research); Andren, O. (1996) **Measured and simulated nitrogen dynamics in winter wheat and a clay soil subjected to drought stress or daily irrigation and fertilization.** *Fertilizer Research (Netherlands) v. 44(1) p. 51-63.* 30 ref. English. (AGRIS 97-019147).

1890 Karavaev, VA.; Solntsev, MK.; Yurina, TP.; Yurina, EV.; Kukushkina, MA.; Ekobena, FAP. (1997) **LUMINESCENCE PARAMETERS AND PHOTOSYNTHESIS IN WHEAT LEAVES UNDER VARIOUS CONDITIONS OF MINERAL NUTRITION.** *Russian Journal of Plant Physiology. 44(1):14-16.* English. [MOSCOW MV LOMONOSOV STATE UNIV FAC PHYS MOSCOW 119899 RUSSIA].

Data on luminescence parameters in wheat (Triticum aestivum L.) leaves from plants grown at various N : P : K ratios revealed a positive correlation between the rate of photosynthesis per mg chlorophyll, on the one hand, and the relative fluorescence quenching of slow fluorescence induction ($r = 0.70$, $P > 0.99$) and relative integral emission of thermoluminescence band B ($r = 0.63$, $P > 0.99$), on the other hand. [References: 11].

1891 Koenig, R.T. (Washington State University, Pullman, WA.); Pan, W.L. (1996) **Chloride enhancement of wheat responses to ammonium nutrition.** *Soil Science Society of America (USA) v. 60(2) p. 498-505.* references. English. (AGRIS 97-004029).

Calcium chloride combined with an enhanced ammonium supply (EAS) (0.5:1 Ca/NH4 molar ratio) has increased yields of horticultural crops. Greenhouse experiments were conducted to determine if Ca or Cl promote wheat (Triticum aestivum L., cv. Len) responses to an EAS. Wheat was grown in a Shano silt loam soil (coarse-silty, mixed, mesic Andic Mollic Camborthid) with 0 to 400 mg N kg-1 applied as (i) 100 NO3-N supplied by Ca(NO3)2; (ii) 50 NO3-N supplied by Ca(NO3)2, 50 NH4-N supplied by urea with a nitrification inhibitor (NI) (50:50 NO3/NH4, 0.5:1 Ca/NH4 molar ratio); (iii) 50:50 NO3/NH4 + CaCl2 (1:1 Ca/NH4); (iv) 100 NH4-N supplied by urea with a NI; and (v) NH4 + CaCl2 (0.5:1 Ca/NH4). Grain yield averaged 9 to 30 less for the NH4 and 50:50 NO3/NH4, but 15 to 37 more for the NH4 + CaCl2, than for the NO3, indicating that CaCl2 promoted the response to an EAS. A response to CaCl2 added to the 50:50 NO3/NH4 treatment, in which the NO3-N was supplied as Ca(NO3)2, suggested that the response to CaCl2 was due to the Cl rather than the added Ca. The individual roles of Ca and Cl in EAS responses were evaluated in a second experiment by combining Ca, Cl, and Ca + Cl with NO3 and NH4 (300 mg N kg-1 soil) in a factorial design. There was no effect of added Ca on grain yield with either N form. Furthermore, grain yield was higher for the NH4 + Cl than for the NH4, NH4 + Ca, or NO3 treatments, indicating that supplemental Cl elicited wheat responses to an EAS. Chloride also stimulated Ca uptake, which may have played a secondary role in the EAS response.

1892 Leinhos, V.; Tiroke, S.; Bergmann, H. (1996) **INFLUENCE OF OSMOTIC STRESS AND AMINO ALCOHOL TREATMENT ON PROTEIN CONTENT, PROTEIN PATTERNS AND GROWTH OF GERMINATING BARLEY.** *Angewandte Botanik. 70(5-6):199-204.* English. [UNIV JENA INST ERNAHRUNG & UMWELT NAUMBURGER STR 98 D-07743 JENA GERMANY].

The influence of osmotic stress generated by polyethylene glycol (PEG) solutions (0.02 and 0.04 mol/L - moderate stress, osmotic pressure pi < 1 bar) on protein content, protein patterns and growth of barley (Hordeum vulgare cv. Alexis) seedlings and/or the pretreatment of barley caryopses

with the amino alcohols 2-amino ethanol (AE) and choline (CC) was investigated. Germination of seeds in PEG solutions during a period of 5 d caused a growth reduction of seedling shoots. The root dry matter, however, increased with increasing concentration of the stressor (up to 73%). The protein content (per mg dry matter) of roots from osmotically stressed seedlings droped with increasing stressor-concentrations (up to 25%) and rose in shoots (5%). In roots and shoots derived from CC - and AE - pretreated seeds, a higher protein content compared to untreated controls (5-45%) was found. Osmotic stress (drought stress) caused alterations of the protein patterns of germinating barley. After sodium dodecyl sulfate (SDS) polyacryamide gel electrophoretic separation of soluble proteins (phosphate buffer extracts) followed by coomassie blue protein staining and subsequent OD spectrography of the electropherograms a significant drop of the intensity of a broad protein band at a molecular weight corresponding to 54 kDa in shoots (derived from stressed seedlings, 0.04 mol/L PEG) was observed. In roots from seedlings stressed with 0.02 mol/L PEG an additional protein band with a molecular weight corresponding to 59 kDa appeared. Pretreatment of seeds with 2-amino ethanol resulted in an almost complete revocation of the stress related changes of the protein patterns in shoots and roots of barley seedlings indicating a stress deminishing effect of this amino alcohol substance. The effects of 2-amino ethanol and choline are alike in terms of dry matter and protein quantities but different in case of protein patterns. [References: 21].

1893 Lieffering, M.; Andrews, M.; Mckenzie, BA. (1996) **NITRATE STIMULATION OF MOBILIZATION OF SEED RESERVES IN TEMPERATE CEREALS - IMPORTANCE OF WATER UPTAKE.** *Annals of Botany. 78(6):695-701.* English. [UNIV SUNDERLAND CTR ECOL SUNDERLAND SR1 3SD ENGLAND].

Relationships between nitrate (NO3-) supply, uptake and assimilation, water uptake and the rate of mobilization of seed reserves were examined for the five main temperate cereals prior to emergence from the substrate. For all species, 21 d after sowing (DAS), residual seed dry weight (d.wt) decreased while shoot plus root d.wt increased (15-30%) with increased applied NO3- concentration from 0 to 5-20 mM. Nitrogen (N) uptake and assimilation were as great with addition of 5 mM ammonium (NH4+) or 5 mM NO3- but NH4+ did not affect the rate of mobilization of seed reserves. Chloride (Cl-) was similar to NO3- in its effect on mobilization of seed reserves of barley (Hordeum vulgare L.). Increased rate of mobilization of seed reserves with additional NO3- or Cl- was associated with increases in shoot, root and residual seed anion content, total seedling water and residual seed water content (% water) 21 DAS. Addition of NH4+ did not affect total seedling water or residual seed water content. For barley supplied with different concentrations of NO3- or mannitol, the rate of mobilization of seed reserves was positively correlated ($r > 0.95$) with total seedling water and residual seed water content. The rate of mobilization of seed reserves of barley was greater for high N content seed than for low N content seed. Seed water content, was greater for high N seed than for low N seed, 2 DAS. Additional NO3- did not affect total seedling water or residual seed water content until 10-14 DAS. The effects of seed N and NO3- on mobilization of seed reserves were detected 10 and 14 DAS, respectively. It is proposed that the increased rate of mobilization of seed reserves of temperate cereals with additional NO3- is due to increased water uptake by the seedling while the seed N effect is due to increased water uptake by the seed directly. (C) 1996 Annals of Botany Company [References: 31].

1894 Masoni, A.; Ercoli, L.; Mariotti, M. (1996) **SPECTRAL PROPERTIES OF LEAVES DEFICIENT IN IRON, SULFUR, MAGNESIUM, AND MANGANESE.** *Agronomy Journal. 88(6):937-943.* English. [UNIV PISA DIP AGRON & GEST AGROECOSISTEMA VIA S MICHELE SCALZI 2 I-56100 PISA ITALY].

In crop plants, deficiency of an essential element may drastically reduce growth rate and yield. Research on the use of leaf spectral properties in the detection of crop mineral deficiency is needed. The objective of this study was to examine the effects of Fe, S, Mg, and Mn deficiency on reflectance (R), absorptance (A), and transmittance (T) spectra of barley (Hordeum vulgare L.), wheat (Triticum aestivum L.), corn (Zea mays L.), and sunflower (Helianthus annuus L.) leaves. Plants were grown in the greenhouse in nutrient solution. Chlorophyll (Chi), Fe, S, Mg, and Mn concentrations and spectral properties were determined on the youngest fully expanded leaf when deficiency symptoms were clearly manifested. In all species, mineral deficiency affected leaf concentration of the deficient element and also of other elements. Nutrient deficiency reduced Chi concentration and A, and increased R and T. Iron deficiency severely affected all species, and corn was the species mast sensitive to all deficiencies. Reflectance, A, and T spectra of leaves were correlated with leaf Chi concentration. Our results suggested that all nutritional deficiencies reduce leaf Chi concentration, and subsequently this reduction increases leaf R and T, decreases leaf A, and shortens the red-edge position, defined as the inflection point that occurs in the rapid transition between red and near-infrared. Modifications in leaf spectral properties were not characteristic of nutrient deficiency, but were always observed in the same wavelengths. [References: 26].

1895 Matile, P.; Hortensteiner, S.; Thomas, H.; Krautler, B. (1996) **CHLOROPHYLL BREAKDOWN IN SENESCENT LEAVES.** *Plant Physiology. 112(4):1403-1409.* English. [UNIV ZURICH DEPT PLANT BIOL CH-8008 ZURICH SWITZERLAND].

1896 Mishra, R.K. (Basic Science College, Bhubaneswar (India). Department of Microbiology); Sen, S.P. (Kalyani University, Kalyani (India). Department of Botany) (1993) **Associative symbiosis and nitrogen nutrition of wheat.** *Orissa Journal of Agricultural Research (India) v. 6(3-4) p. 150-157.* 3 tables; 9 ref. English. (AGRIS 97-004027).

1897 Richards, IR.; Wallace, PA.; Turner, IDS. (1996) **A COMPARISON OF SIX COVER CROP TYPES IN TERMS OF NITROGEN UPTAKE AND EFFECT ON RESPONSE TO NITROGEN BY A SUBSEQUENT SPRING BARLEY CROP.** *Journal of Agricultural Science. 127(Part 4):441-449.* English. [LEVINGTON AGR LTD LEVINGTON PK IPSWICH IP10 0LU SUFFOLK ENGLAND].

A field experiment was conducted at nine sites in England (1991-94) to compare six sown species of cover crop and natural regeneration in terms of nitrogen uptake and effect on response to applied N by a subsequent spring barley crop. The success and extent of cover crop establishment varied among sites and was insignificant in two. This may be associated with the relatively late sowing of the cover crops, the earliest site being sown on 27 August and the latest on 19 October. Dry matter (DM) yield of the sown cover crop at time of incorporation was related to sowing date, earlier sowing giving the higher yields. Maximum total DM yield and N uptake by the above-ground portion of cover crops were 1280 kg DM/ha and 38 kg N/ha respectively. The extent of N uptake by the cover crops appeared to be related to the success of establishment rather than to the level of soil nitrate-N at the time of their sowing. Effects of cover crop incorporation on the subsequent spring barley were small. There was no evidence for any positive effect of the cover crop on N supply to the barley. In one trial, incorporation of forage rye significantly reduced grain yield of the barley by 0.7-1.2 t/ha compared to other cover crop species. [References: 11].

1898 Savidov, NA.; Lvov, NP.; Sagi, M.; Lips, SH. (1997) **MOLYBDENUM COFACTOR BIOSYNTHESIS IN TWO BARLEY (HORDEUM VULGARE L) GENOTYPES AS AFFECTED BY NITRATE IN THE TISSUE AND IN THE GROWTH MEDIUM.** *Plant Science. 122(1):51-59.* English. [BEN GURION UNIV NEGEV JACOB BLAUSTEIN INST DESERT RES BIOSTRESS RES LAB IL-84993 SEDE BOQER ISRAEL].

Two barley genotypes, the wild type and the nar1a, nar7w mutant, impaired in two structural genes of the nitrate reductase (NR) apoproteins, exhibited a considerable level of molybdenum cofactor (MoCo) when grown in the absence of NO3-. Increasing concentrations of nitrate in the nutrient solutions did not affect MoCo content in shoots and roots of barley plants during the first 7 h of incubation. The MoCo and pterin content of the plants remained also unchanged during 24 h induction in 0.1 mM nitrate. Removal of NO3- from the nutrient medium caused a rapid loss of NR activity in the shoots of wild type plants while MoCo and pterin content remained unaffected by the presence or absence of nitrate in the medium. Previous observations of MoCo induction in higher plants by NO3- by a number of researchers may have been due to an overestimation of the actual MoCo content due to NO3- accumulation in the tissue and its reduction by NADPH during the NR complementation process which resulted in nitrite accumulation. Exclusion of NADPH from the complementation medium prevented nitrite formation and allowed to estimate MoCo content in plant tissues containing a wide range of nitrate concentrations. The genotype nar1a;nar7w, when grown in nitrate, exhibited MoCo levels similar to that of wild type plants. Copyright (C) 1997 Elsevier Science Ireland Ltd. [References: 38].

1899 Schaaf, H.; Heyn, J. (1995) **[Relationships between P-uptake of spring wheat in a plot test and different extraction methods in soil test (CAL, DL, CaCl2/DTPA, CaCl2)]. Beziehungen zwischen der P-Aufnahme von Sommerweizen im Gefaessversuch und unterschiedlichen Extraktionsmethoden in der Bodenuntersuchung (CAL, DL, CaCl2/DTPA und CaCl2).** 107. VDLUFA-Kongress. Garmisch-Partenkirchen (Germany). 18-23 Sep 1995. *[Grassland as production location and landscape element]. Gruenland als Produktionsstandort und LandschaftselementVDLUFA-Schriftenreihe (Germany); . 40. Hessische Landwirtschaftliche Versuchsanstalt, Kassel (Germany) p. 293-296.* VDLUFA. German. (AGRIS 97-019144).

1900 Schulze Nieden, P.; Sommer, K. (1995) **[Enrichment of nitrogen in stem and translocation into the ear of Triticum in dependence on N-fertilization]. Anreicherung von Stickstoff im Halm und seine Translokation in die Aehre bei Weizen in Abhaengigkeit von der N-Duengung.** 107. VDLUFA-Kongress. Garmisch-Partenkirchen (Germany). 18-23 Sep 1995. *[Grassland as production location and landscape element]. Gruenland als Produktionsstandort und LandschaftselementVDLUFA-Schriftenreihe (Germany); . 40. Bonn Univ. (Germany). Agrikulturchemisches Inst. p. 129-132.* VDLUFA. German. (AGRIS 97-019143).

1901 Seeling, B. (International Crops Research Inst. for the Semi Arid Tropics, Patancheru, A.P. (India). Asia Center); Jungk, A. (1996) **Utilization of organic phosphorus in calcium chloride extracts of soil by barley plants and hydrolysis by acid and alkaline phosphatases.** *Plant and Soil (Netherlands) v. 178(2) p. 179-184.* 26 ref. English. (AGRIS 97-019087).

1902 Shalygo, NV.; Averina, NG.; Grimm, B.; Mock, HP. (1997) **INFLUENCE OF CESIUM ON TETRAPYRROLE BIOSYNTHESIS IN ETIOLATED AND GREENING BARLEY LEAVES.** *Physiologia Plantarum. 99(1):160-168.* English. [INST PLANT GENET & CROP PLANT RES CORRENSTR 3 D-06466 GATERSLEBEN GERMANY].

Cesium chloride (CsCl) treatment of greening primary leaves of barley for 8 h inhibited chlorophyll accumulation in a concentration-dependent manner and led to the accumulation of excessive amounts of uroporphyrin(ogen) III (URO[gen]) and to a minor extent of heptacarboxylporphyrin(ogen). When dark-grown leaves were incubated with CsCl, accumulation of URO(gen) was observed only after feeding of the tetrapyrrole precursor 5-aminolevulinic acid. Western blot analysis showed no apparent difference in content of uroporphyrinogen decarboxylase (EC 4.1.1.37, UROD) or selected proteins involved in tetrapyrrole biosynthesis in extracts of CsCl-incubated (15 mM) versus control leaves. UROD activity was drastically decreased upon CsCl treatment in leaves incubated in the dark or in the light (44 and 86%, respectively). Selected preceding enzymes of the tetrapyrrole biosynthetic pathway, 5-aminolevulinic acid dehydratase (EC 4.2.1.24, ALAD) and porphobilinogen deaminase (EC 4.3.1.8, PBGD), were influenced only to a minor extent under standard incubation conditions (15 mM CsCl). Furthermore, the ALA synthesizing capacity did not differ in leaves incubated with and without Cs+ cations. UROD activity of crude homogenates from control plants and after partial purification was reduced to 56 and 80%, respectively, upon addition of 10 mM CsCl. Equal concentrations of KCl were not inhibitory. Enzyme assays of the same barley extract in the presence of CsCl yielded no effect on ALAD and a minor loss of PBGD activity. The initial visible cytotoxic effect of CsCl appeared to be a selective inhibition of UROD resulting in accumulation of photosensitizing URO(gen). Consequences of the diminished UROD activity on early steps of the tetrapyrrole biosynthesis and its functional and regulatory significance for the porphyrin synthesis are discussed. [References: 27].

1903 Stone, PJ.; Nicolas, ME. (1996) **VARIETAL DIFFERENCES IN MATURE PROTEIN COMPOSITION OF WHEAT RESULTED FROM DIFFERENT RATES OF POLYMER ACCUMULATION DURING GRAIN FILLING.** *Australian Journal of Plant Physiology. 23(6):727-737.* English. [UNIV MELBOURNE DEPT AGR JOINT CTR CROP IMPROVEMENT PARKVILLE VIC 3052 AUSTRALIA].

Two varieties of wheat differing in high-molecular-weight glutenin subunit composition (Oxley, 2+12, Glu-D1a and Egret, 5+10, Glu-D1d) and dough properties were examined in order to determine the manner in which differences in mature protein composition were the result of differences in accumulation of proteins during grain filling. To this end, grain samples from each cultivar were taken at 5 day intervals from 10 days after anthesis to maturity, and analysed for protein content and composition. Wheat proteins were separated and quantified as albumin/globulin, monomer, SDS-soluble polymer and SDS-insoluble polymer using size-exclusion high-performance liquid chromatography. For both cultivars, the accumulation of each class of protein was found to be highly asynchronous: synthesis of albumin/globulin was followed by that of monomer, SDS-soluble polymer and finally SDS-insoluble polymer, such that the average molecular size of grain protein increased throughout grain filling. Varietal differences in mature protein composition were almost entirely the result of a greater rate of polymer accumulation in the 2+12 than in the 5+10 genotype. [References: 53].

1904 Tong, YP.; Rengel, Z.; Graham, RD. (1997) **INTERACTIONS BETWEEN NITROGEN AND MANGANESE NUTRITION OF BARLEY GENOTYPES DIFFERING IN MANGANESE EFFICIENCY.** *Annals of Botany. 79(1):53-58.* English. [UNIV ADELAIDE WAITE AGR RES INST DEPT PLANT SCI GLEN OSMOND SA 5064 AUSTRALIA].

Ammonium-fed plants may acidify the rhizosphere and thus increase availability of Mn in calcareous alkaline soils. The importance of N nutrition in the differential expression of tolerance to Mn deficiency among cereal genotypes is not yet clear. Two factorial experiments testing effects of the NH4-N/NO3-N ratio and Mn fertilization on growth of barley genotypes differing in tolerance to Mn deficiency were conducted in two calcareous alkaline soils in pots in a controlled environment. In the soil containing 80% CaCO3 at pH 8.5, better root and shoot growth and higher shoot Mn concentrations were achieved with nitrate supply, especially at lower rates of Mn fertilization The Mn-efficient genotype Weeah (tolerant of Mn deficiency) achieved better root and shoot growth than Mn-inefficient Galleon barley (sensitive to Mn deficiency) regardless of experimental treatment. Fertilization with Mn did not influence total N concentration in barley roots and shoots. In the soil containing 5% CaCO3 at pH 7.8, ammonium-fed plants had better root and shoot growth and, at shoot Mn concentrations above the critical level, Mn-inefficient Galleon performed better than Mn-efficient Weeah barley. It appears that differential expression of Mn efficiency among barley genotypes is not associated with differences in Mn availability expected to be produced by differential rhizosphere acidification as a response to different forms of N supply. There is an apparent preference of locally selected barley genotypes for nitrate nutrition when grown on the highly calcareous alkaline soils of southern Australia. (C) 1997 Annals of Botany Company [References: 33].

1905 Vouillot, MO.; Machet, JM.; Meynard, JM. (1996) **RELATIONSHIP BETWEEN THE AMOUNT OF REDUCED NITROGEN ACCUMULATED IN WINTER WHEAT SHOOTS AND THE ACTIVITY OF NITRATE REDUCTASE MEASURED IN SITU.** *European Journal of Agronomy. 5(3-4):227-236.* English. [INRA INA PG AGRON LAB F-78850 THIVERVAL GRIGNON FRANCE].

Nitrate reductase activity measured in shoots of winter wheat (Triticum aestivum cv. Apollo and Soissons) was assessed as an indicator of the nitrate assimilation rate in plants grown in the field and subjected to various nitrogen nutrition treatments. In N-deficient plants, the nitrate reductase activity was lower than in well fertilized plants and was an early indicator of nitrogen deficiency. At each stage of stem elongation, there was a constant relationship between the nitrate reductase activity in the shoots and the quantity of reduced nitrogen accumulated daily in these organs. This relationship was not affected by the level of nitrogen fertilization. [References: 29].

1906 Wenzel, WW.; Blum, WEH.; Brandstetter, A.; Jockwer, F.; Kochl, A.; Oberforster, M.; Oberlander, HE.; Riedler, C.; Roth, K.; Vladeva, I. (1996) **EFFECTS OF SOIL PROPERTIES AND CULTIVAR ON CADMIUM ACCUMULATION IN WHEAT GRAIN.** *Zeitschrift fur Pflanzenernahrung und Bodenkunde. 159(6):609-614.* English. [UNIV BODENKULTUR INST BODENFORSCH GREGOR MENDEL STR 33 A-1180 VIENNA AUSTRIA].

Cd accumulation in the grain of wheat cultivars grown on soils at seven experimental sites in the Austrian wheat zone was significantly affected by soil chemical characteristics and by cultivar. Multiple linear regression analyses indicate that about 80% of the variation in Cd accumulation may be explained by cultivar, total soil Ca, and organic carbon (OC). An additional 10% of the variation was correlated with Cl- and Ca2+ in the soil solution. Uptake of Cd increased with higher soil Cd content and

higher Cl- concentrations in soil solution, but decreased at higher levels of OC and soluble Ca. Cd accumulation varied by a factor of up to 2.5 among cultivars. The highest Cd accumulation was found in some spring durum cultivars in soils containing relatively low total Cd (< 0.4 mg kg(-1)); at some sites the maximum permissible Cd concentrations in wheat grain (0.1 mg kg(-1)) was exceeded according to German regulations. Selecting low Cd-accumulating cultivars adjusting soil chemical conditions may provide alternatives to reduce Cd intake in human diet. [References: 15].

1907 Wolf, J. (1996) **EFFECTS OF NUTRIENT SUPPLY (NPK) ON SPRING WHEAT RESPONSE TO ELEVATED ATMOSPHERIC CO2.** *Plant & Soil. 185(1):113-123.* English. [WAGENINGEN UNIV AGR DEPT THEORET PROD ECOL POB 430 NL-6700 AK WAGENINGEN NETHERLANDS].

The effects of increased atmospheric CO2 on crop growth and dry matter allocation may change if nutrient supply becomes insufficient for maximal growth. Increased atmospheric CO2 may also cause changes in minimum nutrient concentration in plant tissue and hence in the nutrient use efficiency or yield-nutrient uptake ratios of crops. To study these effects for spring wheat, pot experiments have been carried out in two glass houses at ambient and doubled CO2 concentration. Wheat plants were grown at different supplies of N, P or K. Doubling of ambient CO2 resulted in a large increase in total biomass (+70%) and grain yield when the nutrient supply was optimum. With strong N and K limitation this CO2 effect was about halved and with strong P limitation it became almost nil. Doubling of ambient CO2 resulted in a 10% lower minimum N concentration in plant tissue and in no change in the minimum P concentration. [References: 24].

1908 Yurina, TP.; Yurina, EV.; Karavaev, VA.; Solntsev, MK. (1997) **EFFECT OF MINERAL NUTRITION ON WHEAT RESISTANCE TO POWDERY MILDEW.** *Russian Journal of Plant Physiology. 44(1):54-56.* English. [MOSCOW MV LOMONOSOV STATE UNIV DEPT BIOL MOSCOW 119899 RUSSIA].

Nitrogen dressing reduced, whereas dressing with potassium, phosphorus, and combined potassium plus phosphorus improved wheat (Triticum aestivum L.) resistance to powdery mildew infection. In healthy plants, all treatments enhanced the rate of photosynthesis as determined on the basis of flesh weight. Dressing with nitrogen and potassium plus phosphorus increased the level of chlorophyll. Potassium, phosphorus, and potassium plus phosphorus increased the content of phenolic compounds and activated polyphenol oxidase in leaves. Effects of mineral nutrition on the physiological characteristics of wheat leaves are discussed as related to the nonspecific resistance of plants to powder mildew infection. [References: 17].

1909 Zafar, SI.; Abdullah, N.; Iqbal, M.; Sheeraz, Q. (1996) **INFLUENCE OF NUTRIENT AMENDMENT ON THE BIODEGRADATION OF WHEAT STRAW DURING SOLID STATE FERMENTATION WITH TRAMETES VERSICOLOR.** *International Biodeterioration & Biodegradation. 38(2):83-87.* English. [BIOTECHNOL & FOOD RES CTR PCSIR LABS LAHORE 54600 PAKISTAN].

The present study proposes a system whereby lignin biodegradation in lignocellulosic units may be optimised with the minimum loss of cellulose and other organic matter. Lignin, cellulose and organic matter losses were followed at 7-day intervals during 35-day solid state fermentation of wheat straw with Trametes versicolor with and without amendment carbon (C) and nitrogen (N) sources. Substrate supplementation with a C source favoured degradation of lignin; glucose as the C source was better than beet pulp molasses. Ammonium N slowed lignin removal. Lignin loss during 35-day fermentation in the presence of glucose was 42% as compared with 17.1% in the unamended wheat straw. The highest ratios of lignin loss to cellulose loss (9.55:1) and to organic matter loss (3.34:1) occurred in the first 14 days of fermentation when the straw was amended with glucose. These observations indicate that for efficient ligninolysis, it is appropriate to terminate fermentation of the glucose-amended straw at the 14-day stage at which 36.3% lignin degradation occurred at the cost of only 3.8% cellulose and 10.7% organic matter. Copyright (C) Published by 1996 Elsevier Science Limited. [References: 19].

F62 PLANT PHYSIOLOGY-GROWTH AND DEVELOPMENT

1910 Ayuso, M.; Hernandez, T.; Garcia, C.; Pascual, JA. (1996) **STIMULATION OF BARLEY GROWTH AND NUTRIENT ABSORPTION BY HUMIC SUBSTANCES ORIGINATING FROM VARIOUS ORGANIC MATERIALS.** *Bioresource Technology. 57(3):251-257.* English. [CSIC DEPT SOIL & WATER CONSERVAT & MANAGEMENT ORGAN WA CTR EDAFOL & BIOL APLICADA SEGURA MURCIA 30080 SPAIN].

We compared the effect of humic substances extracted from municipal wastes (sewage sludge and a compost) and those extracted from more humified materials (leonardite, peat and a commercial humic acid) on plant growth and nutrient absorption during hydroponic cultivation. The results showed that doses representing less than 10 mg C l(-1) favoured plant growth, while higher doses sometimes inhibited it. Humic substances favoured the development of the aerial part rather than the root The effects of both groups of humic substances were similar both as regards plant growth and nutrient absorption. The absorption of macronutrients (nitrogen, phosphorus and potassium) was significantly affected by the addition of humic substances, but differed for each nutrient. Nitrogen absorption, for example, was stimulated by the lowest doses, such stimulation decreased as the dose increased, while the opposite was true for The absorption of micronutrients was the lowest doses while doses above 10 mg C l(-1) inhibited it, which was probably one of the causes of the depressed growth observed with the highest doses. Copyright (C) 1996 Elsevier Science Ltd. [References: 20].

1911 Beemster, GTS.; Masle, J. (1996) **EFFECTS OF SOIL RESISTANCE TO ROOT PENETRATION ON LEAF EXPANSION IN WHEAT (TRITICUM AESTIVUM L) - COMPOSITION, NUMBER AND SIZE OF EPIDERMAL CELLS IN MATURE BLADES.** *Journal of Experimental Botany. 47(304):1651-1662.* English. [AUSTRALIAN NATL UNIV COOPERAT RES CTR PLANT SCI GPO BOX 475 CANBERRA ACT 2601 AUSTRALIA].

Wheat seedlings (Triticum aestivum L.) were grown on soils with contrasted resistances to root penetration (measured as penetrometer resistance, R(s)). High R(s) reduced the rates of leaf appearance and expansion. Although the duration of expansion was increased, mature leaves were smaller. Underlying changes in leaf anatomy were investigated on cleared mature leaves, focusing on the epidermes. Three leaves were analysed: leaves 1 and 3 which started their development in the embryo, and leaf 5 which was initiated on the seedling, after imposition of contrasted soil conditions. In all leaves, high R(s) caused a reduction in mature cell sizes, lengths and widths, and a shift in the relative proportions of functionally different cell types, with a decrease in the relative proportions of stomata and associated cell types (interstomatal and sister cells) and an increase in the proportions of unspecialized elongated epidermal cells and of trichomes. In leaves 3 and 5 the number of cellular files across the blade was also reduced, while in leaf 1 it was similar at the two R(s). These differences between leaves are attributed to differences in their developmental stage when root stress was first perceived. Remarkably, R(s) had no effect (leaf 1) or relatively small effects (leaves 3 and 5) on the total number of cells per file, suggesting that this parameter is either largely insensitive to variation in root environment, or is programmed at the outset before stress was perceived at the apex. [References: 38].

1912 Beemster, GTS.; Masle, J. (1996) **THE ROLE OF APICAL DEVELOPMENT AROUND THE TIME OF LEAF INITIATION IN DETERMINING LEAF WIDTH AT MATURITY IN WHEAT SEEDLINGS (TRITICUM AESTIVUM L.) WITH IMPEDED ROOTS.** *Journal of Experimental Botany. 47(304):1679-1688.* English. [AUSTRALIAN NATL UNIV RES SCH BIOL SCI ENVIRONM BIOL GRP GPO BOX 475 CANBERRA ACT 2601 AUSTRALIA].

High soil resistance to root penetration (measured as penetrometer resistance, R(s)) slows down leaf growth and reduces mature leaf size in wheat seedlings (Triticum aestivum L.). Underlying changes in the kinetics of cell partitioning and expansion and in the size and organization of mature cells were reported in companion papers (Beemster and Masle, 1996; Beemster et al., 1996). In the present study, the relationships between apex growth, primordium initiation and expansion were analysed for plants grown at contrasting R(s), focusing on a leaf whose whole

development proceeded after the onset of root impedance (leaf 5). High R(s) reduced the rates of apex and leaf development, but did not appear to have immediate effects on the pattern of development of the newly initiated phytomers. During an initial short period, the rate of development of a leaf primordium and associated node were related to plastochronic age, according to similar relationships (slopes) at the two R, . Effects on developmental patterns were first detected on phytomer radial expansion during plastochron 2. The ontogenetic pattern of leaf elongation was affected later, during the next few plastochrons preceding leaf emergence ('post-primordial stage'). It is concluded that a reduction in the number of formative divisions and in the number of proliferative cells along the intercalary meristem reported earlier (Beemster and Masle, 1996; Beemster et al., 1996) is not related to the size of the apical dome at leaf initiation nor to the size and number of meristematic cells initially recruited to the leaf primordium, which were all unaffected by R(s). Rather they are generated at the primordial and post-primordial stages. [References: 35].

1913 Beemster, GTS.; Masle, J.; Williamson, RE.; Farquhar, GD. (1996) **EFFECTS OF SOIL RESISTANCE TO ROOT PENETRATION ON LEAF EXPANSION IN WHEAT (TRITICUM AESTIVUM L) - KINEMATIC ANALYSIS OF LEAF ELONGATION.** *Journal of Experimental Botany. 47(304):1663-1678.* English. [AUSTRALIAN NATL UNIV RES SCH BIOL SCI INST ADV STUDIES ENVIRONM BIOL GRP GPO BOX 475 CANBERRA ACT 2601 AUSTRALIA].

Wheat leaves (Triticum aestivum L.) elongated 50% more slowly when plants were grown in soils with high mechanical resistance to penetration (R(s)). The profiles of epidermal cell lengths along the growth zone of expanding leaves and the locations of newly formed walls were recorded in order to compare the kinetics of elongation and partitioning of both meristematic and non-meristematic cells. In leaf 5, which completely developed under stress, high R(s) did not affect the flux of mature cells through the elongation zone; leaf elongation was reduced only because these cells were shorter. This reduced size reflected a reduction in cell length at partitioning, associated with shorter cycling time. The relative rates of cell elongation before and after partitioning were unchanged. Cell fluxes were similar because the population of meristematic cells was reduced, offsetting their increased partitioning rate. In contrast, in leaf 1, high R(s) had no effect on the number of dividing cells; elongation rate was reduced because of slower relative cell expansion rate and slower cell partitioning rate. These differences could reflect differences in the stage at which successive leaves perceived root stress and also time-dependent changes in the responsiveness of leaf development to stress-induced root signals or in the nature of these signals. The data reveal that cell cycling time may in fact be decreased by unfavourable growth conditions and is not directly related to cell expansion rates; they also show that the elongation rate of meristematic cells is partly independently controlled from that of nonmeristematic cells. [References: 41].

1914 Berecz, K.; Debreczeni, K.; Presing, M. (1997) **INCORPORATION OF N-15-LABELLED FERTILIZER NITROGEN INTO UPPER VEGETATIVE PLANT PARTS IN WHEAT AND ITS MOBILIZATION DURING GRAIN DEVELOPMENT.** *Plant Physiology & Biochemistry. 35(1):49-54.* English. [PANNON UNIV AGR INST AGRON GEORGIKON FAC H-8361 KESZTHELY HUNGARY].

The incorporation of N-15-labelled fertilizer nitrogen into the plant parts of winter wheat (Triticum aestivum L.), most important from the point of view of N-mobilization during grain development, was investigated in this study. The microplot N-fertilization experiments were carried out on an eutric Cambisol of medium N-status in Keszthely (Hungary). In addition to an unlabelled N-dose of 80 kg ha(-1), applied in autumn, spring doses of N-15-labelled N-fertilizer were employed. From a grain moisture content of 70% to full ripening, six harvests were done. The flag-leaf blade, flag-leaf sheath, uppermost internode, glumes, rachis and grains from 100 plants were separated each time. From the 60 kg ha(-1) N-dose applied at shooting (Feekes scale 6), in addition to the 60 kg N ha(-1) given at tillering (Feekes scale 2-3), the amount incorporated into the vegetative plant parts was 45% higher. The extent of the N-incorporation was 2.5-fold higher as a result of doubling of the 60 kg N-dose applied at tillering. The proportion of the N-15-fertilizer nitrogen in the total nitrogen was similar in the different plant parts, but it varied from 12.4 to 30.6% as an effect of different N-fertilizations. N-depletion of different quantity and rate from the tested vegetative plant parts could be detected. The labelled fertilizer-N mobilized from the vegetative parts above the top node accounted for 49-62% of N-15 contained in the ripe grains per ear in the different N-treatments. Irrespective of the different timing or doses of N-applications, the flag-leaf blade and uppermost internode showed the greatest relative N-depletions. [References: 23].

1915 Bonachela, S. (1996) **ROOT GROWTH OF TRITICALE AND BARLEY GROWN FOR GRAIN OR FOR FORAGE-PLUS-GRAIN IN A MEDITERRANEAN CLIMATE.** *Plant & Soil. 183(2):239-251.* English. [CSIC INST AGR SOSTENIBLE APDO 4084 CORDOBA 14080 SPAIN].

Root systems of one triticale (x triticosecale Witt.) and one barley (Hordeum vulgare L.) cultivar grown for grain or for the dual purpose of winter forage-plus-grain were studied in a Mediterranean climate (Granada, Spain). The aim was to assess the effect of winter forage removal on root systems and to improve the knowledge of cereal root systems under Mediterranean conditions in relation to soil water use. After the forage was removed by clipping at the end of the winter period, cereal roots were shallower and lower in length densities, compared to the unclipped treatment. The largest differences occurred during the clipping-anthesis period and in the upper soil layers. At the end of the life cycle, the differences between the two systems regarding depth, density and dry matter of roots were small or nil. Moreover, there were no differences in total water use between clipped and unclipped cereals. Under both production systems (grain and forage plus grain), cereals demonstrated variable downward root extension (0.9 to 1.8 m) as a response to the wetting depth. Triticale roots continued growing after anthesis, especially in the deeper soil layers. In spite of that, root systems were not able to extract a notable amount of residual water (25 to 50 mm) apparently available from the subsoil. In semi-arid Mediterranean drylands, cereal root systems with greater phenotypic plasticity (deeper or larger in the subsoil) in response to subsoil water should be of interest in wetter areas or seasons. This does not necessarily imply a larger root system, but rather a root growth pattern with greater root growth in the subsoil. [References: 42].

1916 Boubaker, M. (Ecole Superieure d'Agriculture du Kef (Tunisia). Plant Breeding Department); Yamada, T. (1995) **Differential genotypic responses of spring wheat early seedling growth to limited moisture conditions.** *Tropicultura (Belgium) v. 13(2) p. 50-53.* 4 tables; 13 ref. English. (AGRIS 97-004124).

The objective of this study was to measure the genotypic response of spring wheat seedling growth in a range of osmotic media and to determine which genotype could be identified as drought tolerant. Six durum wheat cultivars were subjected to moisture stress using polyethylene glycol PEG-9000. Aqueous solutions at four water potential values of 0, -3, -6 and -9 bars were prepared. For each cultivar 20 seeds were germinated in these solutions in a growth chamber. After 2 weeks, number of roots, leaf number, coleoptile length, seedling height, root length, first and second leaf length, and dry matter weight were measured. All traits measured were significantly influenced by water stress. The water stress treatments of -6 and -9 bars gave lower rates of seedling growth than the 0 and -3 bars treatments. The results suggest that good seedling vigor under water stress condition is a useful selection criterion. An ideotype for a drought tolerant wheat genotype should have good seedling vigor.

1917 Cabeza, CE.; Kin, AG.; Deblonde, PMK.; Ledent, JF. (1996) **USE OF HAUN SCALE FOR MONITORING DEVELOPMENT OF WHEAT FROM FLAG LEAF EMERGENCE TO END OF STEM ELONGATION.** *European Journal of Agronomy. 5(3-4):237-246.* English. [UNIV LOUVAIN LAB ECOL GRANDES CULTURES PL CROIX SUD 2 BTE 11 B-1348 LOUVAIN BELGIUM].

Haun's scale of foliar stages allows a continuous numerical expression of plant development until the complete emergence of the flag leaf. Our objective was to test in a contrasting set of cultivars (common and spelt wheats), locations (Belgium and Argentina). and water status the adequacy of an extension of Haun's scale to stages beyond flag leaf emergence based on observation on the flag sheath and peduncle. The four main post-foliar stages were identified as: 0, corresponding to flag sheath elongation; 1, to flag sheath increase in diameter (booting); 2, to ear emergence; and 3, to the extrusion of the peduncle above the flag leaf ligular zone. The extended scale allowed the monitoring of development during the 3-4 weeks following flag leaf emergence and was sensitive enough to reveal a differences at daily intervals. Plots of post-foliar stages versus-thermal time were roughly linear, little affected by treatments

(cultivar, water status, location) or by discontinuities due to the initial and final value of the decimal part of the numerical codes in the intervals between mean stages. [References: 21].

1918 Corbineau, F. (Universite de Paris 6 (France). Laboratoire de Physiologie Vegetale); Come, D. (1996) **[Barley seed dormancy]. La dormance des semences d'orge.** *BIOS BOISSONS (France) v. 27(261) p. 113-119.* 50 ref., 11 graph. English. (AGRIS 97-019160).

1919 Demotesmainard, S.; Doussinault, G.; Meynard, JM. (1996) **ABNORMALITIES IN THE MALE DEVELOPMENTAL PROGRAMME OF WINTER WHEAT INDUCED BY CLIMATIC STRESS AT MEIOSIS.** *Agronomie. 16(8):505-515.* English. [INRA AGRON LAB F-78850 THIVERVAL GRIGNON FRANCE].

From the onset of meiosis, wheat plants, cv Moulin and Pernel, were subjected to climatic stress for 7 days in a growth chamber. The stress conditions (11 mu mol.m(-2).s(-1) photosynthetic photon flux density, 1.5/8 degrees C night/day, 12.5 h photoperiod) were chosen so that the stress affected the grain set in a similar way to low radiation, possibly associated with chilling in the field. Control plants received 203 mu mol.m(-2).s(-1) photosynthetic photon flux density, 15/18 degrees C temperatures and 16 h photoperiod. In stressed plants, the grain set was reduced due to poor fertilization, as shown by the absence of development of endosperms from the embryo sacs. Male development was affected: anthers were frequently small, curved or shrivelled, and did not dehisce. Pollen release was limited and the pollen load on the stigma was low. Pollen viability (fluorochromatic reaction) was altered, but pollen grains were normally trinuclear at anthesis. Female fertility was unaffected. Both varieties showed the same alterations. [References: 27].

1920 Gan, Y.; Mcleod, JG. (1997) **WINTER RYE LEAF EMERGENCE AND ITS RELATIONSHIP TO THE PHYLLOCHRON.** *Crop Science. 37(1):162-166.* English. [AGR & AGRI FOOD CANADA SEMIARID PRAIRIE AGR RES CTR POB 1030 SWIFT CURRENT SK S9H 3X2 CANADA].

Winter rye (Secale cereale L.) is a high-tillering cereal crop. Understanding the relationship between the phyllochron for mainstem leaves and that of tillers is useful in adequately describing plant development and selecting crop management strategies. This study was conducted to determine the phyllochrons of conventional height (CH) and semidwarf (SD) genotypes of winter rye and the relationship of the phyllochron of mainstem leaves to that of primary tillers. Three CH and two SD genotypes were planted in a controlled-environment growth room. Leaf stages were determined with the Haun scale and the phyllochron calculated as the inverse of the slopes of linear regressions of Haun stage to growing degree-days (GDD). For both CH and SD genotypes, the Haun stage increased linearly with GDD, and the phyllochron was constant in the pre-vernalization (0 < GDD less than or equal to 266) and vernalization (266 < GDD less than or equal to 566) periods. During post- vernalization (566 < GDD less than or equal to 914), the phyllochron for the mainstem increased with GDD. Leaves on the coleoptile tiller (T0), T1 (the tiller from leaf no. 1 of the mainstem), and T2 had mean phyllochrons similar to that for the mainstem. Leaves on higher positioned tillers (T4, T5) had a greater phyllochron than the earlier tillers. The higher positioned tillers also required more thermal time units to emerge than the earlier tillers. To precisely describe winter rye development using the phyllochron, one should consider that the phyllochron changes with leaf and tiller position on the culm. [References: 22].

1921 Garcia del Moral, M.B. (Almeria Univ. (Spain). Escuela Politecnica Superior, Dept. Biologia Vegetal); Garcia del Moral, L.F. (1995) **Tiller production and survival in relation to grain yield in winter and spring barley.** *Field Crops Research (Netherlands) v. 44(2-3) p. 85-93.* 24 ref. English. (AGRIS 97-019210).

1922 Haberle, J.; Svoboda, P. (Vyzkumny Ustav Rostlinne Vyroby, Prague Ruzyne (Czech Republic)) (1996) **Root length, surface and diameter of winter wheat along soil profile.** *Scientia Agriculturae Bohemica (Czech Republic) v. 27(1) p. 5-12.* 6 graphs, 1 table; 18 ref. English. (AGRIS 97-019270).

1923 Ishida, N.; Koizumi, M.; Kano, H. (1996) **LOCATION OF SUGARS IN BARLEY SEEDS DURING GERMINATION BY NMR MICROSCOPY.** *Plant Cell & Environment. 19(12):1415-1422.* English. [NATL FOOD RES INST TSUKUBA IBARAKI 305 JAPAN].

The distribution and fluctuation of sugars in germinating barley seeds were examined by C-13 nuclear magnetic resonance (NMR) spectroscopy, H-1-NMR imaging and H-1-NMR localized spectroscopy in relation to morphology, Maltose, sucrose, fructose and oils were detected in intact imbibed seeds by C-13-NMR spectra, During the first 6 d of germination, the maltose content increased and the oil content gradually decreased, whilst the levels of sucrose and fructose remained constant, Sugars were located by H-1-NMR images and H-1-NMR localized spectra in the vascular bundle of the seeds as well as in the solubilized endosperm, They were also detected in the shoots, The sugars detected in an 80% ethanol shoot extract were sucrose and glucose, which were located in the vascular bundles but not in the mesophyll cells of the coleoptile, They were also located in the basal part of the shoot, but not above 7 mm from the scutellum, The data suggest that the sugars are primarily transported through the vascular bundles and, at the same time, rapidly incorporated into mesophyll cells in the leaves. [References: 25].

1924 Kalapos, T.; Vandenboogaard, R.; Lambers, H. (1996) **EFFECT OF SOIL DRYING ON GROWTH, BIOMASS ALLOCATION AND LEAF GAS EXCHANGE OF TWO ANNUAL GRASS SPECIES.** *Plant & Soil. 185(1):137-149.* English. [LORAND EOTVOS UNIV DEPT PLANT TAXON & ECOL LUDOVIKA TER 2 H-1083 BUDAPEST HUNGARY].

Influence of short-term water stress on plant growth and leaf gas exchange was studied simultaneously in a growth chamber experiment using two annual grass species differing in photosynthetic pathway type, plant architecture and phenology: Triticum aestivum L. cv. Katya-A-1 (C-3, a drought resistant wheat cultivar of erect growth) and Tragus racemosus (L.) All. (C-4, a prostrate weed of warm semiarid areas). At the leaf level, gas exchange rates declined with decreasing soil water potential for both species in such a way that instantaneous photosynthetic water use efficiency (PWUE, mmol CO2 assimilated per mol H2O transpired) increased. At adequate water supply, the C-4 grass showed much lower stomatal conductance and higher PWUE than the C-3 species, but this difference disappeared at severe water stress when leaf gas exchange rates were similarly reduced for both species. However, by using soil water more sparingly, the C-4 species was able to assimilate under non-stressful conditions for a longer time than the C-3 wheat did. At the whole-plant level, decreasing water availability substantially reduced the relative growth rate (RGR) of T. aestivum, while biomass partitioning changed in favour of root growth, so that the plant could exploit the limiting water resource more efficiently. The change in partitioning preceded the overall reduction of RGR and it was associated with increased biomass allocation to roots and less to leaves, as well as with a decrease in specific leaf area. Water saving by T. racemosus sufficiently postponed water stress effects on plant growth occurring only as a moderate reduction in leaf area enlargement. For unstressed vegetative plants, relative growth rate of the C-4 T. racemosus was only slightly higher than that of the C-3 T. aestivum, though it was achieved at a much lower water cost. The lack of difference in RGR was probably due to growth conditions being relatively suboptimal for the C-4 plant and also to a relatively large investment in stem tissues by the C-4 T. racemosus. Only 10% of the plant biomass was allocated to roots in the C-4 species while this was more than 30% for the C-3 wheat cultivar. These results emphasize the importance of water saving and high WUE of C-4 plants in maintaining growth under moderate water stress in comparison with C-3 species. [References: 48].

1925 Kislyuk, IM.; Bubolo, LS.; Vaskovskii, MD. (1997) **HEAT SHOCK-INDUCED INCREASE IN THE LENGTH AND NUMBER OF THYLAKOIDS IN WHEAT LEAF CHLOROPLASTS.** *Russian Journal of Plant Physiology. 44(1):30-35.* English. [RUSSIAN ACAD SCI VL KOMAROV BOT INST UL PROF POPOVA 2 ST PETERSBURG 196376 RUSSIA].

The plants of winter wheat (Triticum aestivum L.) grown to the three leaf stage at 18/14 degrees C (day/night) were exposed to a temperature of 38 degrees C for 3 h. Such a treatment elevated the thermotolerance of potential photosynthesis measured at a saturating CO2 concentration and saturating light intensity, but had no effect on the rate of photosynthesis under optimal temperatures. Morphometric analysis of the median cross-sections of chloroplasts showed an increase in the total length of thylakoids and in the number and size of grana in mature leaves during heating. The number and length of granal thylakoids in heat-treated leaves increased by a factor of almost 1.5, whereas the length of intergranal thylakoids increased twofold; thus, the ratio of the length of appressed to nonappressed membranes decreased. The chlorophyll (a + b) content,

calculated on the basis of both leaf area and dry weight, decreased 15% after heating, but the chlorophyll alb ratio remained unchanged. These data indicate that heat shock provokes the active formation of photosynthetic membranes in mature chloroplasts and that the composition of newly formed membranes is modified. [References: 18].

1926 Kleemola, J.; Teittinen, M.; Karvonen, T. (1996) **MODELLING CROP GROWTH AND BIOMASS PARTITIONING TO SHOOTS AND ROOTS IN RELATION TO NITROGEN AND WATER AVAILABILITY, USING A MAXIMIZATION PRINCIPLE .1. MODEL DESCRIPTION AND VALIDATION.** *Plant & Soil. 185(1):101-111.* English. [UNIV HELSINKI DEPT PLANT PROD POB 27 VIIKKI FIN-00014 HELSINKI FINLAND].

Many crop models relate the allocation of dry matter between shoots and roots exclusively to the crop development stage. Such models may not take into account the effects of changes in environment on allocation, unless the allocation parameters are altered. In this paper a crop model with a dynamic allocation parameter for dry matter between shoots and roots is described. The basis of the model is that a plant allocates dry matter such that its growth is maximized. Consequently, the demand and supply of carbon, nitrogen, and water is maintained in balance. This model supports the hypothesis that a functional equilibrium exists between shoots and roots. This paper explains the mathematical computation procedure of the crop model. Moreover, an analysis was made of the ability of a crop model to simulate plant dry matter production and allocation of dry matter between plant organs. The model was tested using data from a greenhouse experiment in which spring wheat (Triticum aestivum L.) was grown under different soil moisture and nitrogen (N) levels. Generally, the model simulations agreed well with data recorded for total plant dry, matter. For validation data the coefficient of determination (r(2)) between simulated and measured shoot dry weight was 0.96. For the validation treatments r(2) was slightly lower, 0.94. In addition to dry matter production the model succeeded satisfactorily in simulating the dry weight of different plant organs. The response of simulated root to shoot ratio to the level of soil moisture was mainly in accordance with the measured data. In contrast, the simulated ratio seemed to be insensitive to the changes in the levels soil N concentration used in the experiment. The data used in the present study were not extensive, and more data are needed to validate the model. However, the results showed that the model responses to the changes in soil N and water level were realistic and mostly agreed with the data. Thus, we suggest that the model and the method employed to allocate dry matter between roots and shoots are useful when modelling the growth of crops under N and water limited conditions. [References: 35].

1927 Kosner, J. (Research Inst. of Crop Production, Praha Ruzyne. CZ); Zurkova, D. (1996) **Photoperiodic response and its relation to earliness in wheat.** *Euphytica (Netherlands) v. 89(1) p. 59-64.* 15 ref. English. (AGRIS 97-019275).

1928 Loboda, T.; Pietkiewicz, S.; Zurawska, B.; Nalborczyk, E. (1996) **GROWTH OF TRITICALE SEEDLINGS UNDER CONSTANT AND CHANGING IRRADIATION AND TEMPERATURE REGIMES.** *Acta Physiologiae Plantarum. 18(4):305-311.* English. [AGR UNIV WARSAW DEPT PLANT PHYSIOL RAKOWIECKA 26-30 PL-02528 WARSAW POLAND].

Dry matter production of 15 genotypes of Triticale grown under constant irradiance and temperature conditions was lower than that of plants grown under conditions of fluctuating irradiation and varied temperature. Larger differences among studied genotypes and higher positive correlation between the length of the seedlings and their dry matter production were observed when the plants were cultivated under variable rather than constant conditions. Under constant conditions, there was a shorter time of emergence of successive leaves, but they grew slower than under variable conditions. The ratio of dry matter of the shoot to dry matter of roots was higher under variable than constant conditions. The data are discussed with respect to possible factors underlying the effects of irradiation and temperature variations on growth of Triticale plants. [References: 14].

1929 Morris, CF.; Shackley, BJ.; King, GE.; Kidwell, KK. (1997) **GENOTYPIC AND ENVIRONMENTAL VARIATION FOR FLOUR SWELLING VOLUME IN WHEAT.** *Cereal Chemistry. 74(1):16-21.* English. [WASHINGTON STATE UNIV USDA ARS WESTERN WHEAT QUAL LAB FOOD SCI & HUMAN NUTR FAC E E 202 PULLMAN, WA 99164 USA].

The gelatinization and swelling of wheat (Triticum aestivum L.) starch has an important effect on the quality of end-products, especially white salted noodles. This study was conducted to determine the genotypic and environmental variation for flour swelling volume (FSV) in wheat. FSV was measured for various spring and winter wheat cultivars grown in up to 31 unique environments and up to four crop years. Data were analyzed by organizing the data into eight balanced data sets. FSV ranged from approximate to 19 to 30 mL/g. Analysis of variance (ANOVA) indicated that cultivar was consistently a highly significant source of variation. Environments as unique combinations of locations and crop years were variably significant, as were locations, whereas crop years were always a significant source of variation. Only rarely were ANOVA interaction terms significant. Model R(2) ranged from 0.87 to 0.98 for the eight data sets. Components of variation calculated from ANOVA model and total sums of squares indicated that cultivar accounted for 36.1-93.3% of the total variation. Environments, locations, and years accounted for 1.7-61.7% of the total variation. The relative variation assignable to the interaction of cultivars, environments, locations, or years never exceeded 10%. Penawawa was the highest FSV cultivar and was significantly higher than all other cultivars examined. In conclusion, FSV is highly and primarily influenced by cultivar and secondly by environment, crop year more so than location within a crop year. The small interaction of cultivar with environment suggests that FSV is highly heritable and that cultivar development programs can easily identify and track desirable FSV types. Incremental steps in FSV level were observed among the various cultivars and therefore optimum levels of FSV occurring throughout the range encountered should be attainable in new, improved cultivars. [References: 24].

1930 Nakamoto, T.; Oyanagi, A. (1996) **THE CONFIGURATION OF THE SEMINAL ROOTS OF TRITICUM AESTIVUM L (POACEAE).** *Journal of Plant Research. 109(1096):375-380.* English. [UNIV TOKYO GRAD SCH AGR & LIFE SCI TOKYO 113 JAPAN].

The seminal root system of wheat (Triticum aestivum L.) is composed of the primary seminal root, the first pair of seminal roots, and the second pair of seminal roots, which are known to grow in different directions, The direction of root growth, which can be expressed by theta (the angle between the root and the plumb line) and phi (the angle between the root and a Vertical plane including the primary seminal root), was studied with special attention to the latter, tt was measured on seedlings grown in a small hemispherical soil-filled mesh basket There were varietal differences in the phi of the first pair of roots (phi(f)) and in the phi of the second pair of roots (phi(s)). phi(f) and phi(s) were significantly correlated, The mean distance (MD), a measure to evaluate the efficiency of root spacing, was correlated with the difference between phi(f) and phi(s). Neither experimentally applied low soil water potential nor the excision of the primary seminal root affected phi. When the grain was sown vertically with the tip of the embryo pointing downwards, it was found that the growth movement into a direction different from the plumb line and phi(s) was greatly modified, It is suggested that certain internal mechanisms, possibly involving gravitropic reactions, are operating to control the direction of root growth, The significance of root growth direction at the seedling stage is discussed. [References: 13].

1931 Pasricha, N.S.; Aulakh, M.S.; Azad, A.S. (Punjab Agricultural University, Ludhiana (India). Department of Soils) (1995) **Response of pigeonpea grown in rotation with wheat to phosphate application and to residual P.** *Journal of the Indian Society of Soil Science (India) v. 43(4) p. 630-632.* 2 tables; 2 ill., 7 ref. English. (AGRIS 97-004123).

1932 Penson, SP.; Schuurink, RC.; Fath, A.; Gubler, F.; Jacobsen, JV.; Jones, RL. (1996) **CGMP IS REQUIRED FOR GIBBERELLIC ACID-INDUCED GENE EXPRESSION IN BARLEY ALEURONE.** *Plant Cell. 8(12):2325-2333.* English. [UNIV CALIF BERKELEY DEPT PLANT BIOL BERKELEY, CA 94720 USA].

The occurrence and roles of cGMP were investigated in aleurone layers and protoplasts isolated from barley (cv Himalaya) grain, Levels of cGMP in freshly isolated barley aleurone layers ranged from 0.065 to 0.08 pmol/g fresh weight of tissue, and cGMP levels increased transiently after incubation in gibberellic acid (GA), Abscisic acid (ABA) did not increase cGMP levels in aleurone layers. LY 83583 (LY), an inhibitor of guanylyl cyclase, prevented the GA-induced increase in cGMP and inhibited GA-

induced alpha-amylase synthesis and secretion, The inhibitory effects of LY could be overcome by membrane-permeant analogs of cGMP, LY also prevented GA-induced accumulation of alpha-amylase and GAMYB mRNAs, cGMP alone was not sufficient to induce the accumulation of alpha-amylase or GAMYB mRNA. LY had a less dramatic effect on the accumulation of mRNAs encoding the ABA-responsive gene Rab21. We conclude that cGMP plays an important role in GA, but not ABA, signaling in the barley aleurone cell. [References: 46].

1933 Pinthus, M.J. (Hebrew Univ. of Jerusalem, Rehovot (Israel). Faculty of Agriculture); Abraham, M. (1996) **Effects of light, temperature, gibberellin (GA(3)) and their interaction on coleoptile and leaf elongation of tall, semi-dwarf and dwarf wheat.** *Plant Growth Regulation (Netherlands) v. 18(3) p. 239-247.* 16 ref. English. (AGRIS 97-019273).

1934 Reynolds, TL.; Crawford, RL. (1996) **CHANGES IN ABUNDANCE OF AN ABSCISIC ACID-RESPONSIVE, EARLY CYSTEINE-LABELED METALLOTHIONEIN TRANSCRIPT DURING POLLEN EMBRYOGENESIS IN BREAD WHEAT (TRITICUM AESTIVUM).** *Plant Molecular Biology. 32(5):823-829.* English. [UNIV N CAROLINA DEPT BIOL 9201 UNIV CITY BLVD CHARLOTTE, NC 28223 USA].

A clone for an embryoid-abundant, early cysteine-labeled metallothionein (EcMt) gene has been isolated from a wheat pollen embryoid cDNA library. The transcript of this gene was only expressed in embryogenic microspores, pollen embryoids, and developing zygotic embryos of wheat. Accumulation of the EcMt mRNA showed a direct and positive correlation with an increase of the plant hormone, abscisic acid (ABA) in developing pollen embryoids. Treating cultures with an inhibitor of ABA biosynthesis, fluridone, suppressed not only ABA accumulation but also the appearance of the EcMt gene transcript and the ability of microspores to form embryoids. These results suggest that the EcMt gene may act as a molecular marker for pollen embryogenesis because ABA biosynthesis is accompanied by the increased expression of the EcMt transcript that coincides with the differentiation of pollen embryoids in wheat anther cultures. [References: 26].

1935 Royo, C.; Romagosa, I. (1996) **EFFECT OF FORAGE REMOVAL AT THE FIRST DETECTABLE NODE STAGE ON THE GROWTH OF WINTER AND SPRING TRITICALE.** *Grass & Forage Science. 51(2):170-179.* English. [IRTA CTR UDL AREA CONREUS EXTENSIUS ROVIRA ROURE 177 LLEIDA 25198 SPAIN].

The effect of forage removal on the growth of five winter and five spring triticale genotypes was studied in 1992 and 1993 in field experiments in north-eastern Spain. When cut, winter triticales produced more biomass and leaf area than spring types owing to their higher tillering capacity. The leaf area index (LAI) at anthesis was similar in both groups in both clipped and uncut plots, but spring triticales had a greater leaf area on the main stem than winter types. Winter types had a greater leaf area on the tillers than spring types. Spring and winter types had a similar physiological response to forage removal, except for modifications in flag leaf area. In spring types triticale flag leaf area was reduced by clipping, whereas in winter types flag leaf area was increased. Forage removal resulted in less dry-matter accumulation in all plant parts, maximum weight of the plant being reduced by about 20% and the rate of growth by around 13%. LAI at anthesis decreased by 37% as a result of clipping, and the leaf area duration from anthesis to maturity decreased by 36%. The duration of growth increased after clipping. Heading, anthesis and maturity dates were delayed by clipping, but grain filling duration was not affected. [References: 21].

1936 Saeboe, A. (Norwegian Crop Research Inst., Klepp Station (Norway). Saerheim Research Center); Mortensen, L.M. (1996) **Growth, morphology and yield of wheat, barley and oats grown at elevated atmospheric CO(2) concentration in a cool, maritime climate.** *Agriculture, Ecosystems and Environment (Netherlands) v. 57(1) p. 9-15.* 17 ref. English. (AGRIS 97-019274).

1937 Salimi, H.; Angadji, S.J. (1995) **Determination of critical growth stage and densities of Avena ludoviciana in its competition with wheat.** Plant Pests and Diseases Research Institute, Tehran (Iran Islamic Republic). *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 66.* Persian. (AGRIS 97-004107).

To determine the wild oat (A. ludoviciana) competition with wheat, a split-plot trial was carried out. Treatments consisted of six densities of wild oat (10-30-60-100-150-200 plant/m2) and four growth stages of the weed including weed removal at 3 leaf stage (T1), after tillering (T2), at the end of stem elongation (T3) and leaving the weeds to the end of the cycle (T4). Wheat yield decreased, when density of wild oat increased. In wild oat densities of 150, 200 plant/m2, yeild/ha was 4413.33, 4216 and 4000 Kg and in densities of 10, 30, 60 plant/m2 were 5242.66, 4842.66 and 4666.66 Kg which for one group were significantly more than for the higher density group. Number of tiller, weight of 1000 seeds, length of wheat spike decreased in tillering stage of the treatment significantly. Thus critical time of competition of wild oat with wheat was up to tillering stage.

1938 Satorre, EH.; Conde, J. (1996) **GRAIN GROWTH ATTRIBUTES OF MODERN ARGENTINE CULTIVARS OF MALTING BARLEY.** *Annals of Applied Biology. 128(Suppl S):86-87.* English. [UNIV BUENOS AIRES FAC AGRON DEPT PROD VEGETAL CATEDRA CEREALICULTURA AV SAN MARTIN 4453 RA-1417 BUENOS AIRES DF ARGENTINA].

1939 Saunders, PJ.; Mottram, J. (1996) **AN EVALUATION OF THE EFFECT OF SEEDING RATES ON YIELD OF TWO WINTER WHEAT CULTIVARS OF CONTRASTING SEED SIZE.** *Annals of Applied Biology. 128(Suppl S):96-97.* English. [ADAS ARTHUR RICKWOOD ELY CB6 2BA CAMBS ENGLAND].

1940 Slafer, G.A. (Melbourne Univ., Parkville, Vic. (Australia). Dept. of Agriculture); Rawson, H.M. (1995) **Photoperiod x temperature interactions in contrasting wheat genotypes: time to heading and final leaf number.** *Field Crops Research (Netherlands) v. 44(2-3) p. 73-83.* 29 ref. English. (AGRIS 97-019271).

1941 Sudakova, E.M. (1994) **[Physiological indexes of wheat leaves as influenced by plant age].** *Vliyanie vozrasta i vozrastnosti na fiziologicheskie pokazateli list'ev pshenitsy. Doklady RASKhN (Russian Federation) (no.5) p. 14-16.* 6 ref. Russian. (AGRIS 97-004120).

1942 Wang, M.; Oppedijk, BJ.; Lu, X.; Vanduijn, B.; Schilperoort, RA. (1996) **APOPTOSIS IN BARLEY ALEURONE DURING GERMINATION AND ITS INHIBITION BY ABSCISIC ACID.** *Plant Molecular Biology. 32(6):1125-1134.* English. [INST MOL PLANT SCI MOL BIOL SECT CLUSIUS LAB WASSENAARSEWEG 64 NL-2333 AL LEIDEN NETHERLANDS].

During germination of barley grains, DNA fragmentation was observed in the aleurone. The appearance of DNA fragmentation in the aleurone layer, observed by TUNEL staining in aleurone sections, started near the embryo and extended to the aleurone cells far from the embryo in a time dependent manner. The same spatial temporal activities of hydrolytic enzymes such as alpha-amylase were observed in aleurone. DNA fragmentation could also be seen in vitro under osmotic stress, in isolated aleurone. During aleurone protoplast isolation, a very enhanced and strong DNA fragmentation occurred which was not seen in protoplast preparations of tobacco leaves. ABA was found to inhibit DNA fragmentation occurring in barley aleurone under osmotic stress condition and during protoplast isolation, while the plant growth regulator gibberellic acid counteracted the effect of ABA. Addition of auxin or cytokinin had no significant effect on DNA fragmentation in these cells. To study the role of phosphorylation in ABA signal transduction leading to control of DNA fragmentation (apoptosis), the effects of the phosphatase inhibitor okadaic acid and of phenylarisine oxide on apoptosis were studied. We hypothesize that the regulation of DNA fragmentation in aleurone plays a very important role in spatial and temporal control of aleurone activities during germination. The possible signal transduction pathway of ABA leading to the regulation of DNA fragmentation is discussed. [References: 27].

1943 Webb, J.A. (Guelph Univ., Guelph, Ont. (Canada). Dept. of Environmental Biology); Fletcher, R.A. (1996) **Paclobutrazol protects wheat seedlings from injury due to waterlogging.** *Plant Growth Regulation (Netherlands) v. 18(3) p. 201-206.* 14 ref. English. (AGRIS 97-019272).

1944 Westgate, ME.; Passioura, JB.; Munns, R. (1996) **WATER STATUS AND ABA CONTENT OF FLORAL ORGANS IN DROUGHT-STRESSED WHEAT.** *Australian Journal of Plant Physiology. 23(6):763-772.* English. [USDA ARS MORRIS, MN 56267 USA].

Chemical signals from roots have been shown to mediate the response of vegetative shoots to drought. Our objective was to test whether root signals such as abscisic acid (ABA) affect grain set in wheat. Uniculm wheat was grown in a controlled environment and exposed to a water deficit from pollen mother cell meiosis to late boot stage-a period of reproductive development very sensitive to drought. The water deficit decreased grain numbers per spike up to 70%. As soil moisture was depleted, leaf, glume, ovary and anther water potential (Psi(W)) decreased with leaf Psi(W). Turgor decreased in the leaves, but remained at or above control levels in all floral organs examined. Free ABA content of leaves increased 30-fold as leaf turgor declined, while ABA in floral organs increased 10-15-fold. To separate the effects of shoot and root water status on grain set, plants were pressurised to maintain leaf Psi(W) at control levels as the soil dried. Pressurisation increased flowers and grains per spike over that of droughted plants at comparable soil water suctions, but not to control levels. Free ABA content in leaves and floral organs increased only about 3-fold when leaves were maintained at high Psi(W). Shoot water status had a greater effect on grain set than did soil water status. In both pressurised and unpressurised plants, grains per spike and percentage grain set decreased with increasing ABA content in ovaries and anthers. The results indicate that maintenance of a high shoot water status reduces the effect of soil water deficit on grain set by reducing the accumulation of ABA. [References: 33].

F63 PLANT PHYSIOLOGY-REPRODUCTION

1945 Balzer, HJ.; Borisiuk, L.; Meyer, HM.; Matzk, F.; Baumlein, H. (1996) **A POLLEN ALLERGEN-ENCODING GENE IS EXPRESSED IN WHEAT OVARIES.** *Plant Molecular Biology. 32(3):435-445.* English. [INST PFLANZENGENET & KULTURPFLANZENFORSCH ABT MOL GENET CORRENSSTR 3 D-06466 GATERSLEBEN GERMANY].

To isolate genes specifically expressed at the initiation of plant embryo development we have applied a sensitive subtractive hybridization technique for three isogenic wheat lines of the so-called 'Salmon system' with either zygotic or autonomous embryo development. Here we present a gene sequence showing a high homology to grass pollen allergens of type II/III thought to be expressed in pollen tissue only. Surprisingly, the pollen allergen-like sequence, designated Tri a III, is also expressed in gynoecia of the sexual, male fertile wheat line '(aestivum)-Salmon', whereas the two parthenogenetic and male sterile wheat lines '(caudata)-Salmon' and '(kotschyi)-Salmon' completely lack any Tri a III transcript. Our data suggest a positive correlation between the expression of this clone and the manifestation of male fertility. Northern and in situ hybridization analysis revealed that, in addition to its presence in pollen, Tri a III is expressed in the parenchymatous tissue of '(aestivum)-Salmon' ovaries exclusively at the day of anthesis. This precise temporal and spatial expression pattern suggests a more general function of the pollen allergen-like sequence Tri a LU not limited to the exhibition of allergens in pollen grains. [References: 37].

1946 Demotesmainard, S.; Doussinault, G.; Meynard, JM.; Gate, P. (1996) **IS IT POSSIBLE TO DIAGNOSE AT HARVEST A PROBLEM OF POLLEN STERILITY IN WHEAT.** *European Journal of Agronomy. 5(3-4):169-180.* English. [INRA INA PG AGRON LAB F-78850 THIVERVAL GRIGNON FRANCE].

We tested if various plant parameters, easy to measure at maturity in a wheat crop, could discriminate between situations with and without limitations in grain set caused by pollen sterility. In a pot experiment, plants were subjected to two treatments: shading during stem elongation, reducing growth; and climatic stress (low radiation and chilling) at meiosis, inducing pollen sterility. The percentage of grain setting among the two oldest florets within each spikelet (LF) and the ratios of grain number to (i) biomass of the chaff and (ii) biomass of the straw plus chaff were markedly reduced by the stress at meiosis and either little or not affected by shading during stem elongation. Two indices were tested in the field: LF and the ratio, RK, of the grain number per ear to an estimate, based on chaff biomass, of the potential number in the absence of sterility. These indices were measured in a network of five field experiments with six cultivars. The fluctuations in the indices were compared to those of a reference criterion that identified sterility: the rate of grain setting among the two oldest florets of each spikelet, measured in bagged ears to prevent cross-pollination. Both indices were reduced when the reference criterion diagnosed a major sterility but they did not always decrease in case of minor sterility. Classification of the cultivars based on the reference criterion was similar to that based on LF, but not on RK. LF diagnosis of sterility was in agreement with the occurrence of climatic conditions likely to induce sterility. [References: 41].

1947 Matzk, F.; Meyer, H. M.; Baeumlein, H.; Balzer, H. J.; Schubert, I. (Institute of Plant Genetics and Crop Plant Research, Gatersleben (Germany)) (1995) **A novel approach to the analysis of the initiation of embryo development in Gramineae [Triticum aestivum].** *Sexual plant reproduction (Germany) v. 8(5) p. 266-272.* 5 ill., 3 tables; 22 ref. English. (AGRIS 97-019308).

1948 Rawson, HM. (1996) **THE DEVELOPMENTAL STAGE DURING WHICH BORON LIMITATION CAUSES STERILITY IN WHEAT GENOTYPES AND THE RECOVERY OF FERTILITY.** *Australian Journal of Plant Physiology. 23(6):709-717.* English. [CSIRO DIV PLANT IND POB 1600 CANBERRA ACT 2601 AUSTRALIA].

Sterility in wheat in parts of the subtropics has been linked primarily with low-boron soils and its variability between years and locations with variation in the weather. This paper shows, from reciprocal transfers of plants between adequate and zero boron root media at different developmental stages, that the period during which florets are sterilised by boron insufficiency can be very short. For any ear it extends from after its flag leaf tip has emerged until shortly after the flag leaf has become fully expanded. This critical period of up to 1 week in length has already passed when the ear begins to emerge. Because tillers are sequential, the critical stage for the whole plant is longer than 1 week. It was shown that ears could also be sterilised by enclosing the whole plant in a clear plastic bag during this critical period, even though the plants were growing with adequate boron provided in sub-irrigated gravel culture. It is suggested that one of the effects of enclosure is to prevent transpiration and possibly the associated uptake and movement of boron to the reproductive growth centres. The six genotypes tested did not differ in the developmental stage at which they were sensitive, and all were completely sterile when they were grown without boron up to and including that stage. However, it appeared that a prior period in adequate boron had a different effect on sterility amongst genotypes. One genotype (Fang 60) showed evidence of a boron reserve that could be utilised even after a period equivalent to 3 phyllochrons whereas others appeared to have no boron pool. Ears which were fully sterilised by inadequate boron could have their fertility raised marginally by a spray of boric acid even several days after they had emerged. The implications of these results to grain yield in the subtropics are discussed. [References: 45].

H10 PESTS OF PLANTS

1949 Abdollahi, A. (1995) **More investigation on the sex pheromone of Eurygaster integriceps Put.** Sazandegi, Djehad (Iran Islamic Republic). *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 11.* Persian. (AGRIS 97-004550).

Many behavioural activities of insects (eg. movement, mating, aggregation) are under population control via chemical messengers given the general term of pheromone. Pheromones have particular advantages for pest management because they are highly specific, leave no undesirable residues in the environment and are used in very minute quantities. Further investigation was carried out: 1) To confirm the ratio of vanillia, the chemical structure of pheromone. 2) To compare composition of air-borne volatile with composition of material extracted directly by a solvent. Method : the air-borne volalile extract and solvent washed samples were analysed by gas chromatography (GC). According to our results; the major component, area of vanillin and also difference in the composition of different methods have been obtained.

1950 Abtali, Y. (Agricultural Research Center of Mazandaran, Sari (Iran Islamic Republic)); Mirkamali, H.; Ebrahimi, R. (Plant Pests and Diseases Research Institute, Tehran (Iran Islamic Republic)) (1995) **Evaluation of efficacy of chlodinafob Propargil (Topic) in control of grass weeds in wheat field of Mazandaran.** *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 63.* Persian. (AGRIS 97-004897).

A study was undertaken to evaluate the effectivencess of topik (clodinafop propargil) in controling grass weeds in wheat fields of Mazandaran. A randomized complete blocks design with 3 replications was used. Activity of chlodinafop Propargil was compared with three herbicides "tralkoxdim (10 EC. 3lit/ha), fenoxaprop-ethyl (4.5 EC. 1 lit/ha),

and diclofop- methyl (36 EC. lit/ha)." The herbicides were applied when wheat was at late tillering stage and grass weeds at the 4-6 leaf stage. Use of 0.8 and 1.0 l/h of chlodinfob propargil gave 100 control of wild oat (Avena spp.) and cannary grass (Phalaris spp.). The herbicide did not cause phytotoxicity on wheat plants even at the higher application rates. Yield of wheat was significantly increased by all herbicides used but there was no difference among herbicides.

1951 Aheer, G.M.; Ahmad, K.J.; Ali, A. (Ayub Agricultural Research Inst., Faisalabad (Pakistan). Entomology Section) (1994) **Role of weather in fluctuating aphid density in wheat crop.** *Journal of Agricultural Research (Pakistan) v. 32(3) p. 295-301.* 5 tables, 9 ref. English. (AGRIS 97-020199).

Study was conducted during 1988-91 at Faisalabad to determine the role of temperature, relative humidity, rainfall and wind velocity in fluctuating aphid density in wheat. Fluctuation in pest population varied in different years. It was higher in 1988-89 and lower in 1990-91. Maximum aphid population was trapped in March. Wind velocity played a positive and significant role in fluctuating aphid density during 1990-91 (r = 0.798). All other factors for the years individually had no significant correlation with aphid density. However, multiple regression showed a significant trend between aphid density and weather factors for 1990-91. The contribution was 86.6 percent. Regression analysis for 1988-89 and 1989-90 did not respond significantly showing 16.00 and 33.40 percent contribution in fluctuating aphid density.

1952 Anderson, J.A. (Oklahoma State University, Stillwater, OK.); Peters, D.C. (1995) **Inhibitors of ethylene biosynthesis and action do not prevent injury to wheat seedlings infested with Schizaphis graminum (Homoptera: Aphididae).** *Environmental entomology (USA) v. 24(6) p. 1644-1649.* references. English. (AGRIS 97-020200).

ACT Experiments were conducted to determine whether inhibitors of ethylene biosynthesis and action can prevent symptoms of aphid damage to wheat seedlings. 'TAM 107' wheat, Triticum aestivum L., seedlings infested with biotype G greenbugs, Schizaphis graminum (Rondani), for 6 h developed chlorosis and necrotic spots within 4 d after the aphids were removed. AVG (1 mM 2-aminoethoxyvinylglycine), an ethylene biosynthesis inhibitor, reduced ethylene production but not development of lesions or loss of chlorophyll from infested seedlings. STS [silver thiosulfate complex (0.5 mM AgNO3, 2.0 mM Na thiosulfate)], an inhibitor of ethylene action, did not prevent a reduction in chlorophyll concentration or the development of lesions. A secondary objective was to determine how the ethylene biosynthetic pathway was differentially affected by aphid biotypes previously shown to stimulate high or low levels of ethylene. 'Largo' and TAM 107 wheat seedlings were infested with biotype E or G greenbugs, then harvested after 1, 6, or 48 h. Both wheat genotypes are susceptible to biotype G. TAM 107 is susceptible to biotype E and Largo is resistant. Increased ethylene production 6 h after seedlings were exposed to biotype G was associated with an increase in ACC (1-aminocyclopropane-1-carboxylic acid, the immediate precursor of ethylene) and EFE (ethylene-forming-enzyme) activity in both wheat genotypes. Ethylene production, ACC content, and EFE activity declined by 48 h, concomitant with an increase in MACC (N-malonyl-ACC, an inactive conjugate of ACC). Biotype E triggered a smaller increase in ethylene production than biotype G. ACC levels were not affected by biotype E, but EFE activity increased by 33 in Largo and 151 in TAM 107 after 6 h. Ethylene production from greenbug-infested wheat seedlings was controlled primarily by ACC content. Ethylene appeared to be a symptom, not a mediator of greenbug-induced injury.

1953 Asghari, S.; Kharrazi Pakdel, A.; Esmaili, M. (1995) **Graphosoma lineatuma L. (Het. Pentatomidae) as an alternative host for mass rearing of egg parasitoids Trissolcus spp. (Hym., Scelionidae).** Tehran Univ. (Iran Islamic Republic). Agriculture College. *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 17.* Persian. (AGRIS 97-004459).

Eggs of Eurygaster integriceps used for mass rearing of egg parasitoids in Iran in 1946-63, is not economically applicable today, because of reduced population density due to spraying. Therefore the bug Graphosoma lineatum L. which has no obligatory diapause, is to be used as an alternative host in Iran. Adults were collected from Shahrestanak region on seeds of Chaerophyllum aureum L. (Umbelliferae) prior to oviposition at the end of May in 1993. Their biology was studied in vitro. Three feeding regimes of dry seeds of Umbellifers, Foeniculum vulgare Miller, Heracleum-persicum desf. and their mixture, were used for rearing and amounts of their eggs and mortalities determined. Collected eggs were stored in 4 temperature treatments including 4, 5, 6 and -23C for 8 months. Then paper strips consisting of 100 eggs each were exposed to two species of Trissolcus grandis Thom. and T. vassilievi Mayr. Variations of parasitization, adult hatching percentages and their sex ratios were evaluated. Bugs collected from nature produced the most eggs (300 eggs per female) being reduced for the following generations (50-135). Male progeny for T. grandis was very high (70-100) in most cases but it was lower for T. vassilievi (30 maximum).

1954 Awmack, C.S.; Harrington, R.; Leather, S.R.; Lawton, J.H. (IACR Rothamsted, Harpenden, Herts AL5 2JQ (United Kingdom)) (1996) **The impacts of elevated CO2 on aphid-plant interactions.** *Aspects of Applied Biology (United Kingdom) (no.45) p. 317-322.* 22 ref. Implications of 'Global environmental change' for crops in Europe, 1-3 April 1996, Churchill College, Cambridge, UK. English. (AGRIS 97-005121).

1955 Azimi, A.R.; Biemani, M.; Haghighat Khah, M. (1995) **Chemical control of Syringopais temperatella Led. (Lep. Scythridae), wheat leaf miner in Khuzestan province.** Ahwaz, Khuzestan Agricultural Organization (Iran Islamic Republic). Plant Protection Office. *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 2.* Persian. (AGRIS 97-004462).

A trial was conducted to evaluate the chemical treatment and yield losses caused by wheat leaf miner (Syringopais temperatella Led.) in unirrigated wheat-fields at Khuzestan province, in 1993-94. Results obtained five days after application of Diazinon 60EC showed 8.14 and 95.9 mortality in fields number 1 and 2 respectively. However, yield analysis of treated and untreated plots showed no significant difference among them. Moreover, it is concluded that insecticide application at early stage of plant growth is more effective against this pest.

1956 Barro, P.J. de; Sherratt, T.N.; Brookes, C.P.; David, O.; Maclean, N. (Department of Biology, University of Southampton, Bassett Crescent East, Southampton, SO16 7PX (United Kingdom)) (1995) **Spatial and temporal genetic variation in British field populations of the grain aphid Sitobion avenae (F.) (Hemiptera: Aphididae) studied using RAPD-PCR.** *Proceedings of the Royal Society of London. Series B, Biological Sciences (United Kingdom) v. 262(1365) p. 321-327.* 32 ref. English. (AGRIS 97-020048).

1957 Blackshaw, R.P.; Coll, C.; Humphreys, I.C.; Stewart, R.M. (Department of Agricultural Zoology, Queen's University of Belfast, Newforge Lane, Belfast BT9 5PX (United Kingdom)) (1996) **The epidemiology of a new leatherjacket pest (Tipula oleracea) of winter cereals in northern Britain.** *HGCA Project Report (United Kingdom); no. 120 119 p.* Home Grown Cereals Authority. 7 pp. of ref. English. (AGRIS 97-004834).

1958 Ciric, D. (Institut za istrazivanja u poljoprivredi "Srbija", Kragujevac (Yugoslavia). Centar za strna zita); Simova Tosic, D. (Poljoprivredni fakultet, Beograd Zemun (Yugoslavia)) (1994) **[The occurrence of gall-midges depending on wheat variety and maturity stage]. Pojava cecidomida u zavisnosti od sorte psenice i faze zrelosti.** Treci jugoslovenski kongres o zastiti bilja. Vrnjacka Banja (Yugoslavia). 3-7 Oct 1994. *Plant protection today and tomorrow: [selected papers from the third Yugoslav congress about plant protection, Vrnjacka Banja (Yugoslavia), October 3-7, 1994]. Sestovic, M.; Neskovic, N.K.; Peric, I. (eds.). Zastita bilja danas i sutra: [odabrani radovi sa Treceg jugoslovenskog kongresa o zastiti bilja, Vrnjacka Banja (Jugoslavija), 3-7. oktobra 1994] p. 233-238.* Drustvo za zastitu bilja. 4 graphs; 10 ref. Serbian. (AGRIS 97-005125).

Gall-midges population density on different wheat varieties (Kragujevacka 56, Srbijanka, Orasanka, Oplenka and Jugoslavija) and different maturity stages was investigated. The investigation was carried out from 1989 to 1990. Two species of gall-midges were found: Contarinia tritici Kirby and Sitodiplosis mosellana Gehin. The abundance of gall midges varied depending on wheat variety. The highest number of gall midges was encountered in the Oplenka variety. The smallest of gall-midges was registered in the Orasanka variety. The investigation showed a decline in the abundance of gall-midges larvae from milky stage to full maturity stage.

1959 Darvish, T. (Agricultural Research Center of Gorgan and Gonbad (Iran Islamic Republic). Plant Pests and Diseases Research dept.); Bayat Asadi, H. (Tehran (Iran Islamic Republic). Plant Pests and Diseases

Research Institute) (1995) **Identification of the natural enemies of wheat green aphid (Sitobion avenae F.) in gorgan and Dasht.** *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 21.* Persian. (AGRIS 97-005058).

Surveys have been conducted during 1993-1994. Based on the weekly samplings, the following beneficial insects have been collected: Order- Coleoptera 1- Coccinella septempunctata (L.) 2- Hippodamia variegata (Goeze) 3- Propyla 14- punctata (L.) Order- Neuroptera 1- Chrysopa formosa (Prauer) 2- Chrysoperla carnea (stephon) Order- Diptera 1- Metasyrphus corollae (Fabr) 2- Syrphus ribessi (L.) 3- Episyrphus balteatus de Geerr. 4- Syrphus pyrastri (L.) Order- Hymenoptera; Parasitoids 1- Aphidius uzbekistanicus Luzhetzki 2- Aphidius ervi Haliday 3- * Ephedrus plagiator (Nees) Hymenopterous species with mark * for first have been reported from Iran.

1960 Dolati, L. (Maragheh Agricultural College. (Iran Islamic Republic)); Rasulian, G.; Esmaili, M.; Azmayesh Fard, P. (Karaj Agricultural College. (Iran Islamic Republic)) (1995) **Study of the biology and distribution of the Russian wheat aphid in Tehran province.** *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 6.* Persian. (AGRIS 97-004519).

Biology of the Russian wheat aphid (Diuraphis noxia) at the green house condition (average temp. 25.7C and average hum. 40 percent) and at field condition was studied in 1993 and 1994 in Karaj respectively. In order to study weekly population flucuation of the aphid 20 infested plants were selected randomly during the crop season, and number of alive and mummied ones were recorded. In order to study the distribution of the aphid in Tehran province, crop and non-crop hosts were investigated at various regions of the province. Results from the green house studies were as follows : average life time of nymphs, pre-reproduction, reproduction, post reproduction and total life span periods were 7.5, 1, 42.77, 11.63 and 63 days respectively and 72.12 nymphs were produced per female. In field condition the average times of the periods were 19.71, 2.43, 49, 16.43, 87.43 respectively and 76.86 nymphs were produced per female. Results of the study indicated that the aphid survives on volunteer wheat and barley and some grasses during non-crop seasons. D. noxia overwinters as nymph and adult forms on the hosts. The population density of the aphid increased as the relative humidity decreased and the temperature increased. Also the sampling indicated the alate emigrants estabilished on crop fields. In early April at Karaj condition they leave the crops as soon as their senescence is reached. During the samplings the percentage of parasitism by Aphelinus sp. was recorded. By studing the distribution of D. noxia in Tehran provice it was found from Karaj, Varamin, Damavand, Talegan, Shahryar as well as Abyek and Qazvin regions and its natural enemies and various hosts are recorded.

1961 Eslami, S.J.; Safar Alizadeh, M.H. (1995) **Cultural control Porphyrophora tritici (Bod.) on wheat in Hamadan.** Hamadan Univ. (Iran Islamic Republic). Bou-Ali Sina Dept. of Plant Protection. *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 22.* Persian. (AGRIS 97-005012).

To find a proper method of control for Porphyophora tritici on wheat, we studied the following methods in the contaminated farms around Hamadan: 1. Furrowing during the embryo and larval stages of P. tritici 2. The role of different furrow types on reduction of the population of this pest. Furrowing during the embryo and larval stages caused a considerable reduction in population of this pest on the host plants. The average numbers of larvae in each pair of examined plants were equal but the percentages of contaminated plants in the farms furrowed during the larval stage were less than the other one. The effects of different types of furrows on reduction of the pest population has not been the same. Deep and relatively shallow furrows had a stronger effect than shallow and half-deep ones. The same results were obtained in the case of percentages of contaminated plants.

1962 Ester, A.; Nijenstein, JH. (1996) **MOLLUSCICIDAL SEED TREATMENT OF BARLEY, WHEAT AND PERENNIAL RYEGRASS TO CONTROL THE FIELD SLUG (DEROCERAS RETICULATUM).** *Netherlands Journal of Agricultural Science. 44(3):241-248.* English. [PAGV RES STN ARABLE FARMING & FIELD PROD VEGETABLES POB 430 NL-8200 AK LELYSTAD NETHERLANDS].

The effects on the field slug (Deroceras reticulatum (Muller)) of treating seeds of barley, wheat and perennial ryegrass were investigated in laboratory experiments. Barley seeds were treated with metaldehyde and methiocarb, wheat seeds with metaldehyde, methiocarb, neem oil (azadirachtin) and saponins, and perennial ryegrass seeds with metaldehyde, methiocarb and thiocyclam hydrogen oxalate. These compounds were tested at several rates. Metaldehyde was the most effective treatment in preventing slug damage to the seeds and seedlings. The level of protection against slugs at 0.8 g a.i. kg(-1) barley and 1.6 g a.i. kg(-1) wheat seeds was insufficient, but 1.6 g a.i. kg(-1) (barley) and 3.2 g a.i. kg(-1) (wheat) gave good protection for up to 10 and 6 days respectively after sowing. Metaldehyde at 160 g a.i. kg(-1) perennial ryegrass seed also gave sufficient protection against the field slug. [References: 18].

1963 Evans, K.A.; Hughes, J.M. (SAC, West Mains Road, Edinburgh EH9 3JG (United Kingdom)) (1996) **Methods for predicting changes in pest distribution due to climate change: wheat bulb fly.** *Aspects of Applied Biology (United Kingdom) (no.45) p. 285-292.* 15 ref. Implications of 'Global environmental change' for crops in Europe, 1-3 April 1996, Churchill College, Cambridge, UK. English. (AGRIS 97-004730).

1964 Freier, B.; Triltsch, H. (BBA, Institute of Integrated Plant Protection, D 14532 Kleinmachnow (Germany)) (1996) **Climate chamber experiments and computer simulations on the influence of increasing temperature on wheat-aphid-predator interactions.** *Aspects of Applied Biology (United Kingdom) (no.45) p. 293-298.* 25 ref. Implications of 'Global environmental change' for crops in Europe, 1-3 April 1996, Churchill College, Cambridge, UK. English. (AGRIS 97-005123).

1965 Frost, M.J.; Elsworth, S.G.; Moran, A. (Zeneca Crop Protection, Fernhurst, Haslemere, Surrey, GU27 3JE (United Kingdom)) (1994) **Tefluthrin - a cereal seed treatment for the control of wheat bulb fly (Delia coarctata).** *Proceedings - Brighton Crop Protection Conference, Pests and Diseases, 1994, vol. 1 p. 217-222.* British Crop Protection Council, BCPC Publications. 3 ref. English. (AGRIS 97-004870).

1966 Ghadiri, V. (1995) **Fenitrothion effect on reduction of population density of cereal sawfly (Cephus pygmeaus L.).** Tehran Univ. (Iran Islamic Republic). Plant Pests and Diseases research Institute. *Proceedings of the 12th Iranian Planr Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 16.* Persian. (AGRIS 97-004457).

In recent years the population density of cereal sawfly has increased in Karadj and other areas such as Tehran and central province. Researches were carried out to estimate the effect of fenitrothion normally used against sunn pest during 1992-93. For this purpose in a field of about 6000m the experiments were carried out in randomized complete block design with 4 treatments and 5 replications each. The treatments were: 1. Spraying against overwintered adult of sunn pest 2. Spraying against nymphs of sunn pest 3. Spraying against overwintered adults and nymphs 4. Check (without spraying). Percentage of infestation was determined for each replication. The data obtained at the end of two years experiments, were analyzed. The data revealed that, there was significant difference among the treatments. Spraying against overwintered adults of sunn pest has been found the most effective.

1967 Gianoli, E.; Papp, M.; Niemeyer, HM. (1996) **COSTS AND BENEFITS OF HYDROXAMIC ACIDS-RELATED RESISTANCE IN WINTER WHEAT AGAINST THE BIRD CHERRY-OAT APHID, RHOPALOSIPHUM PADI L.** *Annals of Applied Biology. 129(1):83-90.* English. [UNIV CHILE FAC CIENCIAS DEPT CIENCIAS ECOL SANTIAGO 653 CHILE].

Estimations of infestation by the bird cherry-oat aphid (Rhopalosiphum padi) as well as measurements of grain yield in 26 Hungarian winter wheat cultivars under field conditions were correlated with the concentration of hydroxamic acids (Hx) in seedlings of those cultivars. The significant inverse relationship between infestation ratings and Hx levels in wheat showed that Hx, despite their decreased accumulation at later plant phenological stages, may be able to confer resistance against aphid infestation in the field. Since no significant relationship was found between grain yield and Hx levels in plants it is suggested that Hx accumulation does not impose a cost to the plant in terms of yield. These findings support earlier claims stressing the potential of Hx as breeding targets for aphid resistance in wheat. [References: 34].

1968 Gillespie, R.L. (Washington State University, Ephrata, WA.); Kemp, W.P. (1995) **Habitat associations of grasshopper species (Orthoptera:**

Acrididae) in winter wheat (Triticum aestivum L.) and adjacent rangeland. *Journal of the Kansas Entomological Society (USA) v. 68(4) p. 415-424.* references. English. (AGRIS 97-019967).

1969 Hagh Shenas, A.; Esmaili, M.; Talebi, Kh.; Sepehr, D.K. (1995) **Effect of granular organophosphorus on sunn pest.** Karaj, Tehran Univ. (Iran Islamic Republic). College of Agricultural. Dept. of Plant Protection. *Proceedings of the 12thIranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 5.* Persian. (AGRIS 97-005124).

The effect of three organophosphorus granular formulations was evaluated in Karaj, Varamin and Esfahan. The insecticides fenitrothions (Gr. 5 and 10) chlorpyrifos (Gr. 5 and 10) and diazion (Gr. 5) were applied either by aircraft (Karaj, Varamin) or hand-carried granule applicator (Esfahan). In Karaj (Kamalabad), where fenitrothion (10) and diazinon (5) were applied at the rates of 20 and 40 Kg/ha respectively, adult female mortality was 85, 9 days after application and fenitrothion was more effective than diazinon. In Varamin these insecticides at the same rates caused 90 to 96 and 86 to 93 mortality respectively, 18 days after application. Diazinon (5), fenitrothion (10) and chlorpyrifos (50 were applied in Esfahan region at the rates of 40, 12 and 24 Kg/ha respectively. The sunn pest mortalities were 84, 45 and 33, 3 days after application. A similar experiment in Karadj with diazinon (5) chlorpyrifos (5) at the rates of 20 and 40 Kg/ha gave 48 and 47 mortality respectively, 20 days after application. This study showed that, when diazinon granule was applied in moist soil, the nymphal mortality was increased by 30.

1970 Hagstrum, DW. (1996) **MONITORING AND PREDICTING POPULATION GROWTH OF RHYZOPERTHA DOMINICA (COLEOPTERA, BOSTRICHIDAE) OVER A RANGE OF ENVIRONMENTAL CONDITIONS.** *Environmental Entomology. 25(6):1354-1359.* English. [USDA ARS US GRAIN MKT RES LAB 1515 COLL AVE MANHATTAN, KS 66502 USA].

Population growth of lesser grain borer, Rhyzopertha dominica (F.), in 135-kg lots of hard red winter wheat, Triticum aestivum L., was monitored at 3 grain moisture levels (approximate to 10, 12, and 14%) at each of 3 temperatures (approximate to 22, 27, and 32 degrees C). Over this range of environmental conditions, a published population growth model explained 64-96% of the variation in insect density. Based on published studies and new data collected for developmental times, new equations were developed for egg production and developmental time, and daily adult mortality was estimated. Substituting new equations and mortality rate in the published model improved predictions, increasing by 3-24% the percentage of variation explained. The biggest improvements tended to be at the extreme grain moisture and temperature conditions. [References: 14].

1971 Hashemi Aghajari, M.H.; Hasani, M.H.; Tebyani, H. (1995) **Investigations on wheat spike moth (Apamea sordens Hfn.) in Maragheh and Hashtrood.** Dryland Agricultural Research Inst. (DARI). (Iran Islamic Republic). *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 7.* Persian. (AGRIS 97-004366).

2 years study about the insect biology showed that after harvesting the larvae remain in plant debris inactively during the day and feed on leaves and kernels and are left on the soil during the night. In favorable condition the larvae feed on winter wheat along with changes in color and considerable growth during autumn. The larvae stop feeding in winter and overwinter in the soil at depth of 5-7 Cm. In spring the larvae start feeding again on young leaves and stems of wheat and barley and reach about 40 mm length in April. The pupae are formed in cocoons in the soil at a depth of 4-5 Cm. Adult insects appear in late May and after mating they lay eggs on leaves and spikes. The insect has one generation per year.

1972 Heydari, M. (Tehran (Iran Islamic Republic). Plant Pests and Diseases Research Inst.); Mardoukhi, V. (Kordestan (Iran Islamic Republic). Dept. Agricultural Research Center of Kordestan. Plant Pests and Diseases Research) (1995) **Review of the effects of agricultural and chemical control wheat root scale Porphyrophora tritici (Bod.) in rain-fed farms.** *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 8.* Persian. (AGRIS 97-005011).

Wheat-root scale has incurred losses in certain parts of Kordestan province. In a two year research project, applied as follows: A. Experiment on effects of toxins in the tillering stage of the wheat crop. B. Experiments on effects of agricultural processes were carried out, in rain-fed farms. The 1993 surveys showed that the infection percentage was high in the fourth attendance and considerably so in comparison with other attendance periods in the same group. Thus, it was concluded that all sound agricultural processes including the inhibition of wheat-grain full-off during the harvesting period, rotation and timely spring ploughing in the rotated farms in order to exclude single wheat stalles and weeds playing host to pests, and thus destroying their nutrition resources, were, in combination, the most effecient method to control and diminish pest populations and hinder the resulting losses over which peticide application as an alternative is not recommended.

1973 Iglesias, L.; Romero, K. (Instituto Nacional de Ciencias Agricolas, Pinar del Rio (Cuba). Estacion Experimental del Arroz "Los Palacios"); Gilchrist, L.; Mujeeb Kazi, M. (Centro Internacional de Mejoramiento de Maiz y Trigo (Mexico). Dept. de Cruzas Amplias) (1996) **[A preliminary study of the possible harmful pests and diseases to wheat crop (Triticum aestivum L.) in Cuba]. Estudio preliminar de las plagas y enfermedades que pueden constituir un peligro para el cultivo del trigo (Triticum aestivum L.) en Cuba.** *Cultivos Tropicales (Cuba) v. 17(1) p. 75-78.* 5 tablas; 13 ref. Spanish. (AGRIS 97-019516).

1974 Javadzadeh, M.; Afshari, M.R. (1995) **Effects of some insecticides on Trissolcus grandis Thomson (Hym., scelionidae) the parasitoid of sunnpest.** Tehran Univ. (Iran Islamic Republic). Plant Pests and Diseases Research Institute. *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 4.* Persian. (AGRIS 97-005120).

To investigate the effects of some insecticides on Trissolcus granadis Thomson, a series of experiments were carried out in 1992-1994 with IOBC/WPRS methods. In the laboratory all insecticides caused 100 mortality to the adult wasps. In these trials, the rates of emergence of the adult wasps from treaed parasitized eggs for pirimiphos methyl, endosulfan, fenitrothion, deltamethrin and phosalone were 31.4, 66.2, 72.8, 80 and 94 resepctively. In the field test all treatments caused 100 mortality to the adult wasps. also after spraying of eggs of sunnpest, with the exception of phosalone which showed 99.1 of parasitism. The rates of parasitism were 41.3, 23.1, 11.3 and 0.0 for pirimiphos methyl, respectively, in decamethrin no parasistism was seen. To determine the persistence period of each insecticide in the field, samples were taken from the foliage of treated wheat plants 2, 5, 10 and 20 days after spraying the selected fields. Based on the results obtained, from this experiment, phosalone and endosulfan were short lived, decamethrin was slightly persistent, fenitrothion and pirimiphos methyl were moderately persistent.

1975 Khalaf, J. (1995) **The biology and control of wheat stem sawfly (Trachelus tobidus) in Fars province.** Zarghan Univ. (Iran Islamic Republic). Agricultural Research Centre, Plant Pests and Diseases Dept. *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 18.* Persian. (AGRIS 97-005080).

Recently in wheat fields of Fars province the spread of wheat stem sawflies has been noticed on almost an economical scale. Biology studies indicate that the pest has one generation in a year and hibernate in the form of inactive larvae at the base of the wheat stems. The change of larvae into pupae depends on climate condition. In colder region it appears later than in warmer region. Mating will occur a few days after molting and the female lays their eggs under wheat spike. Individual eggs are laid inside the epidermal cells. After hatching the larvae move down inside the wheat stems. However by the time the seed goes into hard dough stage, the stem breaks off near crown, while the larva stays on the lower parts. Under unfavorable condition (lack of rain and humidity) new generation will not appear after two years as the pest survive in the form of inactive larvae. Wheat varieties which are planted in the province are susceptible, however, the degree differs between common cultivars as the Ghods is the most susceptible. Field control including deep ploughing followed by stubble burning, the proper use of rotation and fallow system in regional cropping pattern is also advised. Choosing of early maturing varieties which are planted later in the season is an effective measure. In other case, resistance varieties should be used.

1976 Kindler, S.D. (Plant Science and Water Conservation Research Laboratory, USDA, ARS, Stillwater, OK.); Springer, T.L.; Jensen, K.B. (1995) **Detection and characterization of the mechanisms of resistance to Russian wheat aphid (Homoptera: Aphididae) in tall wheatgrass.** *Journal*

of economic entomology (USA) v. 88(5) p. 1503-1509. references. English. (AGRIS 97-004533).

The Russian wheat aphid, Diuraphis noxa (Mordvilko), is a recently introduced pest that is an economic threat to wheat, Triticum aestivum L., and barley Hordeum vulgare L., production. Tall wheatgrass, Agropyron elongatum (Host) Beauvois, in an important alternative summer host of the aphid and provides a food source for Russian wheat aphid populations between spring harvest and fall planting of cereal crops such as wheat and barley. Experiments were conducted in the greenhouse to identify Russian wheat aphid-resistant tall wheatgrass plants obtained from the Western Regional Plant Introduction (PI) Station, USDA-ARS, Pullman, WA. PI 401010 was resistant to leaf chlorosis and leaf curling caused by aphid feeding, and had decreased aphid reproduction compared with 'Jose' tall wheatgrass. Further tests were conducted to characterize the plant components (antibiosis, antixenosis [nonpreference], and tolerance) contributing to resistance of PI 401010. PI 401010 had high levels of antibiosis, demonstrated by Russian wheat aphids delayed reproductive maturity, shorter reproductive lifespan, and reduced rates of fecundity compared with 2 susceptible genotypes. When infested with Russian wheat aphids, plant heights were reduced and dry mass foliage loss per unit of aphid mass produced was high. A strong antixenosis (nonpreference) resistance component existed in PI 401010 when aphids were given a choice of several genotypes. PI 401010 is a new source of resistance for germplasm enhancement efforts.

1977 Kindler, SD.; Hammon, RW. (1996) **COMPARISON OF HOST SUITABILITY OF WESTERN WHEAT APHID WITH THE RUSSIAN WHEAT APHID.** *Journal of Economic Entomology. 89(6):1621-1630.* English. [USDA ARS PLANT SCI & WATER CONSERVAT RES LAB 1301 N WESTERN ST STILLWATER, OK 74075 USA].

The western wheat aphid, Diuraphis tritici (Gillette), and the Russian wheat Diuraphis noxia (Mordvilko), are pests of wheat, Triticum aestivum L. Both species similar distribution pattern in the United States. However, D. noxia is a perennial economic pest of wheat, whereas D. tritici is, at most, an occasional economic pest of wheat. The economic importance of D. noxia depends in part on its ability to use alternative plant species as oversummering hosts. We studied the survival and reproduction of D. tritici on numerous cool- and warm-season grasses, legumes, and forbs, and also compared D. tritici with D. noxia on some common Bromus spp. and Agropyron spp. to see if the 2 aphid species differ in their reproduction and survivorship on the same grass species. D. tritici survived on 36 of 40 cool-season grass species, 7 of 19 warm-season grass species, and none of the 33 legumes or 13 forbs. The natality of D. tritici compared with D. noxia on several species of brome grasses and wheatgrasses was generally significantly lower for D. tritici than D. noxia. D. tritici preferred wheat compared with 3 other cereals, whereas wheat and barley were equally suitable as hosts for D. noxia. Rye, Secale cereale L., was essentially a nonhost for D. tritici. After 14 d, aphid populations were significantly higher for D. noxia on all 4 cereals compared with D. tritici populations on the same hosts. In a separate experiment to compare damage of D. tritici with D. noxia on different growth stages of wheat, we found that D. tritici was significantly more deleterious than D. noxia to the yield potential and yield components of wheat, particularly when infestation occurred at the 7-leaf plant growth stage and the jointing growth stage. The economic importance of D. noxia compared with D. tritici to U.S. wheat production may be caused in part by its ability to survive and increase on cool-season grasses and cereals better than D. tritici. [References: 19].

1978 Lane, S.J. (National Agriculture Research Centre, Tsukuba, Ibaraki (Japan). Lab. of Applied Ornithology); Nakamura, K. (1996) **The effect of night grazing by wigeon (Anas penelope) on winter-sown wheat in Japan and the efficacy of black plastic flags as scaring devices.** *Agriculture, Ecosystems and Environment (Netherlands) v. 59(1-2) p. 81-87.* 19 ref. English. (AGRIS 97-020198).

1979 Maarouf, A. (Ecole Normale Superieure, Casablanca (Maroc)); Chemseddine, M. (1995) **[A survey of cereal infestation by the wheat shoot fly (Phorbia securis Tiensu; Diptera, Anthomyiidae)]. Surveillance de l'infestation des cereales par la mouche noire (Phorbia securis Tiensu; Diptera, Anthomyiidae).** *Ecologia Mediterranea (France) v. 21(3-4) p. 93-99.* 12 ref., 5 graph. French. (AGRIS 97-004283).

1980 Majani, T.D.; Rezwani, A. (1995) **Surveys on the wheat aphids and their proportional densities in Gorgan region.** Tehran Univ. (Iran Islamic Republic). Gorgan and Gonbad Plant Pests and Diseases Research Inst. *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 13.* Persian. (AGRIS 97-004370).

Based on the data collected during 1993, 1994 the aphids attacking wheat heat crops in Gorgan region are as follow: Population 1. Sitobion avenae (F.) 97 (the most abundant species) 2. Rhopalosiphum maidis (Fitch.) 3. Rhopalosiphum padi (L.) 0/7 4. Metopolophium dirhodum (Walk.) 0/6 5. Schizaphis graminum (Rondani) 0/3 6. Sipha (Rungsia) elegans del Guercio 7. Tetraneura ulmi (L.) 0/4 8. Anoecia corni (F.) 0/4 9. Anoecia vagans (Koch) 0/4.

1981 Mann, J.A.; Harrington, R.; Carter, N.; Plumb, RT. (1997) **CONTROL OF APHIDS AND BARLEY YELLOW DWARF VIRUS IN SPRING-SOWN CEREALS.** *Crop Protection. 16(1):81-87.* English. [IACR ROTHAMSTED HARPENDEN AL5 2JQ HERTS ENGLAND].

The effects of sowing date and the timing of insecticidal applications on the colonization of cereal crops by aphids and incidence of barley yellow dwarf luteovirus were investigated. For three years (1990-1992) spring barley was sown in mid-March and mid-April, and one to three sprays of pirimicarb were applied prior to stem elongation. In 1990, yield declined with increased virus incidence; spray treatments just prior to stem elongation were most effective in aphid control but the benefit was short-lived. In 1991 and 1992, aphid migrations were relatively late, virus incidence was low and the sprays had no significant effect on aphid or virus abundance. Yields from early-sown plots were significantly greater than from plots sown late in all 3 years. Results suggest that spray regimes aimed at controlling aphids carrying BYDV into spring-sown crops are of little benefit and should be discouraged. In cases where some form of control is needed, appropriate timing of insecticide sprays depends upon the timing of aphid migrations relative to crop development and the infectivity of aphids migrating in the spring. Copyright (C) 1996 Elsevier Science Ltd. [References: 26].

1982 Markwick, N.P. (The Horticulture and Food Research Institute of New Zealand Limited, Auckland, New Zealand.); Laing, W.A.; Christeller, J.T.; Reid, S.J.; Newton, M.R. (1996) **alpha-Amylase activities in larval midgut extracts from four species of Lepidoptera (Tortricidae and Gelechiidae): response to pH and to inhibitors from wheat, barley, kidney beans, and Streptomyces.** *Journal of economic entomology (USA) v. 89(1) p. 39-45.* references. English. (AGRIS 97-019805).

Levels of alpha-amylase activity between 0.6 and 5.0 micromoles maltose minute-1 gram insect-1 occurred in larval midgut extracts from 4 species of lepidopterous pests--light brown apple moth, Epiphyas postvittana (Walker), Planotortrix octo (Dugdale), and Ctenopseustis obliquana (Walker) are pests of apple leaves and fruit, and potato tuber moth, Phthorimaea operculella (Zeller), is a pest of potato tubers and foliage. Activity response curves described the optima for activity at a highly alkaline pH range (pH 10.5 in leafrollers and pH 9.5 in potato tuber moth). This result is consistent with the known high midgut pH in other species of Lepidoptera and with the pH optima of their digestive proteases. The 3 wheat-derived alpha-amylase inhibitors inhibited enzyme activities of all 4 species of Lepidoptera, but the other 3 (barley tetramer, Streptomyces, and kidney bean inhibitors) had no effect. Wheat dimeric inhibitor (30 micromolar) completely inhibited alpha-amylase activity in potato tuber moth midgut extracts.

1983 Mayoral, A.M. (Consejo Superior de Investigaciones Cientificas CIB, Madrid (Spain)); Tjallingii, W.F.; Castanera, P. (1996) **Probing behaviour of Diuraphis noxia on five cereal species with different hydroxamic acid levels.** *Entomologia Experimentalis et Applicata (Netherlands) v. 78(3) p. 341-348.* 28 ref. English. (AGRIS 97-020197).

1984 Miller, HL.; Porter, DR. (1997) **A TECHNIQUE TO QUANTITATIVELY MEASURE THE LEAF STREAKING SYMPTOM OF RUSSIAN WHEAT APHID INFESTATION.** *Crop Science. 37(1):278-280.* English. [ARS USDA 1301 N WESTERN STILLWATER, OK 74075 USA].

One of several symptoms of Russian wheat aphid (RWA) [Diuraphis noxia (Mordvilko)] damage in susceptible barley (Hordeum vulgare L.) is white or chlorotic streaking of the leaf. Current methods use several symptoms to qualitatively rate damage. We have developed a simple, inexpensive, and non-destructive technique to quantitatively measure

streaking. The technique uses a series of small contiguous circles photocopied onto a clear plastic sheet to help quantify the percentage of leaf streaked. Measurements of streaking can be done within a week after infestation, and require no other specialized instrumentation. The series of circles technique allowed us to confirm and quantify some previously observed patterns of the streaking response concerning location and amount of streaking in relation to aphid age, location, and feeding duration. This technique could be used in physiological and genetic studies of the plant's response to insect stress. [References: 11].

1985 Moghadas, H.; Bagheri, M.R.; Nasiri, M.S. (1995) **Occurrence of cereal stem moth (Ochsenheimeria taurella) in wheat and barley farms of Esfahan.** Esfahan Univ. (Iran Islamic Republic). Agricultural Research Center, Plant Pests and Diseases Dept. *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 20.* Persian. (AGRIS 97-004684).

The pest was collected, for the first time, by Behdad and Naimfrom in the cereal fields of Esfahan province in 1986 and identified as Ochsenheimeria sp. (Ochsenheimeriidae, Lep.) by Plant Pests and Diseases Research Institute. The pest was recollected in cereal farms of Bara-an and Lenjan Sofla in 1992 and identified as O. taurella by P.P.D.R. Institute. This insect is a small, relatively slender moths which is active only in the daylight. Wing expanse: 11-15mm, vertex-extremely rough densely covered with long, divergent, stramineous scales. Compound eyes rounded relatively small. A pair of rather large ocelli present near to antennal sockets, antennae simple short, less than 0.6 of the length of forewing. The common colour of body and forewings is focus, dorsum sixth abdominal segment pale yellow which is obvious character of pest, basal hindwing is white, distal part and fringe are brown. Overwintering is as egg on debris of cereal around the farms. After emerging in the spring, the first instar larvae are blown away to the host plants by the wind.

1986 Moreby, SJ. (1996) **THE EFFECTS OF ORGANIC AND CONVENTIONAL FARMING METHODS ON PLANT BUG DENSITIES (HEMIPTERA, HETEROPTERA) WITHIN WINTER WHEAT FIELDS.** *Annals of Applied Biology. 128(3):415-421.* English. [GAME CONSERVANCY TRUST FORDINGBRIDGE SP6 1EF HANTS ENGLAND].

An understanding of the mechanisms responsible for direct and indirect effects of pesticides on Heteroptera were studied by comparing densities within fields of winter wheat on organically and conventionally managed farms. Weed and insect densities were estimated in 56 fields in 1990 and 62 in 1991. Four out of five of the heteropteran groups studied were more numerous within organic fields in both years, however differences were statistically significant in only one out of 10 comparisons. Differences in agricultural practices between the two farming regimes are given as possible reasons for the densities observed. [References: 17].

1987 Noorbakhsh, S.H.; Razavi, S. (1995) **Distribution of Sunn Pest (Eurygaster intergriceps Put.) and its natural enemies in Chaharmahal Bakhtiari.** Agricultural Organization Chaharmahal Bakhtiari (Iran Islamic Republic). Plant Protection Dept., Plant Pests and Diseases Res. Dept. Agr. Research Center (Iran Islamic Republic). *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 15.* Persian. (AGRIS 97-004552).

Field surveys were carried out during 1992-94 to assess the distribution of sunn pest and its natural enemies in Chaharmahal Bakhtiari province. The highest densities and wider distribution were mostly found in dry farming wheat and barley fields of Ardal, Soureshjan and Jouneghan. At these locations about 21 adults and 500 nymphs were counted in 1m2 of the fields. Cultivation in rangelands and oak forests, mosaic cultivation of wheat and barley, and late horvesting were considered to be the most important factors increasing sunn pest population in these regions. Saman wheat fields were omitted from chemical control programs, because the egg parasitoid Trissolcus grandis was highly active and had great impact on parasitizing 83 of the sunn pest eggs. In this survey 4 species of natural enemies belonging to 2 familes were also collected and identified. The scientific names of the species are listed according to their families: 1. Scelionidae: Trissolcus grandis (Thoms) 2. Tachinidae: Phasia crasipennis F., Ectophasia rubra Girsch., and Helomia sp.

1988 Norambuena M, Hernan (1995) **[Survey and control of insect pests in cereals. New aphids detected in wheat]. Reconocimiento y control de plagas de cereales. Nuevos pulgones detectados en trigo.** Seminario de proteccion vegetal. Temuco (Chile). 29 Ago 1995. [Plant protection seminar]. Seminario de proteccion vegetal. *Serie Carillanca - Instituto de Investigaciones Agropecuarias. Centro Regional Carillanca (Chile); no. 45 p. 77-84. Instituto de Investigaciones Agropecuarias, Temuco (Chile). Centro Regional Carillanca.* INIA. 14 ref. Spanish. (AGRIS 97-004231).

1989 Nyczepir, A.P. (USDA, ARS, Southeastern Fruit and Tree Nut Research Laboratory, Byron, GA.); Bertrand, P.F.; Cunfer, B.M. (1996) **Suitability of a wheat-sorghum, double-crop rotation to manage Criconemella xenoplax in peach production.** *Plant disease (USA) v. 80(6) p. 629-632.* references. English. (AGRIS 97-004586).

Twenty-one sorghum cultivars were evaluated for host suitability to the ring nematode Criconemella xenoplax in the greenhouse. No C. xenoplax were detected on peach in soil previously planted to GK8172C, Funks G-522DR, Jacques-505, McCurdy M51YG, Northrup King NK2660, or Northrup King NK-Savannah 5. Additionally, the effects of 1-, 2-, and 3-year wheat-sorghum and wheat-fallow preplant double-crop rotations for the management of C. xenoplax were studied from 1990 to 1993 in a field experiment in central Georgia. The field site had a previous history of peach tree short life and was heavily infested with C. xenoplax. All wheat-sorghum and wheat-fallow rotations suppressed population densities of C. xenoplax compared with 3 years of continuous peach (P less than or equal to 0.05). One year of wheat-fallow did not suppress C. xenoplax population densities as low as did 1 year of wheat-sorghum. No differences in suppression of C. xenoplax population density were detected among the 1, 2, and 3 years of wheat-sorghum rotation. A wheat-sorghum rotation has potential as a preplant strategy to manage C. xenoplax in peach orchards in the southeastern United States.

1990 Oakley, J.N.; Green, D.I.; Jones, A.E.; Kilpatrick, J.B.; Young, J.E.B. (ADAS Bridgets, Martyr Worthy, Winchester, Hants SO21 1AP (United Kingdom)) (1994) **Forecasting the abundance of orange wheat blossom midge in wheat.** *Proceedings - Brighton Crop Protection Conference, Pests and Diseases, 1994, vol. 1 p. 193-198.* British Crop Protection Council, BCPC Publications. 8 ref. English. (AGRIS 97-004871).

1991 Oakley, JN.; Walters, KFA.; Ellis, SA.; Green, DB.; Watling, M.; Young, JEB. (1996) **DEVELOPMENT OF SELECTIVE APHICIDE TREATMENTS FOR INTEGRATED CONTROL OF SUMMER APHIDS IN WINTER WHEAT.** *Annals of Applied Biology. 128(3):423-436.* English. [ADAS BRIDGETS WINCHESTER SO21 1AP HANTS ENGLAND].

Field experiments on the use of recommended and reduced application rates of aphicides for control of summer aphid infestations on winter wheat have been done at five sites each year from 1990 to 1992. The experiment compared sprays of pirimicarb at recommended rate (140g a.i. ha(-1)) and reduced rate (25 g a.i. ha(-1)) and of alphacypermethrin at recommended rate (15 g a.i. ha(-1)) and one third recommended rate (5 g a.i. ha(-1)), each applied either at flag leaf emergence or at flowering. Aphid infestations were allowed to develop naturally and were measured at critical growth stages. In 1990, overwintered aphid infestations, together with established populations of parasitoids, were detected at four of the five sites when the first assessment was made in April. Parasitoids provided sufficient aphid control to prevent yield loss at two sites without pesticide applications. At three sites both aphicides gave similar levels of control and yield response at both recommended and reduced application rates. In 1991 and 1992 no overwintered aphids were detected in the crops and aphid infestations developed much later. Aphicide applications gave significant yield responses at four sites in 1992. Recommended rates gave better control of aphids than reduced rates. There was no significant difference in the yield response obtained with different rates of aphicide. [References: 22].

1992 Ortel, J. (Abt. Okophysiologie/Stoffwechselphysiologie, Institut fur Zoologie, University of Vienna, A 1090 Wien/Vienna (Austria)) (1995) **Changes in protein content and free amino acid composition in metal-contaminated gypsy moth larvae (Lymantria dispar L., Lymantriidae, Lepidoptera).** *Comparative Biochemistry and Physiology. C, Pharmacology, Toxicology and Endocrinology (United Kingdom) v. 112(3) p. 291-298.* 46 ref. English. (AGRIS 97-004851).

1993 Papp, M.; Mesterhazy, A. (1996) **RESISTANCE OF WINTER WHEAT TO CEREAL LEAF BEETLE (COLEOPTERA, CHRYSOMELIDAE) AND BIRD CHERRY-OAT APHID**

(HOMOPTERA, APHIDIDAE). *Journal of Economic Entomology. 89(6):1649-1657.* English. [CEREAL RES INST DEPT WHEAT BREEDING POB 391 H-6701 SZEGED HUNGARY].

Resistance tests based on estimation of leaf-feeding damage by cereal leaf beetle, Oulema melanopus (L.), and infestation by bird cherry-oat aphid, Rhopalosiphum padi (L.), were conducted on 26 winter wheat genotypes over a 3-yr period. Grain yield and thousand-kernel mass were measured in infested and non-infested control plots in cages covered by insect nets. Highly significant differences were found between genotypes in feeding damage by cereal leaf beetle and infestation by bird cherry-oat aphid. The most resistant genotype had 7.4% leaf-feeding damage by cereal leaf beetle and the most susceptible 69.4%. Values of infestation by bird cherry-oat aphid varied between 25 and 79.2%. Yield response was more sensitive indicator of genotype reaction than the 1, 000-kernel mass. Yield of the most tolerant genotype was reduced by 26%, whereas the 1, 000-kernel mass was reduced only 23%. The maximum losses were 63% in yield and 50% in 1, 000-kernel mass. A close correlation was found between infestation severity by bird cherry-oat aphid and yield reduction (r = 0.7572), but feeding by cereal leaf beetle did not significantly affect yield. Trichome length of the flag leaf exhibited a significant correlation with feeding damage by cereal leaf beetle (r = -0.7161), but neither trichome density nor length influenced the infestation by aphids. Principal components analysis and multiple regression analyses were performed to determine the relationships among tested characteristics and to quantify the effect of leaf-feeding damage by cereal leaf beetle, infestation by bird cherry-oat aphid, Fusarium spp. infection, heading date, and plant height on grain yield and 1, 000-kernel mass. Among the variables examined, infestation severity of R. padi had the highest relative importance and direct effect on both yield reduction and 1, 000-kernel mass. [References: 51].

1994 Plarre, R. (1996) **THREE-DIMENSIONAL DISTRIBUTION OF SITOPHILUS GRANARIUS (L) (COLEOPTERA, CURCULIONIDAE) IN WHEAT INFLUENCED BY THE SYNTHETIC AGGREGATION PHEROMONE.** *Journal of Stored Products Research. 32(3):275-283.* English. [UNIV WISCONSIN DEPT ENTOMOL USDA ARS STORED PROD INSECTS RES UNIT 1630 LINDEN DR MADISON, WI 53706 USA].

The distribution pattern of Sitophilus granarius released in different weevil densities in a large bulk of ca. 350 kg wheat was investigated using a three-dimensional trapping grid of surface and bottom pitfall-traps, as well as probe-traps beneath the surface at eight different trap locations. Baiting the surface, bottom and pitfall traps of a single trapping location each with ca. 6000 ng of the synthetic aggregation pheromone sitophilate considerably changed the distribution of the weevils. In the presence of the pheromone, the overall catch of all trap sites combined was reduced at lower weevil densities. The insects tended to stay in the interkernel space beneath the surface. The aggregation pheromone acted more as an arrestant than an attractant chemical. The sex specific effects and the behavior modifying character of sitophilate in the granary weevil is discussed in relation to practical application, which may lead to an improvement of monitoring systems in the field of stored product protection. Copyright (C) 1996 Elsevier Science Ltd. [References: 45].

1995 Rafi, M.M. (University of California, Davis, CA.); Zemetra, R.S.; Quisenberry, S.S. (1996) **Interaction between Russian wheat aphid (Homoptera: Aphididae) and resistant and susceptible genotypes of wheat.** *Journal of economic entomology (USA) v. 89(1) p. 239-246.* references. English. (AGRIS 97-020202).

Interaction between the Russian wheat aphid, Diuraphis noxia (Mordvilko), and the resistant wheat, Triticum aestivum L., plant introduction lines PI 137739, PI 140207, and PI 262660 and the susceptible wheat cultivar 'Stephens' were studied. D. noxia reproductive rate and population development were higher when fed on Stephens compared with the resistant genotypes. Reproductive rate of D. noxia decreased as aphid density and length of aphid time on plant increased. Whereas, D. noxia populations increased with increasing aphid densities and length of aphid time on plant. Although the populations of D. noxia were lower when fed resistant genotypes, total chlorophyll content was reduced compared with the susceptible genotype. This could have been caused by increased aphid probing activity on resistant genotypes. There was no significant difference between the antibiotic line PI 140207 and the tolerant line PI 262660 in aphid reproductive rate, population density or reduction in leaf chlorophyll content. Expression of several polypeptides were altered by D. noxia feeding on PI 137739 and Stephens. Three polypeptides of sizes approximately 32, 33, and 35 k were enhanced in PI 137739 but not in Stephens. Involvement of these proteins in plant defense is discussed.

1996 Ramzan, M.; Judge, B.K.; Chawla, R.P.; Narang, D.D. (Punjab Agricultural University, Ludhiana (India). Department of Entomology) (1994) **Assessment of storage losses in wheat at farm and public sector levels in Punjab.** *Journal of Insect Science (India) v. 7(2) p. 187-190.* 2 tables; 8 ref. English. (AGRIS 97-005127).

1997 Reed, H.C. (Oral Roberts University, Tulsa, OK.); Tan, S.H.; Haapanen, K.; Killmon, M.; Reed, D.K.; Elliott, N.C. (1995) **Olfactory responses of the parasitoid Diaeretiella rapae (Hymenoptera: Aphidiidae) to odor of plants, aphids, and plant-aphid complexes.** *Journal of chemical ecology (USA) v. 21(4) p. 407-418.* references. English. (AGRIS 97-019776).

Diaeretiella rapae (M'Intosh) (Hymenoptera: Aphidiidae) is a parasitoid of several aphid species, including the Russian wheat aphid (RWA), Diuraphis noxia (Mordvilko), and the cabbage aphid (CA), Brevicoryne brassicae (L.). The response of mated D. rapae females to odors from wheat, cabbage, and plant-host complexes was investigated using a four-choice olfactometer. Experienced parasitoids, but not inexperienced females, responded positively to odors of the wheat-RWA complex in a no-choice test. In choice tests, experienced parasitoids did not respond to odors of uninfested cabbage and wheat leaves, but did respond positively to aphid-infested plants and to aphids alone. The response of D. rapae to the cabbage-CA complex and to CA alone was significantly greater than to the wheat-RWA complex and RWA alone, suggesting an innate odor preference for crucifer-feeding aphids.

1998 Reza Rassoulian, Gh.; Dowlati, L. (1995) **The effect of wheat varieties on longevity and reproduction potential of Russian wheat aphid Diuraphis noxia Mordvilko.** Karadj Univ. (Iran Islamic Republic). College of Agriculture, Plant Protection Dept. *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 19.* Persian. (AGRIS 97-004521).

Russian wheat phid has been known as one of the most important pests on wheat and barley in the recent years. This pest is spread in several State of U. S. A. and Canada and cause a high damage on wheat farms. There are many research projects in the world in order to decrease the damage of this pest by resistante varieties of wheat. In order to investigate the longevity and reproduction of Russian wheat aphid on wheat varieties, 13 varieties of wheat were selected as: Argentine, Dastjerdi, Zarand, Rashid, Azar, Adleghadim, Adlejadid, Khalij, Naz, Sefideh, Darab and Ghods. The plants were grown in plastic pods filled with vermculite soil, in greenhouse condition (20-25C and 75 R. H.). After 30 days first instar nymphs were placed on a single leaf of each variety. Each experiment was replicated four times. During the study (6 weeks), longevity and reproductive data were recorded weekly. The results showed that the longevity of aphids on all varieties was the same, but reproductive performance was significantly reduced on some varieties such as Shahi and Sefideh.

1999 Rezabeigi, M. ((Iran Islamic Republic). agricultural research Center of Kermanshah); Esmaili, M. ((Iran Islamic Republic). Univ. of Tehran. College of Agriculture. Dept. of Plant Protection); Rajabi, G.R. ((Iran Islamic Republic). Tehran. Plant Pests and Diseases Res. Inst.) (1995) **Host prefeence, the percentage of damage and fecundity of sunn pest Eurygaster integriceps Put. (Het. Scutelleridae) to 25 wheat varieties under greenhouse conditions.** *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 10.* Persian. (AGRIS 97-004549).

In order to evaluate resistance properties of 25 wheat varieties under green house conditions; morphological and specimens collected from Varamin (Tehran Province) and Kermanshah (Kermanshah province) biochemical characters of host plants and extension of damage caused by sunn pest were compared for two years (1994-1995). The results obtained can be summarized as follows: 1. There are significant differences among Varamin and Kermanshah population of Eurygaster both in size and body weight and their extension of damage to wheat varieties. Overwintered sunn pest of Kermanshah population caused more damage and laid more eggs compared to those of Varamin. 2. As a whole wheat varieties of Baiat, Azadi, Gholestan, Karaj, Ghafghaz and Navid were the most resistance and Rashid, Altar, Sadari, Inia, Zardak, Tabasi and Omid seem more susceptible respectively. 3. There are significant differences among wheat

varieties in response to overwintering adults compared with nymphs and newly emerged adults.

2000 Shrestha, S.K.; Shrestha, K.; Batsa, B.K.; Ranjit, J.D.; Pradhan, S.B. (Nepal Agricultural Research Council, Khumaltar, Lalitpur (Nepal)) (1996) **Integrated pest management: research strategies, achievement and approaches to adoption in NARC.** Challenges and opportunities for IPM implementation in Nepal. Parwanipur (Nepal). 20-21 Mar 1996. *Workshop preceedings. Nepal Agricultural Research Council, Khumaltar, Lalitpur (Nepal) p. 15-22.* Nepal Agricultural Research Council. 30 ref. English. (AGRIS 97-020025).

2001 Tafaghodi, B.; Esmaili, M. (Karaj (Iran Islamic Republic). Tehran University. Department of Plant Protection College of Agriculture); Noori, G. (Ardebil (Iran Islamic Republic). College of Agriculture Ardebil University); Khalili, A. (Karadj (Iran Islamic Republic). Tehran University. College of Agriculture. Dept.) (1995) **Preliminary studies on population dynamics of cereal sunn pest Eurygaster integriceps Put. (Het. Scutelleridae) In Karadj.** *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 14.* Persian. (AGRIS 97-004551).

Population of sunn pest based on life table evaluation was studied during 1992-1995 in Karadj. Population density was evaluated by regular sampling during active phase in the field (every day in 1993 and every other day in 1994). A one m2 wooden quadrate was used for this purpose and various stages of sunn pest and natural enemies were evaluated. Because of difficulties of finding the first instar nymph, direct evaluation of this stage was neglected in the first year and was computed by subtraction of parasitized eggs from 1000 artifically installed eggs in wheat field. For this purpose, egg clusters glued on rectangular green card boards were installed in the field and number of hatched parasitized eggs or otherwise were calculated. For resting phase number of died adult, parasitized and missed individuals in late summer were subtracted from number of fifth instar nymphs for adult mortality evaluation.

2002 Tolmay, V.; Prinsloo, G. (Agricultural Research Council, Bethlehem (South Africa). Small Grain Inst.) (1996) **[Lice on wheat under control]. Koringluis nog goed onder beheer.** *Landbouweekblad (South Africa) (no.965) p. 24-25.* Afrikaans. (AGRIS 97-020194).

2003 Trematerra, P.; Fontana, F.; Mancini, M. (1996) **ANALYSIS OF DEVELOPMENT RATES OF SITOPHILUS ORYZAE (L) IN FIVE CEREALS OF THE GENUS TRITICUM.** *Journal of Stored Products Research. 32(4):315-322.* English. [UNIV MOLISE DEPT ANIM VEGETABLE & ENVIRONM SCI VIA CAVOUR 50 I-86100 CAMPOBASSO ITALY].

A route to the analysis and comparison of experimental data of Sitophilus oryzae (L.) development rate at a fixed temperature and relative humidity, for five different cereals (Triticum aestivum, T. dicoccum, T. durum, T. monococcum, T. spelta) is prosposed. To describe cumulative curves for developmental rate, we suggest the use of a simple exponential model. The model accounts for the evolution of a given system from a stable state (e.g. no adults emerged) to another stable state (e.g. all adults emerged). The main advantage of our approach lies in the fact that no fitting parameters are required. The only parameters required can be measured directly from the experimental data. Different developmental behaviour in accordance with the cereal supplied corresponded to different survival strategies on the different foods. In all the cases examined, the simulated data reached a confidence level of over 95%. Copyright (C) 1996 Elsevier Science Ltd [References: 9].

2004 Vahedi, H.A. (1995) **The effect of wheat harvesting on the Porphyrophora tritici population.** Kermanshah, Razi Univ. (Iran Islamic Republic). College of Agriculture. *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 1.* Persian. (AGRIS 97-005008).

Porphyrophora tritici is a wheat pest in west of Iran and damages by sucking the plant sap, of collar, causes the weakness and death of the plant. In 1992 and 1993 this research was fulfilled in an infested, non irrigated field of wheat in Mazraleh, a village in Songhor (Kermanshah). The field was equally divided into two parts, one harvested by combine, and the other by hand harvester. In mid April 1993 the two parts were sampled to detect the average number of grown grains fallon during the previous year harvest. The number of wheat plants per square meter and the infestation level were found significantly higher in harvested part by combine, showing that the fallon grains provide an important source for survial of P. tritici.

2005 Wilson, M.J.; Hughes, L.A.; Glen, D.M. (IACR Long Ashton Research Station, Department of Agricultural Sciences, University of Bristol, Long Ashton, Bristol, BS18 9AF (United Kingdom)) (1995) **Developing strategies for the nematode, Phasmarhabditis hermaphrodita, as a biological control agent for slugs in integrated crop management systems.** *Integrated crop protection: towards sustainability. Proceedings of a symposium, Edinburgh, UK, 11-14 September 1995 [chaired by McKinlay, R. G.; Atkinson, D.]. p. 33-40.* British Crop Protection Council. 15 ref., BCPC Monograph Series No. 62, BCPC Symposium Proceedings No. 63. English. (AGRIS 97-019724).

2006 Zareh, N.; Gonzlesz, D. (reverside. Un. Cal., Dept. Ent. (Iran Islamic Republic)); Ahmadi, A. (Shiraz (Iran Islamic Republic). Univ., Plant Prot. Dept.) (1995) **A search for the Russian wheat aphid, Diuraphis noxia (Modvilko) (Homoptera:Aphididae), and its natural enemies in Iran.** *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 12.* Persian. (AGRIS 97-004520).

A search for Russian wheat Aphid (RWA), Diuraphis noxia (Mordvilko) and its natural enemies was conducted from 1990-1992 in 7 provinces of Iran. Of the 326 locations surveyed RWA was found at 179 and parasitized aphids at 114. The RWA is not a serious economic pest in any of these 7 provinces. High levels of the aphid were encountered only in localized of small areas of fields in all provinces. This survey revealed the presence of 5 species of parasitoids and 2 species of predators of Russian wheat aphid in Iran. The most abundant and widely distributed parasitoids were Diaeretiella rapae and Aphelinus albipodus varipes. They were found in more varied climatic areas than any of the other species. Aphelinus albipodus varipes was more widely distributed than D. rapae. Aphidius uzbekistanicus and A. matricaria were found with less abundance, and Praon volucre was tha rarest species found in this exploration. Eupeodes nuba and Leucopis ninae, and coccinelid predators were widely distributed and not generally found within the rolled leaves.

H20 PLANT DISEASES

2007 **[New triticum disease can reduce yields]. Nuwe koringsiekte kan oes halveer** (1996) Landbouweekblad, Cape Town (South Africa). *Landbouweekblad (South Africa) (no.957) p. 28-29.* Afrikaans. (AGRIS 97-020761).

2008 **[South African vaccine for beans and maize]. SA entstof haal beste uit bone en mielies** (1996) Landbouweekblad, Cape Town (South Africa). *Landbouweekblad (South Africa) (no.956) p. 10-11, 13.* Afrikaans. (AGRIS 97-020805).

2009 Afandi, M.A.; Shkalikov, V.A.; Shil'nikova, V.K.; Sizova, T.P. (1995) **[Variation of biocenosis in spring wheat rhisosphere as a result of presowing treatment of seed with biologically active substances]. Izmenenie biotsenoza v rizosfere yarovoj pshenitsy v rezul'tate predposevnoj obrabotki semyan biologicheski aktivnymi veshchestvami.** *Izvestiya Timiryazevskoj sel'skokhozyajstvennoj akademii (Russian Federation) (no.1) p. 101-109.* 8 ref. Russian. (AGRIS 97-005852).

Information about variation in species composition of fungi in rhizosphere of spring wheat depending on biologically active substances used for presowing seed treatment is presented. It is shown that attack of root rot is determined by quantitative and qualitative relationship of pathogenic fungi of Fusarium and Bipolaris genera and their antagonists. A new fungus has been found which belongs to Fusarium genus. Cultural-morphological characters on different nutrient media and pathogenicity characteristic of the new fungus are given, and possibility to use the new fungus for protecting spring wheat from root rot is shown.

2010 Afunian, M.R. (Tehran (Iran Islamic Republic). Plant Pests and Diseases Research Institute. Plant Diseases Research Dept.); Sahragard, N. (Yasuj (Iran Islamic Republic). Agriculture Research Center of Chaharmahal Bakhtiari. Plant Pests and Diseases Research Dept.) (1995) **Incidence of bacterial leaf blight of wheat in Shahrekord.** *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 28.* Persian. (AGRIS 97-005774).

In March, 1995 from some wheat samples collected from Shahrekord fields a gram negative-rod shape, fluorescent and oxidative bacterium was isolated that produced a hypersensitive reaction in tobacco. Pathogenicity of the bacterium was confirmed on Atila cultivar of wheat. Ice nucleation activity (INA), catalase, gelainase, urease, levan production from sucrose, esculin hydrolysis tests were positive, whereas arginine and starch hydrolysis, oxidase, potato rot, nitrate reduction, H2S and 2-ketogluconate production and growth at 41C were negative. Based on the above tests the causative bacterium was identified as Pseudomonas syringae pv. syringae.

2011 Akhiyani, A.; Ahmadi, A.R. (1995) **Status of wheat gall nematode (Anguina tritici) in Esfahan.** Esfahan Univ. (Iran Islamic Republic). Agricultural Research Center, Plant Pests and Diseases Dept. *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 23.* Persian. (AGRIS 97-005211).

More than 125, 000 hectares of agricultural lands are under irrigated wheat in Esfahan province. For the first time the wheat gall nematode (Angurina tritici) was observed in Esfahan 55 years ago. Since then there is no report about its distribution prevalence and extent of loss in the province. A survey was conducted during 1994 in irrigated wheat field in this province to study the status of the nematode. The surveyed regions were Ardestan, Esfahan, Zarrinshahr (Lenjan), Semirom, Shahreza, Fereydan, Fereydonshahr, Kashan, Mobarakeh, Najafabad and Natanz. The proportions of fields and areas infested were 21.71 and 4.33 respectively. The means of infected heads was 5.82 and crop loss calculated to be 0.3 of the total yields (1444 tons of wheat). Cultivars of Roshan, Ghods, Navid and Omid did not show any difference in their tolerance to A. tritici.

2012 Akin, DE.; Morrison, WH.; Rigsby, LL.; Gamble, GR.; Sethuraman, A.; Eriksson, KEL. (1996) **BIOLOGICAL DELIGNIFICATION OF PLANT COMPONENTS BY THE WHITE ROT FUNGI CERIPORIOPSIS SUBVERMISPORA AND CYATHUS STERCOREUS.** *Animal Feed Science & Technology. 63(1-4):305-321.* English. [USDA ARS RICHARD B RUSSELL AGR RES CTR POB 5677 ATHENS, GA 30604 USA].

Lignocelluloses from diverse plant types were treated with the white rot fungi Ceriporiopsis subvermispora (strains CZ-3-8497 and FP-90031-sp) and Cyathus stercoreus. Sources of lignocellulose included: the warm-season grasses sorghum (leaf blades, sheaths, and stems), pearl millet, napiergrass, and maize (stems); the cool-season grass wheat (leaf blades, sheaths, and stems); the legumes alfalfa (stems) and lespedeza (leaflets and stems). Fungus-treated residues were compared with untreated, control samples and with plants treated with a non-delignifying isolate of Trichoderma, Residues were evaluated for improved biodegradability by ruminal microorganisms and modifications in cell wall chemistry by nuclear magnetic resonance, gas chromatography, and ultraviolet absorption microspectrophotometry. Specific plant-fungus interactions were identified that resulted in selective removal of lignin and improved biodegradability by white rot fungi but not the Trichoderma sp. All white rot fungi removed ester-linked p-coumaric and ferulic acids from grass stems, and this phenomenon appeared to account for the significant reduction in aromatic components and improved biodegradability of fungus-treated grass lignocellulose. Cell walls in alfalfa stems were more resistant to biological delignification than those in grasses, with only C. stercoreus removing significant amounts of aromatics and improving biodegradability. All white rot fungi improved the biodegradability of tannin-rich lespedeza samples. [References: 39].

2013 Andrade V, O. (1995) **[Foliar blight of wheat (Mycosphaerella graminicola) in southern Chile]. Mancha de la hoja del trigo Mycosphaerella graminicola en la zona sur de Chile.** *Proceedings of a Septoria Tritici Workshop; Mexico, D.F.; 20-24 Sep 1993. Gilchrist, L.; Ginkel, M. van; McNab, A.; Kema, G.H.J. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 84-94.* CIMMYT. 2 tables; 8 figs. Spanish. (AGRIS 97-020756).

An average yield for wheat of 3 t/ha has been obtained during the last five growing seasons in Chile. This is twice the yield obtained until 1983. Studies conducted in southern Chile over a 30-year period have shown that 2.6 t/ha are due to advances in breeding, and 3.1 t/ha are due to improvements in crop management. Thus, between 1961 and 1991 wheat crop production research has brought about an improvement of 5.7 t/ha. Mycosphaerella graminicola is found in all wheat producing areas in Chile, affecting most of the wheat planted early in rain areas. Disease management has focused on planting time according to the germplasm, crop rotation, selection of tolerant germplasm and screening of effective fungicides and application time. En las ultimas 5 temporadas agricolas, el rendimiento promedio del trigo en Chile se ha mantenido por sobre las 3 t/ha, duplicando lo obtenido hasta 1983. Estudios realizados en la zona sur de Chile para el periodo 1961-1991, indican que el avance con que el mejoramiento genetico ha contribuido en esta zona es de 2.6 t/ha, y que el manejo del cultivo ha aportado 3.1 t/ha. El avance total experimentado por el cultivo en este periodo es de 5.7 t/ha. Mycosphaerella graminicola se presenta en todas las zonas productoras de trigo en Chile, afectando principalmente las siembras tempranas en areas de alta pluviometria. El manejo de la enfermedad ha incluido siembras adecuadas al tipo de variedades, rotacion de cultivos, la seleccion de materiales tolerantes y la evaluacion de fungicidas efectivos y momentos de aplicacion.

2014 Andrade V, Orlando (1995) **[How to prevent root rot or wheat take-all disease]. Como prevenir la pudricion radical o mal del pie del trigo.** Seminario de proteccion vegetal. Temuco (Chile). 29 Ago 1995. [Plant protection seminar]. Seminario de proteccion vegetal. *Serie Carillanca - Instituto de Investigaciones Agropecuarias. Centro Regional Carillanca (Chile); no. 45 p. 23-34. Instituto de Investigaciones Agropecuarias, Temuco (Chile). Centro Regional Carillanca.* INIA. 9 ref. Spanish. (AGRIS 97-005164).

2015 Andrade V, Orlando (1995) **[Wheat eyespot disease, new highly pathogenic disease in the south of Chile]. Mancha ocular del trigo, nueva enfermedad de alto potencial de dano en el sur de Chile.** Seminario de proteccion vegetal. Temuco (Chile). 29 Ago 1995. [Plant protection seminar]. Seminario de proteccion vegetal. *Serie Carillanca - Instituto de Investigaciones Agropecuarias. Centro Regional Carillanca (Chile); no. 45 p. 35-41. Instituto de Investigaciones Agropecuarias, Temuco (Chile). Centro Regional Carillanca.* INIA. 9 ref. Spanish. (AGRIS 97-005165).

2016 Apsite, A. (Institute of Microbiology and Biotechnology (Latvia)); Viesturs, U. (Latvian State Institute of Wood Chemistry (Latvia)); Berzina, G. (Latvian Scientific Research Institute of Agriculture, Skriveri (Latvia). Plant Protection Dept.); Shteinberga, V. (Latvian University of Agriculture, Jelgava (Latvia). Plant Biology Dept.) (1996) **[Production of the biofungicide trichodermin preparation and its effect upon barley crop]. Biofungicida-trihodermina preparatu razosana un ietekme uz miezu razu.** *Latvijas Lauksaimniecibas Universitates Raksti (Latvia) v. 283(6) p. 3-16.* 5 tables; 4 ill. Latvian. (AGRIS 97-005835).

A special desing of bioreactors for shear sensitive Trichoderma viride and Trichoderma lignorum submerged cultures has been developed. The two cultures appeared to be the most active against barley root rot. The culture liquid showed better results in comparison with the solid preparation (in the form of conidia). As a result of the treatment with Trichodermin, the productivity (the mass of 1000 grains, yield) of the barley "Abava" has increased by 22.2-23.4. Besides, the biological activity of soil was improved. Thus, Trichodermin proved to be an effective biofungicide to combat the fungal diseases of barley.

2017 Assadi, P.; Behroozin, M. (1995) **Efficacy of some fungicides to control barley stripe disease in East Azarbaidjan.** Tabriz Univ. (Iran Islamic Republic). Agricultural Research Center of East Azarbaidjan, Plant Pests and Diseases Research Dept. *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 26.* Persian. (AGRIS 97-005783).

Since barley stripe disease caused by Helminthosporium *gramineum* appeared as one of the most important diseases in East Azarbaijan and some other provinces, the biology of the pathogen was studied and the effectiveness of 4 fungicides to control the disease was also studied during 1990-92. The results showed that Rovral-TS and Imazalil of 255g commercial form, 100Kg seeds were the most effective ones. Mancozeb at 125g, and Imazalil at the 17ml of commercial forms were the second group, and Benlate-T at 100g of commercial form was the third. This study was done in Khosroshar and in 1993 the formulations were used at 25g/100Kg seeds in Khosroshar and Thikmedash. The results showed that Imazalil, Rovral and Macozeb were most effective and were grouped at the first class. Benlate-T and the control were grouped at the second class.

2018 Azimi, H.; Asadi, P.; Ershad, D. (1995) **Identification and distribution of Tilletia species causing wheat common bunt in East Azarbaidjan and Ardebil Provinces.** Plant Pests and Diseases Research Institute, Tehran (Iran Islamic Republic). *Proceedings of the 12th Iranian*

Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 43. Persian. (AGRIS 97-005831).

From over 9000 samples of wheat and wild graminous species collected from different areas of East Azarbayjan and Ardebil indicated that Tilletia laevis is the most wides spread species in areas and T. controversa in Maragheh. T. controversa and T. caries were collected less frequently from different areas. T. caries was collected from Ardebil with high population. T. controversa was collected on Aegilops triuncialis L. from Khalkhal and Ardebil.

2019 Babaee Zad, V.; Rahimian, H. (1995) **Identification of Rathayibacter species inciting spike blight of wheat in Iran.** Sari Univ. (Iran Islamic Republic). College of Agriculture; Mazandaran Univ. (Iran Islamic Republic). *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 30.* Persian. (AGRIS 97-005850).

Bacterial spike blight or yellow ear rot of wheat (Triticum aestivum L.) caused by Rathayibacter spp., is endemic in several provinces of Iran. Rathayibacter iranicus and R. tritici have previously been reported from a northern and two southern provinces. Identity of R. tritici, however, was not firmly established and hence occurence has been in doubt. The present study was initiated to identify the species of Rathayibacter inciting the disease in several provinces of Iran. Strains isolated from diseased samples collected from Khuzistan (Ahwaz and Dezfool), Isfahan (Shahreza) and Mazandaran (Gonbad-Kavoos) were identified as R. tritici, whereas those obtained from Azarbaidjan (Maragheh), Isfahan (Lanjan and Mobarakeh), Fars (Zafar-Abad) and Ealam were found to be R. iranicus. There were minor variations in phenotypic characteristics among strains of R. iranicus isolated from various provinces. Strains within each species had protein profiles, in polyacrylamide gel, very similar to each other and to those of the type strains of the respective species.

2020 Bailey, S.M. (University of Kentucky, Lexington, KY.); Irwin, M.E.; Kampmeier, G.E.; Eastman, C.E.; Hewings, A.D. (1995) **Physical and biological perturbations: their effect on the movement of apterous Rhopalosiphum padi (Homoptera: Aphididae) and localized spread of barley yellow dwarf virus.** *Environmental entomology (USA) v. 24(1) p. 24-33.* references. English. (AGRIS 97-020709).

Apterous adult and nymphal Rhopalosiphum padi (L.), previously reared on plants infected with barley yellow dwarf virus (BYDV), were subjected to eight perturbations (wind, rain, herbicide, coccinellid predators, crowding, mechanical disturbance, drought, and virus-infected plants) to determine effects on aphid dispersal and pattern of local spread of BYDV to oats in greenhouse experiments. Viruliferous aphids, caged overnight on oat plants in a 25-plant area (infection focus) in the center of each 625-plant plot, were subjected to a given perturbation after cages were removed and then allowed to move freely within the plot for 2 d. Presence of virus-infected plants outside the infection focus provided indirect evidence of aphid movement and direct evidence of virus spread. All types of disturbances except rain caused movement of apterous aphids and spread of BYDV. For all except the rain perturbation, controls were pooled and compared by paired t-tests with means of three indices of infection pattern (incidence, total distance, and average distance) for each experimental treatment. Incidence of infection (number of infected plants located outside the infection focus) in treated plots was significantly greater than pooled controls for the crowding, predator, wind, and herbicide perturbations. Total distance of infection (the sum of distances from the central plant in the infection focus to each infected plant outside the focus) was significantly greater in mechanical disturbance, crowding, predator, drought, wind, and herbicide perturbations than in controls. Average distance of infection (total distance divided by incidence) in treated plots was significantly greater than in the pooled controls for the drought, wind, and virus-infected oat treatments.

2021 Bains, S.S. (Punjab Agricultural University, Gurdaspur (India). Regional Research Station) (1994) **Influence of wheat spikes maturity on susceptibility to infection and growth of sporidia of Neovossia indica.** *Indian Journal of Mycology and Plant Pathology (India) v. 24(2) p. 111-115.* 3 tables; 2 ref. English. (AGRIS 97-005849).

2022 Balaz, F.; Bagi, F. (Poljoprivredni fakultet, Novi Sad (Yugoslavia). Institut za zastitu bilja i zivotne sredine) (1996) **[Efficacy of some new fungicide combinations in controlling major diseases in wheat]. Efikasnost nekih novijih kombinacija fungicida u suzbijanju prouzrokovaca vaznijih oboljenja psenice.** *Pesticidi (Yugoslavia) v. 11(2) p. 125-129.* 2 graphs; 1 table; 15 ref. Serbian. (AGRIS 97-005844).

The efficacy of new combinations of fungicides (propiconazol+fenpropidin, propiconazol+difenoconazol, triademorf+epoxyconazol, epoxyconazol+carbendazim, ciproconazol+carbendazim, propiconazol+fenpropimorf, and propiconazol+carbendazim), as well as ciproconazol, propiconazol and flutriafol in controlling main pathogens on wheat crop was investigated. Most of investigated fungicides showed high level efficacy in the control of Erysiphe graminis and Puccinia recondita. The most efficacious in controlling to Septoria spp. were expressed by the combinations of propiconazol+difenoconazol, epoxyconazol+carbendazime and ciproconazol+carbendazime. Positive results in control of Fusarium spp. on the spike were obtained using preparations which contained carbendazime or tebucodazole. The successful protection against main pathogens of wheat contributed largely to the maintenance of high grain yield.

2023 Bartolome, B.; Faulds, CB.; Kroon, PA.; Waldron, K.; Gilbert, HJ.; Hazlewood, G.; Williamson, G. (1997) **AN ASPERGILLUS NIGER ESTERASE (FERULIC ACID ESTERASE III) AND A RECOMBINANT PSEUDOMONAS FLUORESCENS SUBSP CELLULOSA ESTERASE (XYLD) RELEASE A 5-5' FERULIC DEHYDRODIMER (DIFERULIC ACID) FROM BARLEY AND WHEAT CELL WALLS.** *Applied & Environmental Microbiology. 63(1):208-212.* English. [FOOD RES INST DEPT BIOCHEM NORWICH RES PK NORWICH NR4 7UA NORFOLK ENGLAND].

Diferulate esters strengthen and cross-link primary plant cell walls and help to defend the plant from invading microbes, Phenolics also limit the degradation of plant cell walls by saprophytic microbes and by anaerobic microorganisms in the rumen. We show that incubation of wheat and barley cell walls with ferulic acid esterase from Aspergillus niger (FAE-III) or Pseudomonas fluorescens (XylD), together with either xylanase I from Aspergillus niger, Trichoderma viride xylanase, or xylanase from Pseudomonas fluorescens (XylA), leads to release of the ferulate dimer 5-5'diFA [(E, E)-4, 4'-dihydroxy-5, 5'-dimethoxy-3, 3'-bicinnamic acid]. Direct saponification of the cell walls without enzyme treatment released the following five identifiable ferulate dimers (in order of abundance): (Z)-beta-(4-[(E)-2-carboxyvinyl]-2-methoxyphenoxy)-4-hydroxy-3-methoxycinn mic acid, trans-5-[(E)-2-carboxyvinyl]-2-(4-hydroxy-3-methoxy-phenyl)-7-methoxy-2, 3- ihydrobenzofuran-3-carboxylic acid, 5-5'diFA, (E, E)-4, 4'-dihydroxy-3, 5'-dimethoxy-beta, 3'-bicinnamic acid, and trans-7-hydroxy-1-(4-hydroxy-3-methoxyphenyl)-6-methoxy-1, 2-dihydronaphtha ene-2, 3-dicarboxylic acid. Incubation of the wheat or barley cell walls with xylanase, followed by saponification of the solubilized fraction, yielded 5-5'diFA and, in some cases, certain of the above dimers, depending on the xylanase used. These experiments demonstrate that FAE-III and XYLD specifically release only esters of 5-5'diFA from either xylanase-treated or insoluble fractions of cell walls, even though other esterified dimers were solubilized by preincubation with xylanase, It is also concluded that the esterified dimer content of the xylanase-solubilized fraction depends on the source of the xylanase. [References: 22].

2024 Bendahmane, M. (Institut des Sciences Vegetales, Gif sur Yvette, France.); Schalk, H.J.; Gronenborn, B. (1995) **Identification and characterization of wheat dwarf virus from France using a rapid method for geminivirus DNA preparation.** *Phytopathology (USA) v. 85(11) p. 1449-1455.* references. English. (AGRIS 97-020441).

Using molecular analyses, we identified wheat dwarf geminivirus (WDV), a leafhopper-transmined geminivirus prevalent in northern and eastern Europe, as the causative agent of a recent wheat dwarf outbreak in France. A novel, simple, and rapid method for purification of circular DNA from small amounts of plant tissue was described and was applied to clone the genome of WDV-F. The cloned WDV-F DNA was shown to be infectious on wheat (Triticum aestivum) following agroinoculation, and progeny virus was transmitted by leafhoppers. The DNA sequence of the WDV-F genome consists of 2, 750 bases, differs by only 1.3 and 1.4 from the WDV isolates from Sweden and Czechoslovakia, respectively, and represents a new isolate of WDV.

2025 Beniwal, MS.; Karwasra, SS.; Chhabra, ML. (1996) **EVALUATION OF SYSTEMIC FUNGICIDES AGAINST FLAG SMUT (UROCYSTIS**

AGROPYRI) OF WHEAT. *Annals of Applied Biology. 128(Suppl S):20-21.* English. [HARYANA AGR UNIV HISAR 125004 HARYANA INDIA].

2026 Bernard, EC.; Self, LH.; Tyler, DD. (1997) **FUNGAL PARASITISM OF SOYBEAN CYST NEMATODE, HETERODERA GLYCINES (NEMATA, HETERODERIDAE), IN DIFFERING CROPPING-TILLAGE REGIMES.** *Applied Soil Ecology. 5(1):57-70.* English. [UNIV TENNESSEE DEPT ENTOMOL & PLANT PATHOL POB 1071 KNOXVILLE, TN 37901 USA].

A 2 year field study was designed to determine if soybean-wheat double-cropping and reduced or no tillage altered the soil mycoflora antagonistic to the soybean cyst nematode, Heterodera glycines. Six treatments were sampled monthly: disc 10 cm deep, followed by roller harrow; chisel plow 20 cm deep, followed by disc and roller harrow; moldboard plow 15 cm deep, followed by disc and roller harrow; non-tillage in the previous year's soybean stubble (NT-Soy); non-tillage in standing wheat cover crop (NT-1); non-tillage after wheat cover crop (NT-7). Each treatment had been applied to the same plots for up to 7 years. At appropriate monthly intervals, nematode cysts, females, and eggs were collected and assayed for the presence of fungi, which were identified to species-level taxa. Effects of cropping-tillage regimes on numbers of infective juveniles, numbers of eggs within cysts, and vertical distribution of cysts were determined. Similarities of egg and female mycofloras in this study to those of previous studies were examined. A total of 61 species-level fungal taxa were identified, along with 20 non-sporulating isolates distinguished from one another by appearance, growth pattern, and color. Fusarium solani was the most frequent of 47 species infesting cysts. Fusarium solani and F. oxysporum were the most frequent of 20 taxa isolated from field-collected females; in females produced on soybean plants grown in field soil in the greenhouse, F. oxysporum was the most frequent of 21 taxa. Paecilomyces lilacinus was the most common fungus among the 38 species isolated from eggs. For all fungi, percentages of parasitized females and eggs were similar in all treatments, but some treatments affected the parasitism rates of Paecilomyces lilacinus and Verticillium chlamydosporium. Parasitism of females was relatively low in July and August, but tripled in September. Egg parasitism was generally below 10% regardless of sampling time. Vertical distribution of cysts had no discernible effect on sampling precision, since cysts were concentrated in the top 25 cm in two dissimilar treatments'(moldboard plow, NT-7). No consistent treatment effects were seen on densities of soil-borne infective juveniles in winter or spring, nor on average numbers of eggs per cyst. Based on similarity indices among this study and four previous studies, a biogeography of H. glycines mycofloras is proposed. [References: 55].

2027 Brisbane, P.G. (CSIRO, Glen Osmond, South Australia, Australia.); Neate, S.M.; Pankhurst, C.E.; Scott, N.S.; Thomas, M.R. (1995) **Sequence-tagged site markers to identify Rhizoctonia solani AG 4 or 8 infecting wheat in South Australia.** *Phytopathology (USA) v. 85(11) p. 1423-1427.* references. English. (AGRIS 97-020742).

Polymerase chain reaction with random amplified polymorphic DNA primers was used to generate polymorphisms from Rhizoctonia solani isolates of anastomosis groups (AG) 4 and 8. Products specific to AG 4 and 8 were selected, cloned, sequenced, and used in conjunction with a published AG 8 sequence to obtain four sequence-tagged site (STS) markers that produced different sized products from AG 4 and 8 isolates. A positive control primer (for ribosomal DNA [rDNA]) was mixed with the STS markers, but to obtain products from both the rDNA and the R. solani DNA, the magnesium concentration had to be increased. At the higher magnesium concentration, the specificity of one AG 8 primer changed to encompass all R. solani tested. Wheat root DNA reduced the sensitivity of the STS primers. Wheat plants were inoculated with R. solani AG 4 or 8 isolates, and DNA extracted from tissue samples was tested with mixtures of the ribosomal and AG-specific STS primers. The results yielded both ribosomal and AG-specific markers, illustrating that this technique can be used to identify R. solani within wheat roots.

2028 Burgess, LW.; Backhouse, D.; Swan, LJ.; Esdaile, RJ. (1996) **CONTROL OF FUSARIUM CROWN ROT OF WHEAT BY LATE STUBBLE BURNING AND ROTATION WITH SORGHUM.** *Australasian Plant Pathology. 25(4):229-233.* English. [UNIV SYDNEY DEPT CROP SCI SYDNEY NSW 2006 AUSTRALIA].

The effects of late (autumn) burning of stubble, and of rotation with sorghum, on the incidence of infection of wheat with Fusarium graminearum Group 1 were studied under conditions simulating commercial practice. Late stubble burning was effective in maintaining a low incidence of infection over four seasons, compared with stubble retention. This did not result in increased yield, possibly because of deleterious agronomic effects of removing residue. Incidence of infection was significantly lower in wheat rotated with sorghum than in continuous wheat, over three complete rotation cycles. [References: 11].

2029 Canning, E.S.G. (Leeds Univ. (United Kingdom). Dept. of Pure and Applied Biology); Penrose, M.J.; Barker, I.; Coates, D. (1996) **Improved detection of barley yellow dwarf virus in single aphids using RT-PCR.** *Journal of Virological Methods (Netherlands) v. 56(2) p. 191-197.* 28 ref. English. (AGRIS 97-020459).

2030 Castrejon Sanguino, A.; Gonzalez Iqiguez, R.M.; Gilchrist, L. (1995) **[Reliable chemical control of Septoria tritici in the temperate high rainfall zone in Mexico]. Control quimico redituable de Septoria tritici para el area de temporal humedo en Mexico.** *Proceedings of a Septoria Tritici Workshop; Mexico, D.F.; 20-24 Sep 1993. Gilchrist, L.; Ginkel, M. van; McNab, A.; Kema, G.H.J. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 135-146.* CIMMYT. 12 tables; 6 ref. Spanish. (AGRIS 97-020758).

This study was conducted in the temperate high rainfall zone of Patzcuaro-Pontzumaran, Michoacan, Mexico, where the incidence of Septoria spp. is high. A proper spray schedule was determined for the reliable chemical control of the disease. In this study the varieties used were: Attila, Temporalera, Pavon, Tuc/Mon and Car853/CoctVee. The fungicide used was Terbuconazol, at 0.5 l/ha in 2001 of water, applied with a backpack- sprayer at different phenological stages of the crop. It was determined that only one fungicide application was required at the end of the boot stage, to protect the crop throughout the cycle. When this was done, yields increased by 98 percent in Temporalera and by 108 porciento in Attila. On the other hand, applications carried out after this phenological stage were statistically equal to the unprotected check treatment. El presente trabajo se realizo en la zona de temporal humedo de Patzcuaro-Pontzumaran, Edo. de Michoacan, Mexico, en la que se presentan altas incidencias de Septoria tritici. Se determino la factibilidad de un calendario para el control quimico redituable de esa enfermedad. En este estudio se utilizaron las variedades Attila, Temporalera, Pavon, Tuc/Mon y Car 853/CoctVee. El fungicida usado fue Terbuconazol 0.5 l/ha en 2001 de agua, aplicado con bomba de espalda y en diferentes etapas fenologicas del cultivo. Se determino que solo es necesaria una aplicacion del fungicida hacia final del embuche, para proteger todo el ciclo del cultivo; en este caso los rendimientos se incrementaron un 98 porciento en Temporalera y un 108 porciento en Attila. Por otra parte, las aplicaciones realizadas despues de este periodo fenologico fueron estadisticamente iguales al testigo sin proteccion.

2031 Chauhan, R.S.; Sood, A.K.; Singh, B.M. (Himachal Pradesh Krishi Vishvavidyalaya, Palampur (India). Department of Plant Pathology) (1994) **Relative aggressiveness of new virulences of Tilletia foetida and T. caries on wheat cultivars.** *Indian Phytopathology (India) v. 47(3) p. 232-235.* 4 tables, 10 ref. English. (AGRIS 97-005847).

2032 Chen, X. (Washington State University, Pullman.); Line, R.F.; Jones, S.S. (1995) **Chromosomal location of genes for resistance to Puccinia striiformis in winter wheat cultivars Heines VII, Clement, Moro, Tyee, Tres, and Daws.** *Phytopathology (USA) v. 85(11) p. 1362-1367.* references. English. (AGRIS 97-020490).

The winter wheat (Triticum aestivum) cultivars Heines VII, Clement, Moro, Tyee, Tres, and Daws have been reported to have stripe rust resistant genes Yr2 and YrHVII, Yr9 and YrCle, Yr10 and YrMor, YrTye, YrTr1 and YrTr2, and YrDa1 and YrDa2, respectively. To confirm the existence of the genes and determine their chromosomal location, the cultivars were crossed with the seedling susceptible cultivar Chinese Spring and a set of 21 Chinese Spring aneuploids. Monosomic F1 plants were allowed to self-pollinate to produce F2 seed. Seedlings of F2 plants and their parents were inoculated with selected North American races of Puccinia striiformis. The results confirmed that Yr2 is on chromosome 7B and Yr9 and Yr10 are on chromosome 1B, and showed the tentative location of the following genes: YrHVII on chromosome 4A, YrCle and YrMor on chromosome 4B, YrTye and YrTr1 on chromosome 6D, YrTr2 on chromosome 3A, YrDa1 on chromosome 1A, and YrDa2 on chromosome 5D.

2033 Coja, M. (Poljoprivredni fakultet, Beograd Zemun (Yugoslavia)) (1995) **[Occurrence of the [fungus] Rhynchosporium secalis as barley pathogen in Serbia [Yugoslavia]. [Preliminary communication]]. Pojava [gljive] Rhynchosporium secalis kao parazita jecma u Srbiji [Jugoslavija]. [Prethodno saopstenja].** *Zastita bilja (Yugoslavia) v. 46(4) p. 293-296.* 2 ill.; 6 ref. Serbian. (AGRIS 97-005357).

In spring 1994 a severe attack of the fungus Rhynchosporium secalis was recorded on barley in the surroundings of Novi Sad and Kragujevac (Serbia, Yugoslavia). The isolation of the fungus and examination of the 32 obtained isolates were performed. It was found that the fungus forms hyaline, two-celled conidia 13-26 x 4-8 micrometer in size. Differences in colony development were established in the appearance of pure cultures. Colonies can be black, brown, pink and yellow in colour. Optimal temperatures for mycelium growth range within 15 and 20 deg C. Most of the isolates are photoindifferent. The acidity of the medium PDA was found not to have substantial effect on mycelium growth, but there were differences in the speed of growth on various media.

2034 Cook, J.W.; Kettlewell, P.S.; Parry, D.W. (Crop and Environment Research Centre, Harper Adams Agricultural College, Newport, Shropshire, TF10 8NB (United Kingdom)) (1995) **The effect of foliar applied potassium chloride on Erysiphe graminis infecting wheat.** *Integrated crop protection: towards sustainability? Proceedings of a Symposium, Edinburgh, Scotland, 11-14 September 1995 [chaired by McKinlay, R.G.; Atkinson, D.J. p. 363-370.* British Crop Protection Council. 3 ref. English. (AGRIS 97-005552).

2035 Couleaud, G.; Mangin, M. (1996) **[Fungicide strategy. Integration of the disease risk]. Strategies fongicides. Comment integrer le "risque maladies"?** Institut Technique des Cereales et des Fourrages, Paris (France). *Perspectives Agricoles (France) (no 210) p. 38-52.* French. (AGRIS 97-005182).

2036 Daniels, A. (AgrEvo UK Ltd., Essex, UK.); Papailonomou, M.; Dyer, P.S.; Lucas, J.A. (1995) **Infection of wheat seedlings by ascospores of Tapesia yallundae: morphology of the infection process and evidence for recombination.** *Phytopathology (USA) v. 85(8) p. 918-927.* references. English. (AGRIS 97-005856).

The infectivity to wheat seedlings of ascospores from apothecia of Tapesia yallundae grown in vitro was demonstrated for the first time. The infection process from spore adhesion to lesion formation was monitored using low-temperature scanning electron microscopy and was similar to that observed for conidia of the anamorph, Pseudocercosporella herpotrichoides. Mycelium isolated from lesions was characterized using randomly amplified polymorphic DNA (RAPD) markers and was compared to DNA amplification patterns obtained for parental isolates from which the teleomorph was induced. Recombination was demonstrated in all but one lesion from which mycelium was successfully reisolated. A high proportion of reisolates had unique RAPD profiles, indicative of novel genotypes. The implications for pathogenic variation and the development of fungicide resistance in the field are discussed.

2037 Dawson, K.P. (CSC CropCare, Perth (United Kingdom)) (1995) **The use of spray adjuvants in winter cereals in Scotland.** *Integrated crop protection: towards sustainability? Proceedings of a Symposium, Edinburgh, Scotland, 11-14 September 1995 [chaired by McKinlay, R.G.; Atkinson, D.J. p. 379-385.* British Crop Protection Council. 3 ref. English. (AGRIS 97-005553).

2038 Diaz de Ackermann, M. (1995) **Chemical control of Septoria tritici on spring wheat.** *Proceedings of a Septoria Tritici Workshop; Mexico, D.F.; 20-24 Sep 1993. Gilchrist, L.; Ginkel, M. van; McNab, A.; Kema, G.H.J. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 147-151.* CIMMYT. 3 tables; 4 ref. English. (AGRIS 97-020759).

Septoria tritici has been controlled by chemical products, either as a stop-gap measure or as part of an integrated crop management system. In Uruguay, it is not easy to develop resistance to all of the many diseases attacking wheat. Knowledge of fungicide efficiency is necessary in those where resistance is not present. The fungicides used can be protectants, systemics and seed dressing. Presently, there is a new fungicide Triticonazole, which applied as a seed dressing gives protection at the seedling stage. Early infection is very common in Uruguay (fall infection) and is very important as a source of inoculum for the spring infection. The objective of this work is to compare the efficiency of the fungicides recommended for Septoria tritici. The trial was planted at La Estanzuela, Colonia, Uruguay, on 20 May 1992 in four replicated randomized complete blocks. Fungicides were applied at Zadoks' growth stage (G.S.) 49 on 22 September. Septoria disease was rated at Zadoks' G.S. 69 (10 October), G.S. 71 (23 October) and G.S. 83 (27 October). The parameters studied were grain yield, test weight and thousand kernel weight. The general conditions of the trial were very good. The infection level was intermediate and there was no interaction with other diseases. Severity measured as leaf area affected (S0) at Zadoks G.S. 83, showed significant differences between all the treatments except prochloraz and the check without fungicide. The best two fungicides were flusilazol (Punch) and tebuconazole (Silvacur). There were differences in efficiency among fungicides and also among those in the same chemical group. There were significant differences ($P<0.01$) among treatments for grain yield, test weight and thousand kernel weight. The grain yield increase with the best treatment was 20 percent. Septoria tritici ha sido controlada por productos quimicos, ya sea como medida temporal o como parte complementaria del sistema de manejo integrado del cultivo. En Uruguay no es facil obtener resistencia para todas las muchas enfermedades que atacan al trigo. El conocimiento de la eficiencia del fungicida es necesario en aquellos casos donde la resistencia no esta presente. Los fungicidas usados pueden ser de proteccion, sistemicos, y de proteccion y revestimiento de la semilla. Actualmente, hay un nuevo fungicida, triticonazole, el cual aplicado como un buen cobertor de la semilla da proteccion al estado de plantula. Este tipo de infeccion es muy comun en Uruguay (infeccion de otono) y es muy importante como fuente de inoculo para la infeccion de primavera. El objetivo de este trabajo es comparar la eficiencia de los fungicidas recomendados para el control de Septoria.

2039 Diaz de Ackermann, M.; Stewart, S.; Ibanez, W. (1995) **Pathogenic variability of Septoria tritici isolates from South America.** *Proceedings of a Septoria Tritici Workshop; Mexico, D.F.; 20-24 Sep 1993. Gilchrist, L.; Ginkel, M. van; McNab, A.; Kema, G.H.J. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 41-50.* CIMMYT. 5 tables; 18 ref. English. (AGRIS 97-020755).

Leaf blotch caused by Septoria tritici Rob. ex Desm. is a disease of wheat found in almost every wheat growing area in the world. In Uruguay, yield losses of up to 60 percent caused by Septoria tritici have been reported and in a 12-year survey of the wheat producing areas this disease was rated as the most prevalent and severe. Evidence of the existence of true pathogenic races has been reported by several researchers. In the Southern Cone of Latin America, the first step of a cooperative project was to know the septoria population in order to determine if there are differences within and among the countries involved (Uruguay, Argentina, Chile). The objective of this experiment was to adjust the methodology to be used to study pathogenic variability and to test a large number of isolates, considering a new evaluation criterion: type of reaction of each cultivar used as a differential. El tizon de la hoja causado por Septoria tritici Rob. ex Desm. es una enfermedad foliar del trigo en casi todas las zonas de crecimiento del trigo en el mundo. En Uruguay se han reportado perdidas de rendimiento arriba de 60 porciento causadas por Septoria tritici y en un muestreo hecho en la zona productora de trigo durante 12 anos, esta enfermedad fue detectada como la mayor incidencia y severidad. Pruebas de la existencia de razas patogenicas verdaderas han sido reportadas por varios investigadores. En el Cono Sur, el primer paso para comenzar un trabajo cooperativo fue conocer la poblacion de Septoria tritici de tal manera de determinar si hay diferencias dentro y entre los paises participantes (Argentina, Uruguay, Chile). El objetivo de este experimento fue ajustar la metodologia a usar para estudiar la variabilidad patogenica y probar un gran numero de aislamientos, considerando un nuevo criterio para la evaluacion: tipo de reaccion de cada variedad usada como diferencial.

2040 Dobrev, D.; Tufa, F. (Institut po Introduktsiya i Rastitelni Resursi "K. Malkov", Sadovo (Bulgaria)) (1995) **[Horizontal resistance of some barley cultivars to the pathogen of powdery mildew]. Khorizontalna ustojchivost na sortove echemik spryamo prichinitelya na brashnesta mana.** Selskostopanska Akademiya, Sofia (Bulgaria). *Rasteniev"dni Nauki (Bulgaria). Plant Science v. 32(5) p. 107-109.* 3 tables; 7 ref. Bulgarian. (AGRIS 97-020461).

2041 Duvert, P. (Rhone Poulenc Agro, Lyon (France). Centre de Recherches de la Dargoire, Service Fongicides); Aubert Giqueaux, C. (1996) **[Bromuconazole-prochloraz activity. Effect on French populations of the**

common eye-spot of wheat agent]. Association bromuconazole-prochloraze. Action sur les populations francaises de l'agent du pietin-verse. *Phytoma La Defense des Vegetaux (France) v. 48(486) p. 19-20. 7* ref. French. (AGRIS 97-020282).

2042 El Zahaby, H.M. (Hungarian Academy of Sciences, Budapest, Hungary.); Gullner, G.; Kiraly, Z. (1995) **Effects of powdery mildew infection of barley on the ascorbate-glutathione cycle and other antioxidants in different host-pathogen interactions.** *Phytopathology (USA) v. 85(10) p. 1225-1230.* references. English. (AGRIS 97-020463).

Rate of lipid peroxidation (malondialdehyde formation), levels of ascorbic acid and nonprotein thiols, and activities of ascorbate peroxidase (AP), dehydroascorbate reductase (DHAR), glutathione reductase (GR), glutathione S-transferase (GST), and quinone reductase (QR) were determined in leaves of three barley cultivars inoculated by a Hungarian isolate of Erysiphe graminis f. sp. hordei. Markedly increased malondialdehyde levels (enhanced lipid peroxidation) were observed in leaves of the resistant cultivar Amsel after infection but not in two susceptible cultivars. In the diseased susceptible cultivars Emir and GK-Omega, however, the ascorbic acid levels substantially decreased. A substantial increase of AP and a decline of DHAR activities also were observed in mildewed susceptible plants. A dramatic induction of NADPH-consuming activity was found in the inoculated leaves of the highly susceptible cultivar Emir concomitantly with decreasing 1-electron QR activity. Less-pronounced changes in the parameters were found in the resistant cultivar Amsel. Thiol levels increased moderately in cultivar Amsel and in susceptible cultivar GK-Omega. No significant change in GR activity was found in either cultivar. GST activity was induced in each inoculated cultivar, most substantially in highly susceptible Emir (up to about 360 of the control). Several antioxidative processes seemed to be activated in compatible host-parasite relationships, which may diminish the damaging effects of oxidative stress. This supposition was confirmed by infecting one barley cultivar (Amsel) with compatible and incompatible mildew races. These antioxidative processes were less efficiently activated in the incompatible relationship, which may lead to an early necrotization in the resistant host.

2043 Etebarian, H.R.; Torabi, M. (1995) **Effect of different isolates of Fusarium graminearum Schwabe in seedling-stage of wheat cultivars.** Tehran Univ. (Iran Islamic Republic). Plant Pests and Diseases Research Institute; Tehran Univ. (Iran Islamic Republic). Abouraghan Inst., Plant Diseases Research Dept. *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 27.* Persian. (AGRIS 97-005326).

Twelve isolates of Fusarium graminearum Schwabe-obtained from Gorgan, Mazandaran and Garmsar were tested for their virulence on wheat cultivars: Khazar, Golestan, cross-bayat, PR1 and Falat. Percentage of pre and post emergence seedling blight, fresh and dry weight of shoots and dry weight of roots were examined for the effect of Fusarium graminearum in seeding stage of wheat. The results indicated that the isolates 1 and 10 obtained from Behshahre and Gorgan were the most virulent. Percentage of seed germination and dry weight of roots of cultivars. The percentage of post emergence seedling blight in cv. Falat showed that it was the most susceptible cultivar. It was suggested that for selection of head blight resistant wheats, the cultuvars can be evaluated for seedling blight resistance in greenhouse and then the only highly resistant cultivars can be tested in the field.

2044 Evans, C.K. (University of Minnesota, St. Paul.); Hunger, R.M.; Siegerist, W.C. (1996) **Inoculum density and infection efficacy of conidia and conidiophores of isolates of Pyrenophora tritici-repentis.** *Plant disease (USA) v. 80(5) p. 505-512.* references. English. (AGRIS 97-005842).

Glass slides and wheat leaves were inoculated with conidia and conidiophores of Pyrenophora tritici-repentis isolates to compare the density (no./cm2) of propagules on nonhost and host surfaces. Regression functions of the density of each propagule form on glass slides, as a function of the inoculum concentration, overestimated the density of each propagule form on wheat leaves by three to four times. Subsequently, conidia and conidiophores of three isolates were inoculated at equal rates of propagule density on wheat cultivars TAM 105 (susceptible) and Red Chief (resistant) to compare lesion incidence resulting from the different forms of propagule. Conidia caused 26 times more lesions than did conidiophores, and differences among the isolates for lesion incidence were significant (P less than or equal to 0.05). Finally, the infection efficiency of the three isolates was determined utilizing their conidiophores and conidia in separate inoculum suspensions. Infection efficiency was determined from the slope of the regression of lesion incidence as a function of the density of propagules per unit area of inoculated leaf. Infection efficiency for conidia of the isolates ranged from 0.91 to 0.55 whereas infection efficiency for their conidiophores was not significantly different from zero or was extremely variable. Results indicate that studies of epidemiological parameters of P. tritici-repentis are more precise when based on estimates of conidial density on host leaf surfaces, and when conidiophores are excluded from inoculum suspensions. The estimates of infection efficiency should prove useful in the identification of virulent isolates of P. tritici-repentis and should lead to improved identification of resistance to tan spot.

2045 Eversmeyer, M.G. (ARS, USDA, Kansas State University, Manhattan.); Kramer, C.L. (1996) **Modeling winter and early spring survival of Puccinia recondita in wheat nurseries during 1980 and 1993.** *Plant disease (USA) v. 80(5) p. 490-493.* references. English. (AGRIS 97-005366).

Survival of Puccinia recondita inoculum between wheat crops is critical to the occurrence of severe leaf rust epidemics, which result in economic yield reductions in the Great Plains wheat-producing region of the U.S. Meteorological variables occurring prior to spring green-up of the wheat crop during 1980 to 1993, at Manhattan, KS, were used to model survival of inoculum throughout the winter and early spring in wheat nurseries. Stepwise multiple regression techniques were used to determine those weather variables that explained the most variation in levels of inoculum surviving on 15 March. Inoculum levels were recorded on a 0 to 9 scale with 0 indicating no inoculum survival and 9 indicating inoculum on all plants. Daily maximum and minimum temperatures, fungal temperature equivalence function, precipitation and snow cover, cumulative precipitation and fungal temperature function, and daily deviations from the 10-year average of those variables were averaged for 10-day periods prior to a date of prediction and used as independent variables. Models that explained 99 of the variation in overwintering with five or six variables were developed for the fifteenth of each month from December through March. Models for December, January, and February used five of the same variables, but the minimum temperature deviation used in the December model was replaced by the January rainfall deviation in the January and February models. The model for March used a different set of temperature variables and included daily deviations in snow cover for December and February to explain a significant portion of the overwintering of P. recondita inoculum.

2046 Foroutan, A.; Bamdadian, T.; Valipour, M. (1995) **Fungi associated with root and crown rot of wheat in Mazandaran province.** Agricultural Research Center of Mazandaran Sari (Iran Islamic Republic). *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995, Karadj (Iran Islamic Republic) p.46.* Persian. (AGRIS 97-005709).

2047 Foroutan, A.; Dalili, A.; Shaigan, J. (1995) **Isolation of Drechslera tritici- repentis from infected leaves of wheat in Mazandaran.** Agricultural Research Center of Mazandaran Sari (Iran Islamic Republic). *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 45.* Persian. (AGRIS 97-005708).

2048 Foroutan, A.; Nategh, Z.; Olady, M. (1995) **Selection of tolerance materials of wheat to scab in Mazandaran.** Agricultural Research Center of Mazandaran Sari (Iran Islamic Republic). *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 49.* Persian. (AGRIS 97-005712).

2049 Foroutan, A.; Torabi, M.; Dalili, A. (1995) **Evaluation of some fungicides against yellow rust of wheat in Mazandaran.** Agricultural Research Center of Mazandaran Sari (Iran Islamic Republic). *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 48.* Persian. (AGRIS 97-005711).

2050 Foroutan, A.; Torabi, M.; Mardohi, V. (1995) **Studies on factors influencing epidemies of wheat yellow rust in Mazandaran.** Agricultural Research Center of Mazandaran Sari (Iran Islamic Republic). *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 44.* Persian. (AGRIS 97-005707).

2051 Foroutani, A.; Raiatepanah, S.; Grami, G. (1995) **Chemical control of wheat scab in Mazandaran.** Agricultural Research Center of Mazandaran Sari (Iran Islamic Republic). *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 47.* Persian. (AGRIS 97-005710).

2052 Fulgueira, CL.; Borghi, AL.; Gattuso, MA.; Disapio, O. (1996) **EFFECTS OF THE INFECTION OF TOXIGENIC FUNGI AND AN ANTAGONISTIC STREPTOMYCES STRAIN ON WHEAT SPIKES.** *Mycopathologia. 134(3):137-142.* English. [UNIV NACL ROSARIO CEREMIC FAC CIENCIAS BIOQUIM & FARMACEUT SUIPACHA 531 RA-2000 ROSARIO ARGENTINA].

The objective of the present study was to determine the effect on infection of wheat spikes by toxigenic fungi (Aspergillus parasiticus NRRL, 2999, Fusarium tricinctum NRRL 3299, Fusarium graminearum CEREMIC 136/92) and a strain of Streptomyces sp. that is antagonistic to the above-mentioned fungi. Wheat grains (variety GRANERO INTA) were sown in 8 pots containing natural soil and kept in a greenhouse chamber. In the period of the early anthesis the wheat spikes were inoculated with conidial suspensions of each of the fungi in the presence or absence of Streptomyces. Each pot was assigned a different treatment. After an incubation of 100 days and when the wheat plants had attained maturity, the spikes were separated and the following items were determined: (a) number of grains obtained with each treatment, (b) weight of the grains, (c) average weight of the grains/treatment, (d) average number and weight of the grains/spike, and (e) invasion of the caryopses by the microorganisms determined by the analysis of the caryopses in seriate histological sections. There was a significant decrease ($p < 0.01$) in the average weight of the caryopses and in the weight and number of grains/spike in the presence F. graminearum. The wheat grains were invaded by of F. graminearum and A. parasiticus, an effect which was partially attenuated by the presence of antagonist Streptomyces sp. Nevertheless, the effect was not strong enough to prevent the degenerative consequences on the size and weight of the grains produced by F. graminearum. [References: 31].

2053 Garcia Turnil, E.; Morales Pinzon, V. (1995) **[Identification of sources of resistance to septoriosis (Septoria spp.) through spraying]. Identificacion de fuentes de resistencia a septoriosis (Septoria spp.) por el metodo de aspersion.** *Proceedings of a Septoria Tritici Workshop; Mexico, D.F.; 20-24 Sep 1993. Gilchrist, L.; Ginkel, M. van; McNab, A.; Kema, G.H.J. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 95-98.* CIMMYT. 1 table; 4 ref. Spanish. (AGRIS 97-020757).

The objective of this study was to identify possible sources of resistance to Septoria spp. within the Guatemala wheat germplasm pool. In 1989, 180 genotypes were artificially inoculated at the boot stage (Zadoks 45), followed by two additional inoculations at 8-day intervals. The spray method of inoculation was used, under the prevailing environmental conditions of Labor Ovalle, Quetzaltenango, Guatemala. A differential response in severity to septoria was observed. Seven lines carrying resistance to the disease were identified. In addition, five of these resistant lines expressed high yield potential. El objetivo del estudio fue identificar posibles fuentes de resistencia a la septoriosis (Septoria spp.) dentro del germoplasma guatemalteco y de introduccion de trigo. En 1989, 180 genotipos fueron inoculados artificialmente cuando las plantas se encontraban en estado de embuche (valor 45 en la escala de Zadoks); otras dos inoculaciones se hicieron a intervalos de ocho dias cada una por el metodo de aspersion bajo las condiciones ambientales de Labor Ovalle, Quetzaltenango, Guatemala. Se encontro una respuesta diferencial a la severidad de septoriosis. Siete lineas fueron identificadas como resistentes a la enfermedad. Ademas de la resistencia, cinco 1ineas tuvieron un alto potencial de rendimiento.

2054 Garcia, S.; Garcia, C.; Heinzen, H.; Moyna, P. (1997) **CHEMICAL BASIS OF THE RESISTANCE OF BARLEY SEEDS TO PATHOGENIC FUNGI.** *Phytochemistry. 44(3):415-418.* English. [FAC QUIM MONTEVIDEO CATEDRA FARMACOGNOSIA & PROD NAT AVDA GEN FLORES 2124 MONTEVIDEO URUGUAY].

The 5-(n)-alkylresorcinol fraction of the epicuticular waxes of Hordeum vulgare seeds appeared to be responsible for their in-born resistance to pathogenic fungi such as Aspergillus niger and Penicillium crysogenum. The antifungal properties of this fraction were evaluated qualitatively and quantitatively with a novel bioassay where the extreme lipophilicity of these compounds was taken into account. The minimum inhibitory concentration in the fungi tested ranged from 5.6 to 10 mu g cm(-2) for the alkyresorcinols. The behaviour of the different cultivars against these fungi could be predicted by measuring the natural amount of resorcinols of each variety by TLC-scanning densitometry. The ranking of cultivars thus established correlated well with the field behaviour of each cultivar, providing a useful and rapid method for predicting the behaviour against fungi of new varieties being developed. Copyright (C) 1997 Elsevier Science Ltd [References: 13].

2055 Gerns, H.; Vonalten, H. (1996) **MODIFICATION OF PLASMA MEMBRANE OF BARLEY LEAVES BY RESISTANCE INDUCTION .1. FATTY ACID PATTERNS.** *Zeitschrift fur Pflanzenkrankheiten und Pflanzenschutz-Journal of Plant Diseases & Protection. 103(6):590-595.* English. [UNIV HANNOVER INST PFLANZENKRANKHEITEN & PFLANZENSCHUTZ HERRENHAUSER STR 2 D-30419 HANNOVER GERMANY].

The effects of the resistance inducers Trigonelline and B50 on the fatty acid patterns of plasma membranes of barley were studied. Neither infection nor the application of the inducers alone had a remarkable effect on the acyl chain length. An infection uf barley with powdery mildew caused a decrease in the degree of unsaturation (double bond index, DBI) of the fatty acids. An application of Trigonelline or B50 prior to inoculation prevented the pathogen-induced changes and led, furthermore, to an increase in the degree of unsaturation. [References: 26].

2056 Getaneh Woldeab (IAR, Addis Abeba (Ethiopia)) (1996) **Studies on fungal diseases of wheat at the Plant Protection Research Center, 2974-1994. 3. Annual Conference of the Crop Protection Society of Ethiopia. Addis Abeba (Ethiopia). 18-19 May 1995.** *Proceedings of the third annual conference of the crop protection society of Ethiopia. Eshetu Bekele (IAR, Addis Abeba (Ethiopia)); Abdurahman Abdulahi; Aynekulu Yemane (eds.) p. 171-177.* CPSE. 1 table; 12 ref. English. (AGRIS 97-005839).

Research on fungal diseases of wheat commenced in the then scientific phytopathological Laboratory in 1974. The fungal diseases encountered in surveys included rusts, blotches, smuts, scab, powdery mildew, ergot and root rots. The most prevalent were rusts and Septoria blotches. In many instances, epidemics of rusts were registered in Shoa, Arsi and Bale regions, particularly, Arsi Negele, Debre Zeit and Herero were hot spot areas for at least two rust species. During this period, cultivars Mamba, Romany B.C., Gara, KKBB, Dashen and Enkoy lost resistance to one or more rust diseases. The 45.2 percent yield loss due to stem rust also confirmed the significance of rust diseases in the country. In more detailed studies, 36.57 and 90 races of stem, (Puccinia graminis), leaf, (P. recondita) and yellow rust (P. striiformis) respectively had been identified till 1988. The stem rust monogenic lines Sr22, Sr5 and Sr11; leaf rust lines Lr9 and Lr19 and Yr3/Yr5 and Yr10 possessed genes effective against the respective prevalent races for many years. Furthermore, wheat and wild grasses grown in the off-season were found to be sources of rust infection. Rust spores were also detected in the atmosphere almost all year round. The development of stem rust in tissues of susceptible variety was rather quick and there was no hypersensitivity reaction of the cells as in the resistant one. In other experiments, three methods of artificial inoculation and one method of drying and preserving stem rust spores were recommended. Local and exotic varieties/lines were screened under artificial and natural infections and at different growth stages resulting in identification of entries resistant to rust(s).

2057 Getaneh Woldeab; Temesgen Belayneh (IAR, Addis Abeba (Ethiopia)) (1996) **Occurrence of rust and reaction of barley varieties/landraces. 3. Annual Conference of the Crop Protection Society of Ethiopia. Addis Abeba (Ethiopia). 18-19 May 1995.** *Proceedings of the third annual Conference of the crop protection society of Ethiopia. Eshetu Bekele (IAR, Addis Abeba (Ethiopia)); Abdurahman Abdulahi; Aynekulu Yemane (eds.) p. 178-185.* CPSE. 5 tables; 10 ref. English. (AGRIS 97-005353).

The three rust diseases, leaf rust (Puccinia hordei), stem rust (P. graminis) and stripe rust (P. striiformis) are reported to affect barley in Ethiopia. But, their distribution severity and level of resistance of barley varieties and land races cultivated in the major barley growing regions have not been monitored. Hence, non-replicated nursery consisting of 150 barley entries including a susceptible check was planted and evaluated at Ambo, Holetta, Adet, Sheno and Sinana for 2-4 years. Low level of stem rust infection was observed once on some entries at Ambo, stripe rust was recorded only on Ardu-12-60B food barley and PGRC/E accession at

Sheno and Ambo. Leaf rust, however, was severe and widely distributed on the nursery at many of the locations and years. Ambo, Adet and Sinana were used as screening sites since they were hot spot areas for leaf rust. The intensity of leaf rust was high, but there was no shift in resistance on widely cultivated varieties, PGRC/E accessions and differential varieties. Malting and food barley varieties Proctor, Holkr, Ardu 12 60B and HB 100; accession numbers 202551-202553, 202603 and 202654 and the differential cultivars Oderbrucker and Quinn remained resistant across locations and years. The variable response of leaf rust differentials as well as the resistance of two varieties across locations and years might indicate the unchanged heterogeneity of the pathogen. On the other hand, 13 leaf rust susceptible land races, with high yielding capacity as compared to the local check, were promoted to a tolerance study. Such cultivars will give reasonable yields in the years of leaf rust epidemics.

2058 Ghimire, S.R.; Pradhanang, P.M. (Lumle Agricultural Research Centre, Pokhara, Kaski (Nepal)) (1996) **Response of lentil and wheat genotypes against major diseases - 1993/94.** *LARC Working Paper (Nepal); no. 96/28 41 p.* Lumle Agricultural Research Centre. 7 tables; 4 ref. English. (AGRIS 97-005327).

Seven exotic lentil (Lens culinaris, Med.) genotypes resistant to Fusarium wilt at ICARDA, Syria were tested at Lumle Agricultural Research Centre (1675m asl) against Lumle isolate of Fusarium spp. under naturally infected field condition in 1993/94 winter in RCBD with 3 replication. All test genotypes had more than 10 per cent wilting, and were late in maturity than local check variety Simrik. Therefore, none of them were selected for further testing.

2059 Gilchrist, L.; Fuentes Davila, G.; Martinez Cano, C. (1995) **[Practical guide for the identification of some diseases of wheat and barley]. Guia practica para la identificacion de algunas enfermedades de trigo y cebada.** Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). CIMMYT. 26 figs. 70 p. Spanish. (AGRIS 97-020760).

2060 Gilchrist, L.; Ginkel, M. van; McNab, A.; Kema, G.H.J. (eds.) (1995) **Proceedings of a Septoria tritici Workshop; Mexico, D.F.; 20-24 Sep 1993.** Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). CIMMYT. 164 p. English. (AGRIS 97-020752).

2061 Golinski, P.; Kostecki, M.; Lasocka, I.; Wisniewska, H.; Chelkowski, J.; Kaczmarek, Z. (1996) **MONILIFORMIN ACCUMULATION AND OTHER EFFECTS OF FUSARIUM AVENACEUM (FR) SACC ON KERNELS OF WINTER WHEAT CULTIVARS.** *Journal of Phytopathology-Phytopathologische Zeitschrift. 144(9-10):495-499.* English. [ACAD AGR POZNAN DEPT CHEM WOJSKA POLSKIEGO 75 PL-60625 POZNAN POLAND].

Accumulation of the mycotoxin moniliformin (MON) and other effects on kernels were examined in 13 Polish winter wheat cultivars inoculated with F. avenaceum (Fr.) Sacc. isolate ATCC 64 451. Kernels from inoculated ears were divided into three fractions: Fusarium damaged kernels (FDK), kernels with black point symptoms (BPK) and healthy looking kernels (HLK). The average moniliformin content (mg/kg) was highest in chaff (11.69), lower in infested kernels (FDK + BPK) (2.70) and lowest in HLK (1.16). The mean level (mg/kg) of moniliformin in kernels (total sample) ranged from 0.78 in cv. Liwilla to 3.84 in cv. Gama. Moniliformin levels in chaff were correlated (r = 0.5322) with the average metabolite concentration (mg/kg) in kernels, and ranged from 4.97 in chaff of cv. Roma to 22.9 of cv. Alba. The moniliformin concentration in kernels (total sample) was highly correlated with the level of the metabolite in diseased kernels. This is the first report of the relationship of black point symptoms with F. avenaceum colonization of kernels and moniliformin accumulation. [References: 24].

2062 Golzar, H. (1995) **Evaluation of adult plant resistance of wheat advanced lines to stripe rust in East of Mazandaran.** Agricultural Research Center of Gorgan-Gonbad (Iran Islamic Republic); Plant Pests and Diseases Research Dept., Tehran (Iran Islamic Republic). *Proceedings of the 12 th Iranian Plant Protection Congress 2-7 September Karaj (Iran Islamic Republic) p. 50.* Persian. (AGRIS 97-005298).

The effects of stripe rust epidemics on advanced lines of wheat were evaluated in field experiments during the recent two years. The races 4E2, 6E2 and 138E144 of Puccinia striiformis F. sp. tritici actually present in the field were identified from uredia collected on leaves by Torabi et al 1993-1994. The lines were planted as a rust nursery under mist irrigation. Natural epidemic of yellow rust became widespread and severity and type of infection on upper leaves of advanced lines were estimated several times at 7-day intervals with the aid of the modified cobb scale. Infection rating was also estimated by Average Coefficient of Infection (ACI). The results suggest that two kinds of resistance were present between lines as follows: 1. Advanced lines with Immune (O) or Resistant (R) type reaction such as Chil "S", Ombu/Alamo. HD2380.2. Advanced lines with lower rate of disease development and MR to MS type of Infection, such as Bow "S"/Nkt CM. Kauz CM. Attila CM. Opata CM.

2063 Golzar, H. (1995) **Record of sources of resistance to Fusarium head blight.** Agricultural Research Center of Gorgan-Gonbad (Iran Islamic Republic). *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karaj (Iran Islamic Republic) p. 51.* Persian. (AGRIS 97-005500).

Considerable improvement in the search for resistance cultivars had been achieved in recent years. Wheat cultivars and advanced lines were evaluated at a Fusarium nursery for sources of resistance to scab during 1993-94. Scattering scabby wheat kernels in the field to increase primary inoculum and application of spores suspension were carried out during the flowering until milky stage of growth. In addition selected material was inclusted by injection of conidial suspension into a single floret in the middle of spike (20 per cultivar). Infection rating and incidence of diseased heads were carried out by method of Wang Yu Zhong et al (1987). Results indicated that three chines wheat cultivars Wang Shui- bai, Sumai no. 3 and Ning 7840 were suitable sources of resistance to scab and available for cross breeding program.

2064 Gorlach, J. (Ciba Geigy, Research Triangle Park, NC.); Volrath, S.; Knauf Beiter, G.; Hengy, G.; Beckhove, U.; Kogel, K.H.; Oostendorp, M.; Staub, T.; Ward, E.; Kessmann, H. (1996) **Benzothiadiazole, a novel class of inducers of systemic acquired resistance, activates gene expression and disease resistance in wheat.** *The Plant cell (USA) v. 8(4) p. 629-643.* references. English. (AGRIS 97-020770).

Systemic acquired resistance is an important component of the disease resistance repertoire of plants. In this study, a novel synthetic chemical, benzo(1, 2, 3)thiadiazole-7-carbothioic acid S-methyl ester (BTH), was shown to induce acquired resistance in wheat. BTH protected wheat systemically against powdery mildew infection by affecting multiple steps in the life cycle of the pathogen. The onset of resistance was accompanied by the induction of a number of newly described wheat chemically induced (WCI) genes, including genes encoding a lipoxygenase and a sulfur-rich protein. With respect to both timing and effectiveness, a tight correlation existed between the onset of resistance and the induction of the WCI genes. Compared with other plant activators, such as 2, 6-dichloroisonicotinic acid and salicylic acid, BTH was the most potent inducer of both resistance and gene induction. BTH is being developed commercially as a novel tune of plant protection compound that works by inducing the plant's inherent disease resistance mechanisms.

2065 Guglielmone, L.; Caciagli, P. (1996) **BIOLOGICAL CHARACTERIZATION OF AN ITALIAN ISOLATE OF BARLEY YELLOW DWARF LUTEOVIRUS FROM BARLEY.** *Journal of Phytopathology-Phytopathologische Zeitschrift. 144(7-8):383-386.* English. [CNR IST FITOVIROL APPL ST CACCE 73 I-10135 TURIN ITALY].

An isolate of BYDV (BYDV-OC), from barley in Northwest Italy with typical symptoms of yellowing and dwarfing, was transmitted by Rhopalosiphum padi, Sitobion fragariae, S. avenae, Metopolophium festucae, R. maidis and M. dirhodum, but not by Myzus persicae or Schizaphis graminum. It reacted in DAS-ELISA with monoclonal and polyclonal antisera to PAV, but not with antibodies to MAV, RPV and RMV. A polyclonal antiserum prepared to BYDV-OC did not react with MAV-like, RPV-like, or RMV-like isolates of BYDV in ELISA or in Western blots. The concentration of BYDV-OC in Avena byzantina plants decreased from weeks 1 to 10 after inoculation, but the total virus content per plant increased up to weeks 7 to 8, following the increase of plant weight. [References: 22].

2066 Gunnarsson, T.; Almgren, L.; Lyden, P.; Ekesson, H.; Jansson, HB.; Odham, G.; Gustafsson, M. (1996) **THE USE OF ERGOSTEROL IN THE PATHOGENIC FUNGUS BIPOLARIS SOROKINIANA FOR RESISTANCE RATING OF BARLEY CULTIVARS.** *European Journal of*

Plant Pathology. 102(9):883-889. English. [LUND UNIV DEPT ECOL S-22362 LUND SWEDEN].

Ergosterol content in the plant pathogenic fungus Bipolaris sorokiniana was determined in different matrices including mycelium, spores, culture filtrate and infected barley leaves. Ergosterol was extracted with methanol, hydrolysed with KOH and quantified by reverse phase high performance liquid chromatography (HPLC). Our procedure was used to study how the ergosterol concentration of B. sorokiniana varied due to fungal age and nutrient availability when growing in liquid medium. It was found that the ergosterol content decreased with fungal age. The decrease was not due to leakage. It was also found that a change to a less nutrient-rich medium caused an increase in ergosterol content whereas a change to a rich medium led to a decrease. The procedure was also used for quantification of fungal infections in complex matrices (e.g. leaves). The development of fungal infection in barley leaves was followed during 10 days. Visual grading of leaf spots was also compared to ergosterol content in three varieties of barley. The ergosterol content in the leaves increased exponentially until day 7, and the grading of the leaf spots was correlated to the ergosterol content. Our results show that, despite a great variation, ergosterol may be used as a biomarker to detect and quantify fungal infections in a given matrix. [References: 25].

2067 Harbron, C.G.; Wale, S.J. (Biomathematics and Statistics Scotland, Rowett Research Institute, Bucksburn, Aberdeen AB2 9SB (United Kingdom)) (1995) **The use of additive models to analyse a fungicide dose field trial.** *Aspects of Applied Biology (United Kingdom) (no.43) p. 67-75.* 10 ref. Field experiment techniques, 11-13 December 1995, Churchill College, Cambridge (United Kingdom). English. (AGRIS 97-020419).

2068 Hassanpour, H. (1995) **Study of the effectiveness of some new fungicides against yellow rust of wheat in Golpayegan.** Agricultural Research Center of Esfahan (Iran Islamic Republic). Plant Pests and Diseases Research Dept. *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karaj (Iran Islamic Republic) p. 37.* Persian. (AGRIS 97-005294).

2069 Hassanpour, H.; Damadzadeh, M. (1995) **Resistance of some cultivars of barley to Erysiphe graminis in Esfahan.** Agricultural Research Center of Esfahan (Iran Islamic Republic). Plant Pests and Diseases Research Dept. *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 36.* Persian. (AGRIS 97-005668).

2070 Huszar, J.; Sykora, M.; Plesnik, S.; Vanco, B.; Krippel, E. (1996) **REACTION OF VARIOUS BARLEY GENOTYPES ON INFECTION, FREQUENCY AND GENES COMPLEXICITY OF ERYSIPHE GRAMINIS DC F SP HORDEI MARCHAL IN SLOVAKIA.** *Zeitschrift fur Pflanzenkrankheiten und Pflanzenschutz-Journal of Plant Diseases & Protection. 103(6):596-601.* English. [RES INST PLANT PROD BRATISLAVSKA CESTA 122 PIESTANY 92168 SLOVAKIA].

In 1995, the disease severity, frequency and complexity of virulence genes of Erysiphe graminis DC. f. sp. hordei Marchal on 10 spring barley cultivars with different resistance genes were studied. Under field conditions, only the cv. 'Forum' with resistance gene ml-o was without sporulation of the pathogen. The most significant attack was determined in cv. 'Rubin' with the resistance gene Ml-a(1). On the base of virulence analysis, significant differences between isolates originating from different genotypes were determined. In the population of pathogens isolated from examined genotypes, the highest virulence genes frequency was determined against resistance genes of individual cultivars. According to the complexity of virulence genes, the lowest mean number of virulence in analyzed isolates was found from the genotype with resistance gene Ml-a(12) and the highest one from genotypes with resistance genes Ml-a(6) + at and Ml-a(9) + La. [References: 12].

2071 Izadpanah, K.; Kamran, R. (1995) **Viral diseases of wheat in Eghlid region of Fars.** Shiraz Univ. (Iran Islamic Republic). Agricultural Research Center of Fars, Plant Pests and Diseases Research Dept., Shiraz Univ. (Iran Islamic Republic). College of Agriculture, Dept. of Plant Protection. *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 29.* Persian. (AGRIS 97-005840).

With recent emphasis on wheat production in the Eghlid region (150km north of Shiraz), several diseases have assumed economic importance in this crop. In a survey in the spring of 1994, four viruses were found infecting wheat in this region. 1. Barley yellow dwarf virus (BYDV): Typical BYDV symptoms were observed in both irrigated and rain-fed fields. A number of specimens were checked for serotypes PAV but none for MAV. 2. Barley stripe mosaic virus (BSMV): Some wheat mosaic specimens from Eghlid contained BSMV- like rigid rods when studied by electron microscopy. The causal virus was transmissible by mechanical inoculation. It reacted with a BSMV antiserum from the US in agar-gel diffusion test. This is the first documented report for the presence of BSMV in Iran. 3. Wheat streak mosaic virus (WSMV): WSMV was identified on the basis of particle morphology and DAS-ELISA tests. From 20 wheat mosaic specimens, 10 were positively identified as WSMV. Eriophyes tulipae was abundant in some but not all fields. 4. Unidentified filamentous virus: Some of the wheat mosaic specimens contained a mechanically transmissible filamentous virus of over 1000nm length. Infected wheat extract did not react with antisera to WSMV, BSMV, and sugarcane mosaic virus strains SCMV-SC and SCMV-MS. The rate of mosaic infection in some wheat fields exceded 80 but the share of each of the three mosaic- inducing viruses was not determined.

2072 Jackson, K.E. (Oklahoma State University.); Pratt, P.W. (1996) **Effect of a cereal disease diagnosis systems on hard red winter wheat, north central Oklahoma.** *Research report P (USA) (no. 948) p. 9-14.* In the series analytic: Results of 1995 plant disease control field studies. English. (AGRIS 97-005421).

2073 Jackson, K.E. (Oklahoma State University.); Pratt, P.W. (1996) **Effect of foliar fungicides on foliar diseases of hard red winter wheat, eastern Oklahoma.** *Research report P (USA) (no. 948) p. 1-3.* In the series analytic: Results of 1995 plant disease control field studies. English. (AGRIS 97-020491).

2074 Jackson, K.E. (Oklahoma State University.); Pratt, P.W. (1996) **Effect of foliar fungicides on foliar diseases of hard red winter wheat, north central Oklahoma.** *Research report P (USA) (no. 948) p. 4-8.* In the series analytic: Results of 1995 plant disease control field studies. English. (AGRIS 97-005420).

2075 Kamran, R.; Izadpanah, K. (1995) **Comparative serological and host range studies of rice mosaic- associated virus and Iranian maize mosaic rhabdovirus.** Agricultural Research Center of Fars, Shiraz (Iran Islamic Republic). *Proceedings of the 12th Iranian Plant protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 83.* Persian. (AGRIS 97-005677).

A virus associated with rice mosaic (RMAV) in certain rice fields of Fars and Kohkiluyeh and Boyrahmad is morphologically similar to Iranian maize mosaic rhabdovirus (IMMRV). The two viruses were compared serologically and in regard to host range. In greenhouse experiments, RMAV was transmitted to rice, barley, wheat (Triticum aestivum), corn, barnyardgrass (Echinochloa crus- galli), and goosegrass (Eleusine indica) seedlings. The infected sap of these plants reacted positively with IMMRV antiserum in DAS- ELISA test. In host range studies, non- viruliferous planthoppers (Laodelphax striatellus), after an acquisition access period of 7-10 days on maize or barley infected with IMMRV or the rice virus, respectively, were transferred to seedlings of a number of grasses under greenhouse conditions. The two viruses infected wheat (Triticum aestivum), turgidum wheat (T. turgidum), durum wheat (T. durum), sorghum (Sorghum bicolor), green foxtail (Setaria viridis), barnyardgrass (E. crus- galli and E. colonum), and millet (Panicum miliaceaum). The main symptoms of infection were mosaic in leaves and dwarfing of plants and sometimes denticulation of leaf margins.

2076 Kari, A.G. (Agricultural Res. Inst., Nicosia (Cyprus)) (1996) **Yield losses of spring barley induced by foliar diseases under semi-arid conditions.** *Technical Bulletin (Cyprus); no. 177 8 p.* 3 tables; 14 ref. English. (AGRIS 97-020273).

Chemical control of powdery mildew, net blotch and scald increased yield of barley grain by 9 per cent, which is not commercially profitable.

2077 Kelly Basetti, B.M.; Cundy, D.J.; Pereira, S.M.; Sasse, W.H.F.; Savage, G.P.; Simpson, G.W. (CSIRO Division of Chemicals and Polymers, Private Bag 10, Rosebank MDC, Clayton, Vic. 3169 (Australia)) (1995) **Synthesis and fungicidal activity of 2, 2'-bipyridine derivatives.** *Bioorganic and Medicinal Chemistry Letters (United Kingdom) v. 5(24) p. 2989-2992.* 18 ref. English. (AGRIS 97-005660).

2078 Klem, K.; Polisenska, I.; Vanova, M. (Zemedelsky Vyzkumny Ustav, Kromeriz (Czech Republic)) (1996) **[Economic effectiveness of fungicide application in winter wheat]. Ekonomicka efektivnost fungicidniho osetreni ozime psenice.** *Obilnarske Listy (Czech Republic) v. 4(3) p. 34-36.* 1 graph, 2 tables. Czech. (AGRIS 97-020762).

2079 Lagerberg, C. (1996) **COMPARISON OF POLYCLONAL ELISA WITH THE SEED-BLOTTER, FLUORESCENCE AND AGAR PLATE METHODS FOR DETECTION AND QUANTIFICATION OF SEED-BORNE SEPTORIA NODORUM IN WHEAT.** *Seed Science & Technology. 24(3):585-588.* English. [SWEDISH UNIV AGR SCI DEPT PLANT PROTECT SCI POB 44 S-23053 ALNARP SWEDEN].

Twelve seed samples of winter wheat were analysed with the ELISA, seed blotter, fluorescence and agar plate methods. [References: 6].

2080 Lei, C.H. (Purdue University, West Lafayette, IN.); Lister, R.M.; Vincent, J.R.; Karanjkar, M.M. (1995) **SGV serotype isolates of barley yellow dwarf virus differing in vectors and molecular relationships.** *Phytopathology (USA) v. 85(7) p. 820-826.* references. English. (AGRIS 97-005413).

Two SGV serotype isolates of barley yellow dwarf virus (BYDV) NY-SGV from New York State and TX-SGV from Texas, exhibited differences in aphid transmissibility that could significantly influence their relative occurrence and epidemiology; i.e., TX-SGV was readily transmitted by a range of vector aphids, whereas NY-SCV showed a much greater vector specificity. In serological assays, TX-SGV differed from NY-SGV but resembled an SGV serotype isolate from Idaho that shares similar vector relationships with TX-SGV. Dot blot hybridization assays using cloned cDNA probes distinguished the SGV isolates from the P-PAV, MAY-PS1 NY-RPV, and NY-RMV isolates of BYDV and from each other. Nucleotide sequences were determined for the 22-kDa coat protein gene, the associated 17-kDa internal open reading frame, and a 50-kDa protein gene of the NY-SGV and TX-SGV isolates. The deduced amino acid sequences of these proteins shared approximately 96 similarity between isolates but had only about 71 similarity with comparable regions from the MAV-PS1 and P-PAV serotype isolates and approximately 57 similarity with those of the NY-RPV isolate. These comparisons did not identify obvious differences in primary structure that might be related to differences in vector relationships of NY-SGV and TX-SGV. The results demonstrate that the SGV serotype is distinct from other BYDV serotypes and that it includes sequence-distinguishable variants that differ in epidemiologically significant properties, such as transmissibility by various vectors.

2081 Loiveke, H. (Estonian Agricultural Univ., Tartu (Estonia)) (1996) **[Most commonly spread diseases on barley in Estonia and their control]. Odra levinumad haigused Eestis ja nende torje.** Estonian Academic Agricultural Society, Tartu (Estonia). *Transactions of the Estonian Academic Agricultural Society (Estonia) (no.1) p. 87-89.* Estonian. (AGRIS 97-005351).

From 1989 the effectiveness of dressing agents and spraying preparations in disease control as well as their effect on yield have been studied in our trials. The effectiveness of dressing depends on the type of dressing agent and the spectrum of the active ingredient, on the type and character of infections and on its intensity as well as on the disease resistance of the variety. Agroclimatic conditions can be decisive. The use of wetting agents can improve the efficiency of dressing and give extra yield. Controlling the internal infection of seeds Baytan Un. is the most effective preparation, Raxil and Maxim Star have a good potential. The positive effect of Baytan Un. on yield is apparent only in optimal agrotechnical conditions.

2082 Lovell, DJ.; Parker, SR.; Hunter, T.; Royle, DJ.; Coker, RR. (1997) **INFLUENCE OF CROP GROWTH AND STRUCTURE ON THE RISK OF EPIDEMICS BY MYCOSPHAERELLA GRAMINICOLA (SEPTORIA TRITICI) IN WINTER WHEAT.** *Plant Pathology. 46(1):126-138.* English. [UNIV BRISTOL LONG ASHTON RES STN IACR DEPT AGR SCI BRISTOL BS18 9AF AVON ENGLAND].

Generally, it is recognized that inocula of Septoria tritici present on the basal leaves of winter wheat crops are spread towards the top of the canopy by splashy rainfall. This mechanism of inoculum dispersal is commonly accepted to be a key Limit on disease progression. Therefore, attempts to forecast epidemics of S. tritici often quantify rainfall by some means, but largely ignore measurement of pathogen and host variables. In the present study, we show that new wheat leaves emerge initially at a height below established leaves that can contain sporulating lesions of S. tritici. This presents the possibility of horizontal inoculum transfer, even without splashy rainfall. The extent and duration of overlap between emergent and established leaves was found to differ considerably with cultivar and sowing date. Nitrogen application had little effect on overlap, because differences in crop phenology, e.g. leaf area and nodal length, were relative. However, estimates of raindrop penetration to the base of crop canopies suggested that vertical movement of inoculum is affected by nitrogen application. Crops receiving more nitrogen are denser, and therefore less rainfall reaches the base of the canopy. The interactions between crop and pathogen development are discussed with reference to the implications for predicting disease risk. In particular, cultivar traits that promote disease escape are quantified. [References: 26].

2083 Ma, H.; Singh, R.P. (1996) **Expression of adult resistance to stripe rust at different growth stages of wheat.** *Plant disease (USA) v. 80(4) p. 375-379.* references. English. (AGRIS 97-005855).

Stripe, or yellow, rust (caused by Puccinia striiformis is a common disease of wheat in cool, humid climates. Genes that confer adult resistance to stripe rust are known to be present in high-yielding spring wheats (Triticum aestivum). However, it is not known when in the growth of the plant adult resistance is first expressed. The objectives of the study were to evaluate the expression of adult resistances at various growth stages in the greenhouse, and to assess the effect of such resistances on stripe rust development in the field. Eight wheat cultivars known to carry different levels of adult resistance and three susceptible cultivars were evaluated for resistance in the greenhouse at six growth stages (from seedling to anthesis), using a Mexican race of P. striiformis. Resistance was measured by infection type (IT) and latent period (LP). The cultivars were also evaluated in the field using the same race to determine disease progress. In all tests, Morocco was the most susceptible cultivar (IT 7 to 9, LP 11 to 13 days), followed by Avocet S (IT 6 to 9, LP 12 to 15 days) and Jupateco 73S (IT 6 to 9, LP 12 to 17 days). Seedling IT and LP for cultivars with adult resistance were similar to those of the susceptible cultivars (IT 6 to 8, LP 12 to 15 days). However, as plants grew, resistance increased and was expressed as lower IT and longer LP. The changes in IT displayed by HD2258 and PBW65 were the greatest; intermediate to low IT (2 to 3) were seen as early as the completion of tillering and changed to immunity (IT 0) at anthesis. Other cultivars with adult resistance, viz., Mexico 82, Pavon 76, Jupateco 73R, Apache 81, Anahuac 75 and Ciano 79, generally showed intermediate to moderately susceptible responses (IT 4 to 6) at growth stages later than tillering. The IT and LP displayed at anthesis by resistant cultivars were lowest and highest, respectively, indicating that adult resistance was best expressed at this growth stage.

2084 Madariaga B, R. (1995) **[Epidemiology of Mycosphaerella graminicola in Chile]. Epidemiologia de Mycosphaerella graminicola en Chile.** *Proceedings of a Septoria Tritici Workshop; Mexico, D.F.; 20-24 Sep 1993. Gilchrist, L.; Ginkel, M. van; McNab, A.; Kema, G.H.J. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 19-24.* CIMMYT. 5 figs.; 7 ref. Spanish. (AGRIS 97-020754).

This paper presents epidemiological data on septoria leaf blotches of wheat in Chile. It also outlines the life cycle of these fungi that survive on straw and stubble. The role of straw, its production at a national level, and its implication for the increase of primary inoculum are addressed. In 1991 the monthly maturation of the fungi's pseudothecia was studied at the Chillan Research station. The absence of ascostroma in the green tissue was noted. Mature perithecioid pseudothecia were increasingly present from February onward, peaking in April and May. This coincided with the highest levels of disease symptoms in the relevant nurseries. En el presente trabajo se presentan antecedentes epidemiologicos de septoriosis de la hoja en Chile, el ciclo de vida del agente causal, hongos de la microflora del rastrojo, cantidad de rastrojo producido a nivel nacional y sus implicancias en el aumento de inoculo primario. Se determino la maduracion mensual de pseudotecios del hongo durante 1991 en la localidad de Chillan, observandose ausencia del ascostroma en tejido verde y la presencia creciente de pseudotecios peritecioides maduros a partir del mes de febrero. Los valores mas altos se observaron a partir de abril y mayo, lo cual es coincidente con la mayor abundancia de sintomas de la enfermedad en las sementeras establecidas en estos meses.

2085 Mahato, B.N. (National Wheat Research Programme, Bhairahawa, Rupandehi (Nepal)) (1996) **Genetics of rust resistance of selected wheat lines and mapping of pathotype flora of leaf rust in Nepal: a research**

study carried out during July 4 to Sept. 15, 1996 at Directorate of Wheat Research, Regional Station Flowerdale, Shimla - 171 002, Himachal Pradesh, India. National Wheat Research Programme. 16 tables; 37 ref. 53 p. English. (AGRIS 97-005779).

2086 Mahdyan, S.A. (Tarbiat Modarres Univ., Tehran (Iran Islamic Republic)); bamdadian, A.; Torabi, M. (Plant Diseases Research Dept., Plant Pests and Diseases Research Institute, Tehran (Iran Islamic Republic)) (1995) **Identification of physiological races of wheat brown rust in east Azarbaidjan.** *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 59.* Persian. (AGRIS 97-005232).

Twenty one wheat leaf samples infected with brown rust (Puccinia recondita) were collected from different areas of east Azarbidjan and Ardebil Provinces. In the greenhouse, spores of all samples were purified using single pustule and single spore procedures. Urediniospores of each isolate were separately inoculated on the first leaves of 8 differential varieties for race identification. Results obtained from this experiment showed that, races 12, 45, 54, 57, 84, 176 and biotypes 45A and 84B were present in these areas. Races 57 and 84 had been reported earlier from Iran, but races 12, 45, 54, 176 and 84A and 45A are new for Iran. races 45 and 84 with 28.57 and 23.8 of frequencies respectively were the most prevalent races. According to the Lr resistance genes present in the differential varieties and their reaction to the race identified here, it is postulated that Lrl and LRII resistance genes are effective in these areas.

2087 Makkouk, KM.; Bertschinger, L.; Conti, M.; Bolat, N.; Dusunceli, F. (1996) **BARLEY YELLOW STRIATE MOSAIC RHABDOVIRUS NATURALLY INFECTS CEREAL CROPS IN THE ANATOLIAN PLATEAU OF TURKEY.** *Journal of Phytopathology-Phytopathologische Zeitschrift. 144(7-8):413-415.* English. [INT CTR AGR RES DRY AREAS GERPLASM PROGRAM POB 5466 ALEPPO SYRIA].

Field surveys of cereal crops in the Anatolian Plateau of Turkey revealed that bread wheat, durum wheat, barley, triticale and oats are naturally infected with barley yellow striate mosaic rhabdovirus. Identification was based on symptomatology, double antibody sandwich ELISA (DAS-ELISA), tissue-blot immunoassay (TBIA) and immunoelectron microscopy (IEM). BYSMV was identified in cereal fields near Ankara, Eskisehir, Konya, Karaman and in an area 70 km north east of Isparta. Virus incidence in all the fields surveyed was less than 1%. This is the first report where evidence is presented on the natural occurrence of BYSMV on cereals in Turkey. [References: 12].

2088 Mansoori, B. (1995) **Soil- borne diseases of wheat in Fars Province.** Agricultural Research Center of Fars, Shiraz (Iran Islamic Republic). Plant Pests and Diseases Research Dept. *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 58.* Persian. (AGRIS 97-005676).

Irrigated wheat fields in Fars province are estimated to be 330, 000 ha. During 1993-1994, a field survey indicated local cultivars such as Bayat, Falat, Ghods, Omid, Nevid which are adopted to moderate and cool climates; were susceptible to most soil- borne pathogens. From 70 fields representing high infections, 30-50 samples were collected. The samples consisted of rotted germinated seeds, yellow and dead seedlings and plants, with aborted spikelets or white heads. The cut pieces, 2-5mm, surface sterilized were plated on water agar (WA) amended with 2 percent dextrose and 10 ppm ampicillin and incubated at 25C. The frequency of isolates was: 406 Fusarium spp. 326 Rhizoctonia spp., 247 Pythium spp., 209 Drechslera spp., 73 Verticillium tricorpus, 23 Sclerotium rolfsii and 2 Sclerotinia sclerotiorum.

2089 Masumi, M.; Izadpanah, K. (1995) **A report on five cereal viruses in Zanjan province.** Shiraz Univ. (Iran Islamic Republic). College of Agriculture, Plant Protection Dept. *Proceedings of the 2th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 54.* Persian. (AGRIS 97-005672).

2090 Masumi, M.; Izadpanah, K. (1995) **The status of wheat streak mosaic virus in Iran.** Shiraz Univ. (Iran Islamic Republic). Plant Protection Dept. *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 55.* Persian. (AGRIS 97-005673).

Wheat streak mosaic virus (MSMV) is one of the most widespread viruses of wheat throughout the world and may inflict heavy losses to wheat crop under certain conditions. Occurrence of the virus in wheat, Echinochloa colona and maize in some regions of the Fars Province, has been reported earlier. To assess the presence of the virus in other regions of the country, samples of gramineous plants with mosaic symptoms were collected and subjected to DAS-ELISA in the past three years, using an antiserum to the Iranian isolate of WSMV. The results showed that wheat with mosaic and chlorotic lines and stripes from Shiraz, Sepidan, Eghlid, Fassa, Estahban and Neyriz in the Fars province, similar samples of wheat from Tarom, Zanjan, Kerman, Jiroft, Tabriz and Isfahan, Johnsongrass with mosaic from Qazvin, Sari and Amol, Setaria viridis with mosaic, chlorotic stripping, yellowing and stunting from Zanjan, Sari and Amol, and bermuda grass with mild mosaic from Zanjan, Kerman and Jiroft were infected with WSMV.

2091 Matsumura, K. (Kochi University, Nonkoku, Kochi, Japan.); Tosa, Y. (1995) **The rye mildew fungus carries avirulence genes corresponding to wheat genes for resistance to races of the wheat mildew fungus.** *Phytopathology (USA) v. 85(7) p. 753-756.* references. English. (AGRIS 97-005857).

The common wheat cultivar Chancellor and its near-isogenic lines carrying resistance genes to Blumeria graminis f. sp. tritici the wheat powdery mildew fungus, were inoculated with 60 F1 cultures derived from a cross between B. graminis f. sp. secalis, the rye powdery mildew fungus, and B. graminis f. sp. tritici. Segregation patterns of avirulent and virulent cultures showed that the F1 population carries avirulence genes corresponding to Pm1, Pm2, Pm3a, Pm3b, Pm3c, and Pmla, resistance genes to races of the wheat mildew fungus. This result indicates that the rye mildew fungus, an inappropriate forma specialis for wheat, carries these avirulence genes.

2092 Maumene, C. (Institut Technique des Cereales et des Fourrages, Paris (France)) (1995) **[The campaign "diseases 1995" in France. Disease situation, fungicides in barley, fungicides in wheat]. Bilan de la campagne maladies 1995 (France). Une forte pression parasitaire, le point sur les fongicides orges, le point sur les fongicides ble.** *Perspectives Agricoles (France) (no 208) p. 46-58.* 10 tableaux, 10 graph. French. (AGRIS 97-020304).

2093 Maurin, N.; Saur, L.; Capron, G. (1996) **STEM AND HEAD REACTION OF WINTER WHEAT CULTIVARS TO ARTIFICIAL INOCULATION BY MICRODOCHIUM NIVALE UNDER CONTROLLED ENVIRONMENT AND FIELD CONDITIONS.** *Euphytica. 92(3):359-366.* English. [INRA BP 29 F-35650 LE RHEU FRANCE].

Experiments to assess variation in the resistance of winter wheat to infection by Microdochium nivale were conducted over two consecutive years. Resistance was evaluated using an agar disk technique to reproduce stem lesions and by spraying a conidial suspension to reproduce head blight symptoms. Significant variation for stem reaction measured as stem lesion area (SLA), and head reaction measured as disease severity (DS) was found in the 33 winter wheat genotypes tested. Data obtained over two years in controlled environment conditions were significantly correlated (r=0.713 for SLA and r=0.738 for DS), whereas field data showed a significant genotype x year interaction for disease severity. Quantitative variation for susceptibility to stem and head infection by M. nivale was found among the 33 genotypes tested. The majority of genotypes expressed moderate susceptibility, with cultivar Goupil being very susceptible to both stem and head infection, and the remainder, Renan, Arminda, Munstertaler and Saint-Johann were the most resistant. Resistance to stem and head to M. nivale were not correlated (r=0.358). [References: 32].

2094 Mercer, PC.; Ruddock, A. (1996) **EVALUATION OF FUNGICIDE DOSAGE ON YIELD, SEPTORIA TRITICI AND SENESCENCE IN WINTER WHEAT IN NORTHERN IRELAND.** *Annals of Applied Biology. 128(Suppl S):22-23.* English. [DEPT AGR NO IRELAND APPL PLANT SCI DIV NEWFORGE LANE BELFAST BT9 5PX ANTRIM NORTHERN IRELAND].

2095 Miedaner, T.; Perkowski, J. (1996) **CORRELATIONS AMONG FUSARIUM CULMORUM HEAD BLIGHT RESISTANCE, FUNGAL COLONIZATION AND MYCOTOXIN CONTENTS IN WINTER RYE.** *Plant Breeding. 115(5):347-351.* English. [UNIV HOHENHEIM 720 LANDESSAATZUCHTANSTALT FRUWIRTHSTR 21 D-70593 STUTTGART GERMANY].

Fusarium culmorum head blight infections may lead to accumulation of toxic metabolites in winter rye grain. To estimate the correlation between resistance traits, fungal colonization and accumulation of deoxynivalenol (DON), 3-acetyldeoxynivalenol (3-AcDON) and zearalenone (ZEA), 27 winter rye single-cross hybrids were artificially inoculated in 1992 and 1993. Resistance traits were head blight rating and grain weight of the inoculated relative to the non-inoculated plots. Fungal colonization was determined by the analysis of ergosterol (ERG) content in the grain. Head blight rating and relative grain yield showed a medium to high disease severity and ERG indicated a considerable fungal colonization of the kernels with a mean of 85 mg/kg in 1992 and 66 mg/kg in 1993. DON content among genotypes ranged from 0.7-28 mg/kg in 1992 and from 11 to 35 mg/kg in 1993. 3-AcDON and ZEA contents were low in both years with overall means of 1.1 and 0.09 mg/kg, respectively. Across both years, considerable genotypic variation was found for head blight rating, relative grain weight, and ERG content with medium to high heritabilities (0.6-0.7). For the mycotoxin contents, however, genotype-year interaction variance was the most important source of variation. The correlations between relative grain weight and DON, 3-AcDON, or ZEA were low in 1992 (r approximate to 0.3), but considerably higher in 1993 (r approximate to 0.7, P = 0.01). In contrast, correlation between relative grain weight and ERG was significant in both years (r approximate to 0.5, P = 0.01). In F. culmorum head blight infections, DON, 3-AcDON and ZEA contents appear to be affected, at least partially, by different environmental factors than resistance traits and fungal colonization. [References: 29].

2096 Miedaner, T.; Schilling, AG. (1996) **GENETIC VARIATION OF AGGRESSIVENESS IN INDIVIDUAL FIELD POPULATIONS OF FUSARIUM GRAMINEARUM AND FUSARIUM CULMORUM TESTED ON YOUNG PLANTS OF WINTER RYE.** *European Journal of Plant Pathology. 102(9):823-830.* English. [UNIV HOHENHEIM STATE PLANT BREEDING INST 720 FRUWIRTHSTR 21 D-70593 STUTTGART GERMANY].

Fusarium graminearum and F. culmorum are capable of infecting winter cereals at all growth stages. From natural field epidemics of wheat head blight and rye foot rot, three fungal populations were collected with 21, 38 and 54 isolates, respectively; their aggressiveness was analyzed in comparison to collections of F, graminearum (25 isolates) and F culmorum (70 isolates) that represent a wide range of geographical locations and host species. All isolates were tested for aggressiveness on young plants of winter rye in the greenhouse and scored for disease severity on a 1-9 scale. Disease ratings of individual isolates ranged from 1.5 to 5.7 indicating quantitative variation of aggressiveness. Genotypic variance was highest in the two Fusarium collections. No substantial difference was found in the amount of genotypic variation between F, graminearum and F culmorum. Individual field populations revealed 57-66% of the total genotypic variation of the collections. This implies a high degree of diversity of aggressiveness within single field populations of F. graminearum and F. culmorum causing natural epidemics. [References: 40].

2097 Moeini, A.A. (Virus Research Dept., Plant Pests and Diseases Research Institute Tehran (Iran Islamic Republic)); Hajimorad, M.R. (Univ. of Shiraz, Dept., of Plant Protection (Iran Islamic Republic)) (1995) **Evidence for the association of barley yellow dwarf luteovirus with yellowing disease of wheat in Kelardasht.** *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 57.* Persian. (AGRIS 97-005675).

A disease with prominent symptoms of yellowing and reddening of leaves has been prevalent in wheat fields of Kelardasht Experiment Station, Mazandaran province, Iran, for the past several years. Various tests have failed to demonstrate etiological role of certain biological and environmental factors in the disease. In the present study, possible involvement of barley yellow dwarf luteovirus (BYDV) in the syndrome was investigated using polyclonal antisera to MAV, PAV and RPV serotypes of the virus. A double antibody sandwich enzyme-linked immunosorbent assay (DAS-ELISA) was developed according to the standard procedure and optimized for the reliable detection of each of the above serotypes in naturally infected wheat tissue. Dried leaf materials known to contain each of the above serotypes were used as positive control. Samples of diseased wheat leaves were collected in the area in three successive growing seasons (1992-1994) and stored at-20C until use.

2098 Moeini, M. R. (1995) **Infectesd ratio and distribution area of 3 fungal diseases of barley in Zandjan province.** Agricultural Research Center, Zanjan (Iran Islamic Republic). Plant Pests and Disease Research Dept. *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 56.* Persian. (AGRIS 97-005674).

Barley is an important crop in the Zandjan province. This crop is annually exposed to different injurious factors among which fungi are the most important ones. During this study more than 16000 barley plants in 60 fields were examined and results are as follows: 1. Leaf stripe Helminthosporium gramineum is the most important disease of barley which has been distributed in 46.68 percent of fields and its average infectious ratio is 18.30 percent. 2. Barley scald Rhynchosporium secalis is the second one which has distributed in 31.61 percent of fields and its average infectious ratio is 23.35 percent. 3. Covered smut Ustilago hordei is the third one which has been distributed in 23.21 percent of fields and its average infectious ratio is 3.71 percent.

2099 Mojdehi, H. (1995) **Histopathology of Wheat seedling root infected with Pythium irregulary.** Islamic Azad Univ., Tehran (Iran Islamic Republic). *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karaj (Iran Islamic Republic) p. 52.* Persian. (AGRIS 97-005670).

Two-day-old wheat seedlings were placed on the edge of a P. irregular culture for 3h at 25C, and transferred into test tubes (188mm dia) containing glass beads and 1m1 of sterile water. Roots were sampled every 6 or 12h for 84h, and serial sectioning for light microscopy observations. Roots were colonized extensively in the region of root hair formation near the tip within 30h after inoculation. Extensive penetration occurred 0.1-2mm behind the root tip, with hyphae breaching the endodermis and gaining entry into the stele. Behind this area, hyphae remained limited to the outer cortical cells, or did not penetrate at all. Hyphae grew intracellularly, and became irregulary inflated inside the cells. In most cases, hyphae penetrated the roots directly through the epidermis with appressoria being formed, or through breaks on the surface.

2100 Moshiri, S. (1995) **Identification of resistance source in barley to certain fungal pathogen in Khorasan.** Agricultural Research Center of Khorasan, Mashhad (Iran Islamic Republic). *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 53.* Persian. (AGRIS 97-005671).

Studies on barley diseases have been conducted in Khorasan during 1988-1993. Seventeen barley cultivars were sown in Mashhad as disease nurseries. The reactions of cultivars, containing definite genotypes, were recorded after appearance and development of the disease on susceptible cultivars based on Loegering- Cobb scale. The results obtained are as follows; 1. The following fungal pathogens were found under field conditions in Khorasan: Drechslera graminea, D. sorokinana, D. teres, Erysiphe graminise, Rhynchosporum secalis, Puccinia striiformis, Puccinia hordei. 2. Severity and infection types of tested cultivars against each of diseases were different; and we can use the cultivars which have shown resistance against above diseases as a source of resistance in Khorasan for example the star cultivar is resistant against the most important diseases in Khorasan. At least one cultivar of barley was found to be examined to one of the above pathogens but cultivars star was either resistant or immune to most important fungal pathogens.

2101 Nazari, K. (Seed and Plant Improvement Institute, Karadj (Iran Islamic Republic)); Mamluk, O.F.; El Naimi, M. (The International CEnter of Agricultural Research in Dry Areas (ICARDA), Aleppo (Syria)) (1995) **Resistance evaluation of bread wheat advanced lines to yellow rust at seedling and adult plant stages in plastic house and field condition in ICARDA.** *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 61.* Persian. (AGRIS 97-020421).

For resistance evaluation and investigation of resistance variation in seedling and adult plant stages, 85 accessions of Bread Wheat Yellow Rust Nursey Trial (WYRN-94) were screened to yellow rust. In the seedling stage five seeds of each line were planted on 5Cm diameter pot. Seedlings were inoculated 9 days after sowing when the first seedling leaf was fully expanded by dusting method. Inoculated plants were placed inside a small plastic- covered cage and then were kept in a growth chamber for a 48h period at 10C, 90 r. h. and no illumination, followed by a 15 days after inoculation period at 15C in plastic house. Infection-type response was recorded 15 days after inoculation. The scale of Mc Neal (1971) was used. Seedling results indicate that three categories were designated: 1) one line free of infection, immune, 2) thirty four lines found to be resistant and 3)

forty nine lines with susceptible response. In the adult- plant stage wheat lines were grown under mist irrigation system in two rows with 1- m length and each line was inoculated directly with uredospores diluted with Talc over the seedling, tillering and flag leaf stages.

2102 Nozari, K. (Seed and Plant improvement Institute, Karadj (Iran Islamic Republic)); Mamluk, O.F.; El Naimi, M. (The International Center for Agricultural Research in Dry Areas, ICARDA, Aleppo (Syria)) (1995) **Resistance evaluation of durum wheat advanced lines to yellow rust at seedling and adult plant stages in plastic house and field condition in ICARDA.** *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 60.* Persian. (AGRIS 97-005231).

For resistance evaluation and investigation of resistance variation in seedling and adult plant stages, 45 accessions of Durum Wheat Yellow Rust Nursery Trial (DYRN-94) were screened to yellow rust. In the seedling stage five seeds of each line were planted on 5cm diameter pot. Seedlings were inoculated 9 days after sowing when the first seedling leaf was fully expanded by dusting method. Inoculated plants were placed inside a small plastic-covered cage and then were kept in a growth chamber for a 48h period at 15C, in plastic house. Infection- type response was recorded 15 days after inoculation. Based on the results except one line, all accessions were resistant. For investigation of field resistance, each line was grown under mist irrigation system in two rows with 1-m length and all lines were inoculated with the uredospores diluted with talc over the seedling, tillering and flag leaf stages.

2103 Orolaza, N.P. (University of Manitoba, Winnipeg, Canada.); Lamari, L.; Ballance, G.M. (1995) **Evidence of a host-specific chlorosis toxin from Pyrenophora tritici-repentis, the causal agent of tan spot of wheat.** *Phytopathology (USA) v. 85(10) p. 1282-1287.* references. English. (AGRIS 97-020772).

Spore germination fluid, cell-free culture filtrate, and intercellular washing fluid from race 5 of Pyrenophora tritici-repentis contained a host-specific toxin which elicited extensive chlorosis on Katepwa and 6B662, characteristic of the chlorotic symptom induced by the fungus on the same wheat genotypes. These three sources of toxin showed equivalent host specificity. Other races (including races 1 and 3) which are known to induce chlorosis in different wheat genotypes than does race 5 did not produce a detectable level of a chlorosis toxin, as assessed by bioassay, when grown in a still liquid culture or during spore germination. Of the 15 plant species tested, only wheat (genotypes 6B662, Katepwa, and Neepawa) and triticale (cv. Banjo) developed distinct chlorosis when inoculated with race 5 or infiltrated with its spore germination fluid or partially purified culture filtrate. F2 progenies from a cross between race 5-susceptible and race 5-resistant wheat genotypes were evaluated. Susceptibility of the seedlings to race 5 and their sensitivity to its toxin cosegregated. A ratio of 1:3 (resistant/susceptible) was observed, suggesting the involvement of a single, dominant locus controlling the reaction to the fungus and the toxin. The chlorosis toxin appeared to be a pathogenicity factor and was designated as Ptr-chlorosis toxin.

2104 Oroumchi, S. (Oroumieh (Iran Islamic Republic). agricultural Research Center of Western Azarbaidjan. Plant Pests and Diseases Research Dept.); Ershad, J. (Tehran (Iran Islamic Republic). Plant Pests and Diseases Research Inst., Iran and botany Research Dept.) (1995) **Current status of bunt diseases and loose smut in rainfed wheat fields of West Azarbaidjan.** *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 25.* Persian. (AGRIS 97-005871).

With the aim to provide information on the distribution, prevalence, and economic importance of bunt and smut diseases in the major wheat-growing districts of the province, the incidence of common and dwarf bunt as well as loose smut in each of a total of 20 rainfed winter wheat fields was recorded as the percentage of infected heads during ripening in early summer 1994. Bunted heads were collected and examined singly for determination of the causel fungi on the basis of differences in morphology and germination requirements of teliospores. The results indicate that Tilletia foetida was predominant within the investigated area, and presence of T. controversa was confirmed in samples collected from Oroumieh, Naghadeh, Oshnavvieh, Miandoab and Piranshahr at different infection rates. Loose smut, Ustilago tritici, was observed to occur only sporadic in the region with infection levels less than 1. Average incidence according to infection with common and dwarf bunt was determined to be 10.09 and 1.15, respectively. Teliospores obtained from four bunted heads originating from Bukan showed interspecies characteristics in regard to their wall structure and germination requirements and may probably represent a case of hybridization between the two bunt species.

2105 Oroumchi, S.; Torabi, M. (1995) **Studies on the epidemiology of stripe rust (Puccinia striiformis f. sp. tritici) on wheat in West Azarbaidjan.** Karadj Univ. (Iran Islamic Republic). Oroumieh Seed and Plant Improvement Inst.; Agricultural Research Center of Western Azarbaidjan (Iran Islamic Republic). Plant Pests and Diseases Research Dept. *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 24.* Persian. (AGRIS 97-005780).

Development and progress of stripe rust epidemic was studied on a susceptible (Omid) and a commercial wheat cultivar (Navid) in the field in spring and summer 1994. Sporulating rust sori were first observed on April, 18th on Omid and on April, 25th on Navid. Assessments of infection type and severity of the disease were made visually at regular weekly intervals. The coefficient of infection was calculated from the recorded data for each cultivar and a graph prepared showing the progress of the epidemic in relation to variations in the environmental conditions per unit of time. As indicated by the graph, onset of the epidemic was in mid April this year. Its progress was gradual until mid June but became enhanced in severity in the end of June during a period of repeated rainfall coinciding in time with a drop in temperature and rise in relative humidity. The coefficient of infection in general was higher in Omid reaching its maximum value (100) on July, 5th, whereas maximum value for Navid (80) was reached on June, 21st and did not change until harvest (July, 19th). Sporulation of stripe rust during summer and fall was observed on the following weed plants: Aegilops tauschii, Hordeum spontaneum and Hordeum sp.

2106 Panic, M.; Antonijevic, D. (Poljoprivredni fakultet, Beograd (Yugoslavia)) (1994) **[Susceptibility of Fusarium graminearum and Fusarium moniliforme to fungicides for wheat seed treatment]. Osetljivost Fusarium graminearum i Fusarium moniliforme prema fungicidima za dezinfekciju semena psenice.** Treci jugoslovenski kongres o zastiti bilja. Vrnjacka Banja (Yugoslavia). 3-7 Oct 1994. *Plant protection today and tomorrow: [selected papers from the third Yugoslav congress about plant protection, Vrnjacka Banja (Yugoslavia), October 3-7, 1994]. Sestovic, M.; Neskovic, N.K.; Peric, I. (eds.). Zastita bilja danas i sutra: [odabrani radovi sa Treceg jugoslovenskog kongresa o zastiti bilja, Vrnjacka Banja (Jugoslavija), 3-7. oktobra 1994] p. 449-460.* Drustvo za zastitu bilja Srbije. 4 ill.; 3 tables; 17 ref. Serbian. (AGRIS 97-005845).

It was investigated the toxicity of the following systemic fungicides for wheat seed treatment: Vitavax-200, Benit universal, Baytan universal and Ferrax against the fungi Fusarium graminearum and Fusarium moniliforme. The effect of the investigated fungicides was specific and varied. Vitavax-200 showed no toxic effects. Both fungi were grown successfully on PDA-medium covering the whole area of the Petri dishes. Ferax was not toxic to Fusarium graminearum. However, it was extremely toxic to Fusarium moniliforme. Baytan universal and Benit universal showed a high degree of toxicity to both fungi and at both investigated concentrations. Baytan universal was more efficient against Fusarium graminearum. Benit universal was, on the other hand, more efficient against Fusarium moniliforme.

2107 Parker, S.R.; Whelan, M.J.; Royle, D.J. (IACR Long Ashton Research Station, Department of Agricultural Sciences, University of Bristol, Long Ashton, Bristol BS18 9AF (United Kingdom)) (1995) **Reliable measurement of disease severity.** *Aspects of Applied Biology (United Kingdom) (no.43) p. 205-214.* 12 ref. Field experiment techniques, 11-13 December 1995, Churchill College, Cambridge (United Kingdom). English. (AGRIS 97-020551).

2108 Paulitz, T.C. (McGill University, Ste. Anne de Bellevue, Quebec, Canada.) (1996) **Diurnal release of ascospores by Gibberella zeae in inoculated wheat plots.** *Plant disease (USA) v. 80(6) p. 674-678.* references. English. (AGRIS 97-020771).

The daily pattern of ascospore release by Gibberella zeae (= Fusarium graminearum), the causal agent of Fusarium head blight of wheat, was investigated in artificially inoculated wheat plots. Mature perithecia and ascospores appeared on corn colonized by G. zeae 2 to 3 weeks after being placed in the plots (mid June). Ascospores over the plots were sampled with a Burkard continuous 7-day spore sampler. Temperature, relative

humidity (RH), leaf wetness, and rainfall were also recorded in the plots on an hourly basis. Ascospores were released during the first three weeks of July in 1992 and 1993, with hourly concentrations of 600 to 9, 000 ascospores/m3. Ascospore release typically showed a diurnal pattern. Release began around 1600 to 1800 hours, reached a peak usually before midnight, and declined to low levels by 0900 hours the following morning. The beginning of ascospore release was correlated with a rise in RH during early evening hours. Ascospore release occurred before leaf wetness was detected and was not correlated with rainfall or continuous high RH during the preceding daylight hours. Peak ascospore releases occurred 2 to 4 days after major rainfalls. Ascospore release was diminished on days with continuous RH >80 or rainfall >5 mm. Light rain during a spore release event temporarily washed ascospores from the air; however, heavy rain (>5 mm) stopped spore release. This data suggests rainfall may be needed for perithecial and ascospore formation and maturity on crop debris, but not to trigger the actual release of ascospores. Perithecial drying during the day, followed by sharp increases in RH, may provide the stimulus for release of ascospores.

2109 Peipp, H.; Maier, W.; Schmidt, J.; Wray, V.; Strack, D. (1997) **ARBUSCULAR MYCORRHIZAL FUNGUS-INDUCED CHANGES IN THE ACCUMULATION OF SECONDARY COMPOUNDS IN BARLEY ROOTS.** *Phytochemistry. 44(4):581-587.* English. [INST PFLANZENBIOL WEINBERG 3 D-06120 HALLE GERMANY].

Hordeum vulgare (barley) was grown in a defined nutritional medium with and without the arbuscular mycorrhizal fungus Glomus intraradices. HPLC of methanolic extracts from the roots of mycorrhized and non-mycorrhized plants revealed fungus-induced accumulation of some secondary metabolites. These compounds were isolated and identified by spectroscopic methods (NMR, MS) to be the hydroxycinnamic acid amides N-(E)-4-coumaroylputrescine, N-(E)-feruloylputrescine, N-(E)-4-coumaroylagmatine and N-(E)-feruloylagmatine, exhibiting a transient accumulation, and the cyclohexenone derivative 4-(3-O-beta-glucopyranosylbutyl-3-(hydroxymethyl)-5, 5-dimethyl-2-cyclohexe -1-one and 4-[3-O-[2'-O-beta-glucuronosyl)-beta-glucopyranosyl]-butyl]- 3, 5, 5-trimethyl-2-cyclohexen-1-one (blumenin), exhibiting a continuous accumulation. A third cyclohexenone derivative, 4-[3-O-[(2'-O-beta-glucuronosyl)-beta-glucopyranosyl]-1-butenyl]-3, 5, 5-tri ethyl-2-cyclohexen-1-one, was detectable only in minute amounts. It is suggested that accumulation of the amides in early developmental stages of barley mycorrhization reflects initiation of a defence response. However, the continuous accumulation of the cyclohexenone derivatives. especially blumenin, seems to correlate with the establishment of a functional barley mycorrhiza. Copyright (C) 1997 Elsevier Science Ltd. [References: 44].

2110 Peyghamy, E.; Babadoosst, M. (1995) **Studying biological control of common and dwarf bunts of wheat.** Tabriz Univ. (Iran Islamic Republic). College of Agriculture, Dept. of Plant Protection. *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 32.* Persian. (AGRIS 97-005833).

Seeds of wheat cultivars Omid, a winter cv. and Falat a spring cv. were inoculated with teliospores of Tilletia laevis, the causal agent of the common bunt, and T. controversa, the causal agent of the dwarf bunt, and sown in post containing sterilized soil. After seed germinated, cross and longitudinal sections of coleoptiles were repaired and germination of teliospores, production of sporidia and penetration of hyphae in the seedling were studied. It was found that infection of wheat seedlings with T. laevis occurs mainly during first leaf development. For investigating biological control of T. laevis and T. controversa, the fungus Trichoderma viride (strain 303) was caused, this strain grows well at 6-12C, which are favorable temperatures for infection of wheat seedling with the bunt fungi, when spores of T. viride were added to petri plates, containing teliospores of T. laevis and T. contoversa, it prevented teliospore germination in both of the fungi. In the field experiment, seeds of Omid and Falat cvs. were first inoculated with teliospores of T. laevis or T. controversa, then coated with spores of T. viride and sown.

2111 Pourmansouri, T.; Bamdadian, A. (Tehran (Iran Islamic Republic). Plant Pests and Diseases Research Dept.); Modirrosta, A. (Karadj (Iran Islamic Republic). Plant Pests and Diseases Research Laboratory of Karadj) (1995) **Evaluation of the resistance of some bread and durum wheat germplasm pool to common Bunt (Tilletia laevis) in Karadj.** *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 31.* Persian. (AGRIS 97-005832).

Common bunt of wheat caused by Tilletia laevis is one of the important diseases of wheat in Iran. In the lack of seed treatment it can cause much losses. Because of sanitation and reduction in use of fungicides, finding of resistant varieties is the best way to control common bunt. For this purpose during 1991-1992 and 1992-1993 13 wheat common bunt germplasm pool-91 and 16 Durum common bunt germplasm pool-92 which were received from Icarda International Center for agricultural research in the dry area were evaluated for resistance to Tilletia laevis. These germplasm pools were infested by spore of T. laevis in the rate of 5/1000. Then each of them were sown in 2 one meter rows. After maturity all of them were harvested and by counting the number of healthy and diseased head was identified. The percentage of infection in each variety was calculated. Those with below 5 infection, were chosed as resistant variety.

2112 Rajaie, S.; Torabi, M. (1995) **Studies on the effects of some fungicides on the control of wheat yellow rust in Fars province.** Plant Pests and Diseases Research Dept., Agriculture Research Center of Fars, Shiraz (Iran Islamic Republic). *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 38.* Persian. (AGRIS 97-005702).

2113 Reiss, E.; Bryngelsson, T. (1996) **PATHOGENESIS-RELATED PROTEINS IN BARLEY LEAVES, INDUCED BY INFECTION WITH DRECHSLERA TERES (SACC) SHOEM AND BY TREATMENT WITH OTHER BIOTIC AGENTS.** *Physiological & Molecular Plant Pathology. 49(5):331-341.* English. [FED CTR BREEDING RES CULTIVATED PLANTS INST RESISTANCE RES THEODOR ROEMER WEG 4 D-06449 ASCHERSLEBEN GERMANY].

The perthotrophic fungus Drechslera teres, the causal agent of net blotch disease in barley, induces the accumulation of pathogenesis-related (PR) proteins in barley leaves as shown by isoelectric focusing. The same protein pattern was also found in leaves treated with a toxin extract from the culture filtrate of D. teres as well as after infection with Erysiphe graminis f.sp. hordei or Puccinia hordei. Some of the proteins induced by infection with D. teres were characterized as peroxidases, beta-1, 3-glucanases and chitinases by isoenzyme analysis. Immunodetection following western blots demonstrated that the induced proteins are the same as those that accumulate after inoculation of barley with E. graminis: basic PR-1a and b proteins, thaumatin-like (TL) proteins, beta-1, 3-glucanases and chitinases. The accumulation of PR-1 type proteins, chitinases and TL-proteins was analysed quantitatively by ELISA. (C) 1996 Academic Press Limited. [References: 45].

2114 Rezavi, M.; Amini, J.; Jalayani, N. (1995) **Pathogenicity of Drechslera specifera on wheat cultivars in Jiroft area.** Plant Pests and Diseases Research Institute, Tehran (Iran Islamic Republic). *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 39.* Persian. (AGRIS 97-005703).

2115 Rico, L.M. (1995) **[Septoriosis: some results obtained in Colombia]. Septoriosis: Algunos resultados obtenidos en Colombia.** *Proceedings of a Septoria Tritici Workshop; Mexico, D.F.; 20-24 Sep 1993. Gilchrist, L.; Ginkel, M. van; McNab, A.; Kema, G.H.J. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 9-16.* CIMMYT. 9 figs.; 1 ref. Spanish. (AGRIS 97-020753).

Foliar blights are among the major diseases that attack wheat in Colombia. Preliminary studies are under way to identify the causal organisms of foliar blights in the two major wheat-growing areas: the narinense highlands in the south and the central Cundiboyacense region. Laboratory studies have confirmed that both Septoria nodorum and S. tritici are present in the narinense highlands. Due to favorable conditions, S. nodorum and its sexual stage Leptosphaeria nodorum are prevalent in certain areas in the central region. Identification of these zones allowed the field screening of 330 lines from the ISEPTON (CIMMYT). Such studies indicate the need to continue with a complete identification of these pathogens. In addition, the environmental conditions conducive to disease must be determined in each site, in order to allow the efficient selection of materials resistant to the septoria diseases. En Colombia, las manchas foliares forman parte de las principales enfermedades que afectan al cultivo de trigo. Actualmente, se realizan estudios preliminares sobre la identificacion de los patogenos causantes de estos problemas en las dos subregiones importantes del cultivo: el altiplano Narinense al sur y el Cundiboyacense al centro del pais. En la primera zona, el material enfermo

analizado en laboratorio, demostro la presencia de Septoria nodorum y S. tritici. En el centro del pais, se ha logrado encontrar localidades en las que, por sus condiciones ambientales, prevalecen Leptosphaeria nodorum y S. nodorum. La deteccion de estos lugares ha servido para evaluar en condiciones de campo el comportamiento de 330 lineas del ISEPION procedentes del CIMMYT. Los estudios anteriores muestran la necesidad de continuar con el reconocimiento e identificacion de estos patogenos y de determinar las condiciones ambientales propicias al establecimiento de la enfermedad en cada localidad elegida, para seleccionar materiales resistentes a la septoriosis.

2116 Rodriguez, R.W. (Kansas State University, Manhattan.); Bockus, W.W. (1996) **Differences among isolates of Pyrenophora tritici-repentis in production of conidia on wheat leaves.** *Plant disease (USA) v. 80(5) p. 478-483.* references. English. (AGRIS 97-005854).

Isolates of Pyrenophora tritici-repentis were compared for their ability to produce conidia on host tissue. In the first set of experiments, four isolates were compared on the tan spot-susceptible cultivar TAM 105. In the second set of experiments, three isolates were compared on four wheat cultivars differing in their necrotic and chlorotic reactions to tan spot. Number of conidia and percentage of disease severity were regressed against time after inoculation to compare slopes and estimates of the intercepts of linear response curves. Comparison of slopes for conidia production on the susceptible cultivar TAM 105 indicated that isolate MCR-6 had a significantly higher slope (up to 12-fold) than the other isolates. Additionally, the estimates of the intercepts for the other isolates were all different from each other (up to 5.7-fold). Comparisons of slopes and estimates of the intercepts for conidia production on cultivars differing in resistance showed that MCR-6 had a significantly higher slope than isolates MCS-I and PTF on all cultivars, and that the estimates of the intercepts of MCS-I were higher than those of PTF on all cultivars except on the highly resistant Karl 92. Thus, large differences in sporulation ability occurred within the population of P. tritici-repentis, and the ranking of an isolate remained the same on all cultivars. Differences in conidial production among isolates were not explained by differences in aggressiveness (disease severity). The large differences in sporulation capacity of strains of P. tritici-repentis, if shown to occur in the field, have implications for their rate of spread and would be determining factors in the time required for a new strain to attain a significant frequency in the fungal population.

2117 Rogalski, L.; Kurowski, T.; Czajka, W. (Akademia Rolniczo Techniczna, Olsztyn (Poland). Katedra Ochrony Roslin) (1996) **[Effect of combined urea-fungicide treatments on disease occurrence and yielding of winter wheat and spring barley]. Oddzialywanie opryskiwan laczonych mocznikowo-fungicydowych wykonanych technika lotnicza na nasilenie chorob oraz plonowanie pszenicy ozimej i jeczmienia jarego.** *Acta Academiae Agriculturae ac Technicae Olstenensis. Agricultura (Poland) (no.62) p. 133-140.* 2 fig., 3 tables; 8 ref. Polish. (AGRIS 97-020768).

Urea-fungicide air treatments positively affected the yield level; on average by 0.88 and 0.5 tons per hectare for wheat and barley, respectively, when compared with the control fertilization level (40 kg N/ha). The average efficiency for urea-fungicide treatments was equal to 37.2 and 59.2 kg of grain per kg of nitrogen - used as urea solution - for wheat and barley, respectively.

2118 Rubiales, D. (Institute for Sustainable Agriculture CSIC, Cordoba (Spain)); Snijders, C.H.A.; Nicholson, P.; Martin, A. (1996) **Reaction of tritordeum to Fusarium culmorum and Septoria nodorum.** *Euphytica (Netherlands) v. 88(3) p. 165-174.* 34 ref. English. (AGRIS 97-020751).

2119 Rubiales, D.; Ramirez, MC.; Martin, A. (1996) **RESISTANCE TO COMMON BUNT IN HOREDEUM CHILENSE X TRITICUM SPP AMPHIPLOIDS.** *Plant Breeding. 115(5):416-418.* English. [CSIC INST SUSTAINABLE AGR APDO 4084 E-14080 CORDOBA SPAIN].

The reaction of tritordeum and its Hordeum chilense and Triticum spp. parents to common bunt incited by Tilletia tritici were determined in field experiments. H. chilense accessions were very resistant, and durum wheals exhibited high to moderate levels of resistance. Conversely, bread wheats were highly susceptible. Resistance from H. chilense was expressed in the amphiploids, although the level of resistance was partially diluted at higher ploidy levels. Hexaploid tritordeums were immune to the disease: some infection was observed among the octoploids but at much lower levels than in their respective wheat parents. [References: 18].

2120 Sayoud, R. (1995) **Possible specialization of Mycosphaerella graminicola on durum wheats in Algeria.** *Proceedings of a Septoria Tritici Workshop; Mexico, D.F.; 20-24 Sep 1993. Gilchrist, L.; Ginkel, M. van; McNab, A.; Kema, G.H.J. (eds.). Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico) p. 51.* CIMMYT. English. (AGRIS 97-020773).

Septoria leaf blotch used to be a disease of bread wheats in Algeria. It was very rarely found on durums. Disease surveys carried out in the last five years (1989-1993) in all cereal growing regions of the country revealed the prevalence of Mycosphaerella graminicola often in adjacent durum and bread wheat fields. The disease develops on a durum cultivar and not on the known susceptible bread wheat cultivar. Specialization of the fungus on the durum species was hypothesized. Thus an experiment was conducted in the field inoculating a known durum-originated isolate onto isolated double rows of a susceptible durum (Waha) and a long-time known susceptible bread wheat (Anza). The plants were inoculated when the flag leaf was fully developed. The experiment was replicated three times. The disease developed on the durum with an average score of 98 and of 82 on the bread wheat (double digit scale). The same isolate was then inoculated onto a set of 25 durum and 20 bread wheats composing a national nursery. None of the bread wheats showed a score higher than 83, while the durums ranged from 85-99. It is concluded that the isolate is much more aggressive on the durums and very much less on bread wheats. It is assumed that it could be specialized on durums. More efficient studies are programmed for the coming year to check these assumptions and eventual adaptation. El tizon foliar causado por Septoria tritici es una enfermedad que se presentaba en Algeria generalmente en trigos harineros. Era muy raro encontrarlo en trigos duros. Los muestreos de campo llevados a cabo en los ultimos cinco anos (1989-1993) en la zona productora de cereales del pais revelo la prevalencia de Mycosphaerella graminicola en campos adyacentes de trigo duro y trigo harinero. La enfermedad se desarrolla sobre trigo duro y no sobre el trigo harinero aun cuando la variedad de trigo harinero sea susceptible. Por lo tanto, se hipotetizo una especializacion del hongo sobre la especie Triticum durum. De esta forma se llevo a cabo un experimento en el campo donde se inoculo un aislamiento de septoria proveniente de trigo duro en un surco doble con trigo duro de la variedad susceptible Waha y Anza, variedad de trigo harinero que se le conoce como susceptible desde hace mucho tiempo. Las plantas fueron inoculadas cuando la hoja bandera estaba totalmente desarrollada. El experimento se repitio tres veces. La enfermedad se desarrollo en el trigo duro con una evaluacion promedio de 98 y de 82 en el trigo harinero (escala de digitos dobles). El mismo aislamiento fue entonces inoculado en un grupo de variedades de un vivero nacional conformado por 25 trigos duros y 20 trigos harineros. Ninguna de las variedades de trigo harinero mostro una evaluacion mayor a 83.

2121 Scherm, H. (Iowa State University, Ames.); Yang, X.B. (1995) **Interannual variations in wheat rust development in China and the United States in relation to the El Nino/Southern Oscillation.** *Phytopathology (USA) v. 85(9) p. 970-976.* references. English. (AGRIS 97-005409).

The El Nino/Southern Oscillation (ENSO) is one of the most important and best-characterized mechanisms of global climatic variation. Because regional temperature and precipitation patterns are influenced by the ENSO and plant diseases are responsive to these factors, historical disease records may contain an ENSO-related signal. We used cross-spectral analysis to establish coherence and phase relationships between the Southern Oscillation Index (SOI), which is a measure of the ENSO, and long-term (> 40 years) data on wheat stripe rust in five regions of northern China and wheat stem rust in four climatic divisions of the midwestern United States. Monthly SOI values were averaged from March to June and October to March for analysis of the rust data from China and the United States, respectively, based on the times of the year at which weather patterns in these regions are influenced by the ENSO. The coherence relationships showed consistent and significant (0.01 less than or equal to P less than or equal to 0.10) cooscillations between the rust and SOI series at temporal scales characteristic of the ENSO. The five stripe rust series were coherent with the SOI series at periodicities of 2.0 to 3.0 and 8.0 to 10.0 years, and three of the four stem rust series were coherent with the SOI series at a periodicity of 6.8 to 8.2 years. The phase relationships showed that, in most cases, the rust and SOI series cooscillated out of phase, suggesting that the associations between them are indirect. In a

separate analysis of a shorter (18 years) stripe rust series from the Pacific Northwest of the United States, disease severity was significantly lower during El Nino years (warm phases of the ENSO) than during non-El Nino years (P less than or equal to 0.0222) or during La Nina years (cold phases of the ENSO) (P less than or equal to 0.0253). Although no cause-and-effect relationships could be deduced, this analysis identified methods and directions for future research.

2122 Schulze, D.G. (Purdue University, West Lafayette, IN.); McCay Buis, T.; Sutton, S.R.; Huber, D.M. (1995) **Manganese oxidation states in Gaeumannomyces-infested wheat rhizospheres probed by micro-XANES spectroscopy.** *Phytopathology (USA) v. 85(9) p. 990-994.* references. English. (AGRIS 97-005858).

The take-all disease, caused by Gaeumannomyces graminis var. tritici, is one of the world's most damaging root diseases of wheat. It has been hypothesized that the fungus reduces the host's defense mechanism prior to invasion by catalyzing the oxidation of soluble Mn2+ to insoluble Mn4+ on the rhizoplane and in the soil surrounding the root. For the first time, a direct test of this hypothesis has been accomplished using micro-X-ray absorption near edge structure (XANES) spectroscopy to obtain information about the spatial distribution of Mn oxidation states in and around live wheat roots growing in agar infected with C. graminis var. tritici. Mn in clear agar occurred only as Mn2+, whereas Mn around dark roots infected with G. graminis var. tritici was predominately present as Mn4+. The distribution of Mn oxidation states clearly showed the presence of Mn4+-containing precipitates in the interior of a root infected with G. graminis var. tritici. This was consistent with a map of Mn concentration that showed a relative accumulation of total Mn in the interior of the root as a result of G. graminis var. tritici-catalyzed biomineralization. Given the penetrating nature of X rays, the micro-XANES technique should be applicable to roots growing in soil, thus providing a technique to measure Mn oxidation states during pathogenesis under conditions that closely simulate the natural soil environment.

2123 Secher, B.J.M.; Murali, N.S.; Gadegaard, K.E. (1995) **Site specific control of plant diseases: a great potential.** Site Specific Farming. Aarhus (Denmark). 20-21 Mar 1995. *SP Report, 26: Proceedings of the seminar on site specific farming. Olesen, S.E. (ed.). Statens Planteavlsforsoeg, Foulum (Denmark) p. 165-169.* SP. 2 tables; 5 ref. English. (AGRIS 97-005838).

2124 Sharifnabi, B.; Nekooi, A. (1995) **Occurence and geographical distribution of Tilletia species attacking winter wheat in central parts of Iran.** Esfahan Univ. of Technology, Esfahan (Iran Islamic Republic). College of Agriculture. *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 40.* Persian. (AGRIS 97-005704).

2125 Sharma, RC.; Dubin, HJ. (1996) **EFFECT OF WHEAT CULTIVAR MIXTURES ON SPOT BLOTCH (BIPOLARIS SOROKINIANA) AND GRAIN YIELD.** *Field Crops Research. 48(2-3):95-101.* English. [INT RICE RES INST DIV EPP POB 933 MANILA 1099 PHILIPPINES].

Two experiments were conducted at Rampur, Nepal, in the 1990-1991, 1991-1992, and 1992-1993 growing seasons (November to April) to study the effect of mixtures of wheat (Triticum aestivum L.) cultivars on the severity of spot blotch caused by Bipolaris sorokiniana (Sacc. in Sorok.) Shoem. The first experiment involved using a mixture of equal weights of seed 'RR 21', 'UP 262', and 'Nepal 251', while the second experiment involved using equal weights of seed of 'RR 21', 'UP 262', and 'Nepal 297'. RR 21 is highly susceptible to spot blotch, whereas the other cultivars are somewhat less so. Data were recorded for area under the disease progress curve (AUDPC), grain yield, number of spices per unit area, kernels per spike, and hundred kernel weight. AUDPC in the six trials was significantly ($p < 0.05$) reduced by 9 to 57% in the mixtures compared to the average of the component cultivars. Mixtures increased yields 5.1 to 8.6% ($p < 0.05$) over the average of the component cultivars in five of the eight trials. There was no change in grain yield components in the mixtures versus those in component cultivars. The results suggest that mixtures of wheat cultivars with different levels of resistance to spot blotch offer an alternative strategy of managing spot blotch at the farm level. [References: 19].

2126 Sharma, S.; Ghimire, S.R. (Lumle Agricultural Research Centre, Pokhara, Kaski (Nepal)) (1996) **Plant disease monitoring and disease diagnosis, 1994/95.** *LARC Working Paper (Nepal); no. 96/3 19 p.* Lumle Agricultural Research Centre. 9 tables; 2 ref. English. (AGRIS 97-005747).

Plant disease monitoring by Lumle Agricultural Research Centre (LARC) through its network of off-station research sites (OSR), outreach research sites (OR) and also in farmers fields is conducted regularly to understand disease dynamics and their relative economic importance. A vertical transect from an altitude of 400m (Yampaphat, Bhotewodar and Taranagar) to 2200m (Lopre) was used to observe the disease intensity, severity and crop loss in different cropping patterns, different agroecological zones and different soil fertility conditions. The most damaging disease identifed in rice was neck blast (Pyricularia oryzae). Footrot of rice (Fusarium monilliforme) was also observed to be increasingly important in Baglung, Parbat and Myagdi district specially in the low (800) and mid hill (1300m). Brown spot of rice was found in the seedling crop stage in low fertility areas and leaf blast also occurred in locally infesting seedlings of Mansuli variety. Leaf rust of wheat was found severe in Taranagar of Gorkha and Rishing Patan of Tanahun district. Some recommended varieties like NL 297 and Nepal 251 were found severely attacked by leaf rust, however, this disease was very less in the promising variety NL 683 and Bl 1496. Severe infestation of the leaf curl virus disease occurred in tomato growing areas of Dhanubase, Yampaphant and Rishing Patan. A total of eighty nine diseased samples of cereal, vegetable and fruit crops were studied and identified at LARC Plant Protection Laboratory. There were eleven bacterial diseases and eight viral diseases. Among the most common bacterial disease was bacterial wilt of tomato (Pseudomonas solanacearum). The disease bacterial blight of soyabean (Pseudomonas syringae), freckle (Phllostictina musarum) and anthracnose (Gleosporium musarum) disease of banana and sheath rot (Pseudomonas sp.) disease of wheat were identified in the laboratory. Several virus samples from tomato were preserved for identification in cellulose membranae and were sent abroad for identification. The virus samples of tomato were identified to be Tomato Yellow Leaf Curl Virus (TYLCV virus) transmitted by white fly.

2127 Sharma, S.; Ghimire, S.R. (Lumle Agricultural Research Centre, Pokhara, Kaski (Nepal)) (1996) **Response of wheat genotypes against rust, blight and powdery mildew disease in low and middle hills, 1994/95.** *LARC Working Paper (Nepal); no. 96/27 33 p.* Lumle Agricultural Research Centre. 7 tables; 8 ref. English. (AGRIS 97-005793).

A total of three hundred and fifteen entries of different genotypes of wheat were screened to different diseases like yellow rust (Puccinia striiformis), leaf rust (Puccinia recondita), Powdery mildew (Erysiphe graminis triticis) and leaf spot/leaf blight (Helminthosporium sativum and Helminthosporium tritici repentis). The screening was done at Lumle Agricultural Research Centre (1675m) in 1995 to identify resistant lines/varieties as a donor for breeding programme as well as to evaluate promising/pipe line and recommended varieties for promotion, recommendation, continuation or drop down for cultivation in farmers field. The fertilizer application was 120:60:30 N:P205:K20 per hectare. For rust disease scoring was done based on modifed cobbs scale while for foliar disease double digit system was used. From disease as well as impressive agronomic character nineteen varieties were selected. The varieties NL645 and NL665, were promising due to less blight as well as due to rust resistance. A total of one hundred and fourty four different wheat genotypes of Thinopyrum curvifolium, Brazilian, Chinese derivatives as well as promising and recommended varieties were screened for helminthosporium leaf blight disease. The study was done to identify tolerant or resistant genotypes at hot spots (Rising Patan, 475). The design was rod row of 1m length with three rows per entry and the nursery was surrounded with susceptible boarder row. The disease scoring was done on flag leaf on the basis of percentage of disease coverage on it and on the whole plant based on double digit system. Several lines with curvifolium derivaties were identified for less blight incidence. The varieties WPH170, REZAO/GLEN/3ALDS, CIGMB7-113-2Y-1M-3PR-3M-2PR-010M were selected for disease and agronomic point of view. The promising variety NL645 and 665 is also having low blight incidence.

2128 Shkalikov, V.A.; Shekhovtsova, O.N. (1995) **[Efficiency of complex treatment of spring wheat seed with trichodermin and belgy preparation against root rots]. Ehffektivnost' kompleksnoj obrabotki semyan yarovoj pshenitsy trikhoderminom i preparatom belgi protiv komevykh gnilej.** *Izvestiya Timiryazevskoj sel'skokhozyajstvennoj akademii (Russian Federation) (no.1) p. 110-115.* 19 ref. Russian. (AGRIS 97-005853).

It has been found in small-plot experiments with spring wheat variety Moskovskaja 35 that presowing seed treatment with ecologically safe preparations of trichodermin with belgy (film-producer of protein nature) protects the stands from root rots during vegetation improves the structure of plant production and reliably increases total yield.

2129 Siefert, F.; Thalmair, M.; Langebartels, C.; Sandermann, H.; Grossmann, K. (1996) **EPOXICONAZOLE-INDUCED STIMULATION OF THE ANTIFUNGAL HYDROLASES CHITINASE AND BETA-1, 3-GLUCANASE IN WHEAT.** *Plant Growth Regulation. 20(3):279-286.* English. [BASF AG AGR RES STN D-67114 LIMBURGERHOF GERMANY].

Young plants of wheat (Triticum aestivum L. cv. Star), which were treated hydroponically with the triazole fungicide epoxiconazole (BAS 480 F) over a period of 8 days, showed a dose-dependent stimulation of the enzyme activities of the two antifungal hydrolases chitinase and beta-1, 3-glucanase in the shoot tissue. In the root tissue, no significant rise in the enzyme activities was found. As shown by immunoblot analysis and enzyme-linked immunosorbent assay (ELISA) using antisera against tobacco acidic and basic chitinases and beta-1, 3-glucanases, the observed increase in the activities coincided with an accumulation of enzyme proteins. This possibly indicates the induction of a de novo synthesis of chitinases and beta-1, 3-glucanases by epoxiconazole. To our knowledge, this effect of a synthetic fungicide on antifungal hydrolases in an intact plant is demonstrated for the first time. [References: 35].

2130 Singh, P.J.; Aujla, A.A. (Punjab Agricultural University, Gurdaspur (India). Regional Research Station) (1994) **Effect of lodging on the development of head scab of wheat.** *Indian Phytopathology (India) v. 47(3) p. 256-257.* 1 table, 2 ref. English. (AGRIS 97-020764).

2131 Soleimani, M.J.; Deadman, M.L.; Clements, R.O.; Kendall, D.A. (Department of Agriculture, University of Reading, PO Box 236, Earley Gate, Reading, RG6 2AT (United Kingdom)) (1995) **Cereal-clover bicropping, could it affect our fungicide dependency?** *Integrated crop protection: towards sustainability? Proceedings of a Symposium, Edinburgh, Scotland, 11-14 September 1995 [chaired by McKinlay, R.G.; Atkinson, D.]. p. 195-202.* British Crop Protection Council. 11 ref. English. (AGRIS 97-005551).

2132 Stephenson, MMP.; Kushalappa, AC.; Raghavan, GSV. (1996) **EFFECT OF SELECTED COMBINATIONS OF MICROWAVE TREATMENT FACTORS ON INACTIVATION OF USTILAGO NUDA FROM BARLEY SEED.** *Seed Science & Technology. 24(3):557-570.* English. [MCGILL UNIV DEPT PLANT SCI MACDONALD CAMPUS ST ANNE DE BELLEVUE PQ H9X 3V9 CANADA].

The effects of combinations of absorbed microwave power (AMP) and pulsing (PUL) on barley seeds highly infected (68.9%) with the loose smut pathogen Ustilago nuda (Jens.) Rostr. were investigated. On the basis of a previous study the moisture content of the seeds was fixed at 21% on a dry weight basis and the microwave treatment duration at 75 min. Barley seed germination and seedling vigour, the latter measured as the mean plumule length (MPL), were not significantly affected by most of the microwave treatments compared to a non-treated control, except at high levels of AMP and PUL. The percentage of seed germination was highly correlated with the MPL (r = 0.86). A multiple regression model explained 82% of the variation in the percentage seed germination and 74% of the MLP as functions of AMP and PUL. The effectiveness of microwave treatments to inactivate U. nuda was evaluated based on seedling infection (SI) at the second true leaf stage and plant infection or smutted plants al maturity (PI). There was a poor correlation between %SI and %PI (r = 0.46). Although most of the microwave treatments had a significantly lower %SI than the untreated control, there was no significant effect of AMP or PUL within the range of levels studied. In contrast, the %PI data showed that there was a significant interaction of AMP*PUL on %PI. The SI and PI were reduced to 26.7 and 11.6%, respectively, for the best microwave treatments, as compared to 50.1 and 45.3%, for the untreated control. Therefore, up to 74.3% reduction of the effective inoculum was achieved by using 0.5 W/g AMP and 50/10 s of PUL. At 0.5 W/g AMP, when PUL was reduced to 40/20 s, the effective inoculum was reduced by more than 56.0% without significantly affecting seed germination and vigour. [References: 24].

2133 Stojanovic, J.; Stojanovic, S. (Institut za istrazivanja u poljoprivredi "Srbija", Kragujevac (Yugoslavia). Centar za strna zita) (1994) **[The use of area under disease progress curve (AUDPC) for wheat mildew resistance assessment at various nutrition variants]. Koriscenje pokazatelja AUDPC za ocenu otpornosti sorata psenice prema prouzrokovacu pepelnice pri razlicitoj ishrani.** Treci jugoslovenski kongres o zastiti bilja. Vrnjacka Banja (Yugoslavia). 3-7 Oct 1994. *Plant protection today and tomorrow: [selected papers from the third Yugoslav congress about plant protection, Vrnjacka Banja (Yugoslavia), October 3-7, 1994]. Sestovic, M.; Neskovic, N.K.; Peric, I. (eds.). Zastita bilja danas i sutra: [odabrani radovi sa Treceg jugoslovenskog kongresa o zastiti bilja, Vrnjacka Banja (Jugoslavija), 3-7. oktobra 1994] p. 79-85.* Drustvo za zastitu bilja Srbije. 3 tables; 11 ref. Serbian. (AGRIS 97-005843).

Powdery mildew severity on six wheat cultivars differing in susceptibility, was determined using a pot experiment. Five variants of nutrition were used. In stage 5 the plants from three pots of each cultivar and variant of nutrition were inoculated with a mixture of prevalent genotypes of parasite, and three pots were treated with Bayfidan EC 250. The results show that the assessment in the flowering stage was not reliable enough for expressing the exact differences in cultivar susceptibility and predicting yield loss. There was a significant positive correlation excessive between AUDPC and yield loss. Also, nitrogen amounts and insufficient potassium amounts provoked higher AUDPC values. Insufficient nitrogen and phosphorus amounts lower the values of AUDPC compared with the optimal nutrition variant. Lower AUDPC values were the result of less favourable conditions for disease development in 1992 compared with 1991.

2134 Stojanovic, S. (Institut za istrazivanja u poljoprivredi "Srbija", Kragujevac (Yugoslavia). Centar za strna zita); Stojanovic, J.; Jevtic, R.; Jerkovic, Z.; Milovanovic, M.; Gudzic, S. (1995) **[Resistance of malting barley cultivars to rusts and powdery mildew]. Otpornost sorata pivarskog jecma prema rdjama i pepelnici.** *Zastita bilja (Yugoslavia) v. 46(4) p. 267-271.* 2 tables; 12 ref. Serbian. (AGRIS 97-005356).

In this paper resistance of 17 winter and 27 spring malting barley cultivars, selected in Yugoslavia, to powdery mildew, leaf rust and stem rust is presented. A large number of tested cultivars has been susceptible. But, some cultivars were very resistant. Very high degree of resistance to powdery mildew showed the winter cultivars NS 183, NS 323, NS 311 and the spring ones Kraguj, Jelen, NS 300 amd NS 324. Winter cultivars Jagodinac, NS 293 and NS 295, as well as spring cultivars Lazar, Viktor, Milan and NS 310 were resistant to leaf rust. The cultivars Biser, NS 293 and NS 295 were resistant to stem rust.

2135 Sukhacheva, E. (Russian Academy of Sciences, Moscow (Russian Federation). Shemyakin and Ovchinnikov Inst. of Bioorganic Chemistry); Novikov, V.; Plaksin, D.; Pavlova, I.; Ambrosova, S. (1996) **Highly sensitive immunoassays for detection of barley stripe mosaic virus and beet necrotic yellow vein virus.** *Journal of Virological Methods (Netherlands) v. 56(2) p. 199-207.* 22 ref. English. (AGRIS 97-020460).

2136 Tamas, L.; Fric, F. (Slovenska Akademia Vied, Bratislava (Slovakia). Botanicky Ustav) (1995) **Activity of hydrolytic enzymes in barley leaves infected with powdery mildew.** *Biologia (Slovakia). Sect. Botany v. 50(1) p. 85-92.* 4 ill., 24 ref. English. (AGRIS 97-005355).

The behavior of hydrolytic enzymes (acid phosphatase, non-specific esterase, exoprotease, beta-glucosidase) were investigated in the epidermal and in whole leaf extracts as well as in intercellular spaces of barley plants infected with powdery mildew. Compatible and incompatible barley-powdery mildew genotype combinations were used. The course of the hydrolase activity changes post inoculation of barley leaves was significantly influenced by the degree of compatibility or incompatibility. Generally in epidermal cells that were directly attacked by the fungus, the hydrolase activity was higher in the compatible combination than in the incompatible one. Epidermal exoprotease activity showed the highest differences between compatibility and incompatibility and a positive correlation between enzyme activity and host-parasite genotype compatibility. Results indicate that the investigated hydrolases do not play a key role in host resistance.

2137 Tamas, L.; Fric, F. (Slovenska Akademia Vied, Bratislava (Slovakia). Botanicky Ustav) (1995) **Pathogenesis-related proteins in barley induced by powdery mildew infection.** *Biologia (Slovakia). Sect. Botany v. 50(1) p. 79-83.* 4 ill., 24 ref. English. (AGRIS 97-005354).

Proteins in intercellular washing fluid (IWF) from noninoculated and powdery mildew inoculated barley leaves were separated by polyacrylamid gel electrophoresis. Induction of pathogenesis-related (PR) proteins was ascertained as early as in the preparasitic stage of host-parasite interaction, i.e. up to 24 hours after inoculation. One multiple form of IWF-peroxidase was especially strongly activated after inoculation. The quantity of PR proteins increased up to 72 hours. The accumulation of PR proteins at host-parasite incompatibility was more expressive than at compatibility.

2138 Tarabrin, G.A. (1995) **[Energetic efficiency of wheat photosynthesis under helminthosporiosis infection]. Ehnergeticheskaya ehffektivnost' fotosinteza pshenitsy pri porazhenii gel'mintosporiozom.** *Doklady RASKhN (Russian Federation) (no.5) p. 15-17.* 7 ref. Russian. (AGRIS 97-005841).

2139 Terekhov, V.I.; Sokolov, M.S.; Bessmel'tsev, V.I.; Fissyura, N.I.; Esaulenko, E.A. (1995) **[Contamination of wheat grain with desoxynivalenol under application of agrochemicals]. Kontaminatsiya zerna pshenitsy dezoksinivalenolom pri ispol'zovanii agrokhimikatov.** *Doklady RASKhN (Russian Federation) (no.6) p. 13-15.* 5 ref. Russian. (AGRIS 97-005851).

2140 Torabi, M.; Afshari, F. (1995) **Investigation of seed treatment with systematic fungicides for control of yellow rust (Puccinia striiformis f. sp. tritici).** Karadj Univ. (Iran Islamic Republic). Seed and Plant Improvement Institute. *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 33.* Persian. (AGRIS 97-005781).

Wheat yellow rust is one of the most important diseases with substantial crop losses in cool and humid regions. An alternative and less expensive chemotherapy would be used as systematic fungicides were applied as a seed treatment. Studies were conducted in the greenhouse and field to determine potential of systemic seed treatments for control of yellow rust of wheat and to determine the effects of the treatments of plant growth. The following fungicides applied as slurries to seed of Bolani wheat (Susceptable): Tebuconazole (Raxil 2 W. P), Triadimefon (Bayleton 25 W.P), Triadimenol (Baytan 7.5 W.P), Diniconazole (Sumi- 81 W. P), Propiconazole (Tilt 25 EC), Flutriafole + Thiabendazole (Vinsit 5 W.P). Fungicides were applied at 0.25, 0.5, 1, 1.5, 2, 2.5 g.a.i./Kg of seed, respectively. The treated seeds were sown in two rows with 2m longh. Eight plants of each plot were transplanted in pots and then inoculated with urediospores high virulence race (134 E150) in seedling and Boot stages.

2141 Torabi, M.; Nazari, N.; Afshari, F. (1995) **Identification of physiologic races of wheat yellow rust (Puccinia striiformis f.s. tritici) during 1993-94 in Iran.** Karadj Univ. (Iran Islamic Republic). Seed and Plant Improvement Institute. *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 34.* Persian. (AGRIS 97-005782).

In the early spring of 1993 a severe epidemic of yellow rust causing substantial crop losses was developed in many areas of Iran. For identification of physiological races and virulence of yellow rust 53 samples from 24 different areas were collected. For multiplication and purification of spores, the first seedling leaf of susceptible cultivar (Bolani) was inoculated with each collected sample. Inoculated seedlings were kept inside a small- crystal covered pot separately. In the greenhouse, seedlings of differential varieties along with supplementary set with their first leaf expanded were inoculated but uredospores of P. striiformis dispersed in talc. After incubation in humid chambers at 10C and R. H. =100 with compelete darkness condition for 48h they were placed in green house under a day/night of 15/10C for 18h/6h respectively.

2142 Torabi, M.; Nazeri, K.; Afshari, F. (1995) **Evaluation of resistance in some advanced lines and commercial cultivars of wheat to three races of yellow rust.** Karadj Univ. (Iran Islamic Republic). Seed and Plant Improvement Institute. *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 35.* Persian. (AGRIS 97-005297).

To evaluation the resistance in some bread wheat advanced lines and improved varieties, seeds of twelve advanced lines, four improved MV (Marton Vasar) and three commercial varieties were planted in 10Cm diameter pots with four replications in the greenhouse. Seedlings were inoculated with freshly harvested uredospores of three different races (134E150, 4EO and OEO) of Puccinia striiformis f. sp. tritici and kept at 10C and 90 RH in the darkness for 24hr. When the first leaves were fully expanded, pots of each replication were placed in a cage covered with a clear polyethylene cover, and kept in a greenhouse at 15C. Infection type (1T) of each line or variety was recorded 15 days after inoculation using McNeal et al. (1971) scale. All wheat cultivars were also planted in double rows of one meter with rows spaced at 30Cm in fields located at Moghan, Mashhad and Karadj, where the aformentioned races are prevalent. Host response (IT) and disease severity were recorded on each entry using the Modified Cobb Scale at the maximum disease development in the adult plant stage.

2143 Valuevich, A.A.; Bulojchyk, A.A. (Academy of Sciencies of Belarus, Minsk (Belarus). Institute of Genetics and Cytology) (1996) **[Study of the role of host-plant genome and plasmon in common wheat resistance to fungal diseases]. Vyvuchehnne roli genoma i plasmonu rasliny-gaspadara va ustojlivastsi myakkaj pshanitsy da grybnykh khvarobaw.** *Vestsi Akadehmii Navuk Belarusi. Seryya biyalagichnykh navuk (Belarus) (no.1) p. 29-33.* 23 ref. Byelo Russian. (AGRIS 97-005846).

Investigations on genetics of disease resistance started at the Institute 15 years ago show a significant influence of nuclear and cytoplasmic genetic systems on wheat resistance to fungal diseases: brown rust, powdery mildew, loose smut, bunt and septoriosis.

2144 Volz, P.A.; Huang, W. (Mycology Laboratory, Department of Biology, Eastern Michigan University, Ypsilanti, MI 48197 2211 (USA)) (1996) **Remote sensing of wheat and rice crops in China.** *Microbios (United Kingdom) v. 86(346) p. 7-18.* 43 ref. English. (AGRIS 97-020625).

2145 Wale, S.J.; Murray, F. (Crop Biology Department, SAC Aberdeen, 581 King Street, Aberdeen AB9 1UD (United Kingdom)) (1995) **Towards an integrated disease risk assessment system for winter barley.** *Integrated crop protection: towards sustainability? Proceedings of a Symposium, Edinburgh, Scotland, 11-14 September 1995 [chaired by McKinlay, R.G.; Atkinson, D.] p. 447-454.* British Crop Protection Council. 12 ref. English. (AGRIS 97-005554).

2146 Welham, S.J.; McCartney, H.A.; Fitt, B.D.L. (IACR Rothamsted, Harpenden, Herts AL5 2JQ (United Kingdom)) (1995) **A case study in measurement and analysis of disease gradients.** *Aspects of Applied Biology (United Kingdom) (no.43) p. 77-85.* 17 ref. Field experiment techniques, 11-13 December 1995, Churchill College, Cambridge (United Kingdom). English. (AGRIS 97-020560).

2147 Winter, W.; Krebs, H.; Baenziger, I. (Eidg. Forschungsanstalt fuer Agraroekologie und Landbau (FAL), Reckenholz (Switzerland)) (1996) **[Snow mould of cereals (Gerlachia nivalis): testing resistance to fungicides]. Schneeschimmelpilz: Fungizid-Resistenzpruefung.** *Agrarforschung (Switzerland) v. 3(10) p. 476-478.* 2 graphs, 1 photo, 4 ref. German. (AGRIS 97-005335).

In 1981 a study on the resistance of Gerlachia nivalis to fungicides was started in Switzerland. The percentage of strains resistant to benzimidazols (MBC) remained stable over the past years. The active ingredients used in the triazol, imidazol, phenylpyrrol, and guanidine groups provide full control of the benzimidazol resistant and benzimidazol sensitive G. nivalis strains.

2148 Yahyaoui, AH.; Reinhold, M.; Scharen, AL. (1997) **VIRULENCE SPECTRUM IN POPULATIONS OF THE BARLEY POWDERY MILDEW PATHOGEN, ERYSIPHE GRAMINIS F SP HORDEI IN TUNISIA AND MOROCCO IN 1992.** *Plant Pathology. 46(1):139-146.* English. [ESA KEF TUNIS 7119 TUNISIA].

The virulence of 57 single colonies of Erysiphe graminis f. sp. hordei from Tunisia and Morocco was investigated using the Pallas near-isogenic differential set. Virulence patterns in general were similar in both countries. Va8, Va10+Du2, V41/145, VLa and VRu2 appear to be common in the region. The resistance alleles Mla7 and Mla9, in combination with other resistances, were highly effective against the isolates tested. No virulence against mlo and Mla9 + k was detected in Tunisia. No virulence on Mla7 and Mla9 was detected in Morocco. The frequency of virulence against several resistances was significantly higher in Morocco than in Tunisia. On the other hand, virulence against other resistances was higher in Tunisia than in Morocco. Three isolates from Morocco infected mlo to

an extent greater than previously described. All pathotypes were unique. An attempt is made to interpret the results by comparison with pathotype evolution in Europe. [References: 20].

2149 Zafari, D. (1995) **Barley stripe disease in Hamadan and Lorestan provinces.** Bu-Ali Sina Univ., Hamadan (Iran Islamic Republic). College of Agriculture. *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 41.* Persian. (AGRIS 97-005705).

H50 MISCELLANEOUS PLANT DISORDERS

2150 **[Frost damage in wheat]. Ken rypskade [op koring] so uit** (1996) Landbouweekblad, Cape Town (South Africa). *Landbouweekblad (South Africa) (no.949) p. 30-32.* Afrikaans. (AGRIS 97-020885).

2151 Andrews, CJ. (1997) **A COMPARISON OF GLYCOLYTIC ACTIVITY IN WINTER WHEAT AND TWO FORAGE GRASSES IN RELATION TO THEIR TOLERANCE TO ICE ENCASEMENT.** *Annals of Botany. 79(Suppl A):87-91.* English. [AGR CANADA EASTERN CEREAL & OILSEEDS RES CTR OTTAWA ON K1A 0C6 CANADA].

Melting and refreezing within snow layers can cause the build-up of ice at soil surfaces, which can severely damage overwintering crop plants. The relatively limited tolerance of cold acclimated winter wheat to ice encasement is increased by a prior exposure to low temperature flooding. This is a hypoxic acclimation. In wheat, it is accompanied by a three-fold increase in the activity of pyruvate decarboxylase (PDC) and a two-fold increase in the activity of alcohol dehydrogenase (ADH). Activity of PDC is one tenth that of ADH. The glycolytic kinases [ATP-phosphofructokinase (PFK), PPi-phosphofructophosphotransferase (PFP), and pyruvate kinase (PK)] show little change during the acclimation process. The forage grasses timothy (Phleum pratense) and berings hairgrass (Deschampsia berengensis) when cold acclimated, are more tolerant to ice encasement than winter wheat, and show a relatively small hypoxic acclimation response. During ice encasement, these forage grasses accumulate less ethanol, CO2 and lactic acid than wheat. In further contrast to wheat, they produce lower levels of these metabolites in ice following acclimative flooding than they do in the absence of flooding. Activity of DC and ADH in crowns of the two forage grasses is also less than in wheat. These observations indicate that high ice encasement tolerance of the grasses may be associated with slow fermentation rates and low accumulation of toxic metabolites. (C) 1997 Annals of Botany Company [References: 23].

2152 Blum, A. (1996) **CROP RESPONSES TO DROUGHT AND THE INTERPRETATION OF ADAPTATION.** *Plant Growth Regulation. 20(2):135-148.* English. [AGR RES ORG VOLCANI CTR INST FIELD CROPS POB 6 IL-50250 BET DAGAN ISRAEL].

Drought is a multidimensional stress affecting plants at various levels of their organization. The effect of and plant response to drought at the whole plant and crop level is most complex because it reflects the integration of stress effects and responses at all underlying levels of organization over space and time. This review discusses some of the major aspects of crop response to drought stress which are relevant for plant breeding. Emphasis is given to whole plant aspects which are too often disregarded when conclusions are drawn from molecular studies towards the genetic improvement of crop drought resistance. Topics discussed are seedling emergence and establishment, plant phenology, leaf area, water deficit and assimilation, osmotic adjustment, the root and the formation of yield. The discussion is concluded with the interpretation of crop adaptation to drought conditions in its agronomic sense. Conclusions are drawn regarding plant breeding for drought-prone conditions. [References: 97].

2153 Bouthier, A. (Institut Technique des Cereales et des Fourrages, Paris (France)) (1996) **[Sulphur deficit and soft wheat]. Soufre et ble tendre. Apprecier le risque de carence avant tout apport.** *Perspectives Agricoles (France) (no 210) p. 68-71.* 5 tableaux. French. (AGRIS 97-005899).

2154 Hertstein, U.; Fangmeier, A.; Jager, HJ. (1996) **ESPACE-WHEAT (EUROPEAN STRESS PHYSIOLOGY AND CLIMATE EXPERIMENT-PROJECT 1 - WHEAT) - OBJECTIVES, GENERAL APPROACH, AND FIRST RESULTS.** *Angewandte Botanik. 70(5-6):172-180.* English. [UNIV GIESSEN INST PFLANZENOKOL HEINRICH BUFF RING 38 D-35392 GIESSEN GERMANY].

The "European Stress Physiology and Climate Experiment - project 1: wheat" (acronym: ESPACE-wheat) is funded by the EU since 1994. In the present paper the projects goals, the general methodological approach, and a summary of the experimental work performed in 1994 and 1995 are described. Main objectives of the project are 1) to investigate experimentally the sensitivity of wheat growth, development and productivity to changes in CO2 concentration, climatic variables and other physiological stresses, 2) to use experimental data for extension, improvement and validation of process-based wheat growth simulation models, and 3) to use models for assessments of the influences on crops of climatic change, increasing CO2 concentration and additional physiological stresses in Europe. Most experimental investigations are being performed by means of open-top chambers (OTC's) according to a common standard protocol to meet specific data requirements for model construction and validation. ESPACE-wheat OTC-experiments in 1994 and 1995 are summarized and the principal methods of data evaluation are presented by analyzing responses of grain yield and aboveground biomass of spring wheat, cv. Minaret, to CO2 enrichment and other factors varied in experiments at different sites. The mean observed CO2-doubling responses was about 1.4, i.e. grain yield and biomass production were increased by about 40% compared to growth in ambient CO2 concentration. However, there was a large variability of responses between sites and years. Results are discussed with respect to modeling attempts. [References: 24].

2155 Huang, C. (Adelaide Univ., Glen Osmond, S.A. (Australia). Dept. of Plant Science); Webb, M.J.; Graham, R.D. (1996) **Pot size affects expression of Mn efficiency in barley.** *Plant and Soil (Netherlands) v. 178(2) p. 205-208.* 10 ref. English. (AGRIS 97-020861).

2156 Koo, B.C.; Youn, K.B. (Rural Development Administration, Suwon (Korea Republic). National Crop Experiment Station); Seok, K.H. (Seoul Seed Company Limited, Janghowon (Korea Republic)); Nam, Y.I. (Rural Development Administration, Suwon (Korea Republic). National Horticultural Experiment Station) (1996) **Winter survival and the changes of freezing resistance of barley treated with the different growth stages and sowing depths.** *RDA Journal of Agricultural Science (Korea Republic) v. 38(2) p. 99-105.* 5 illus.; 3 tables; 16 ref. Korean. (AGRIS 97-020863).

2157 Mckee, IF.; Bullimore, JF.; Long, SP. (1997) **WILL ELEVATED CO2 CONCENTRATIONS PROTECT THE YIELD OF WHEAT FROM O-3 DAMAGE.** *Plant Cell & Environment. 20(1):77-84.* English. [UNIV ESSEX DEPT CHEM & BIOL SCI JOHN TABOR LABS WIVENHOE PK COLCHESTER CO4 3SQ ESSEX ENGLAND].

This study investigated the interacting effects of carbon dioxide and ozone concentrations on the growth and yield of spring wheat (Triticum aestivum L, cv, Wembley), Plants were exposed from time of sowing to harvest to reciprocal combinations of two carbon dioxide and two ozone treatments: [CO2] at 350 or 700 mu mol mol(-1), and [O-3] at <5 or 60 nmol mol(-1), Records of leaf emergence, leaf duration and tillering were taken throughout leaf development, At harvest, biomass, yield and partitioning were analysed. Our data showed that elevated [CO2] fully protected against the detrimental effect of elevated [O-3] on biomass, but not yield. [References: 35].

2158 Migliore, L.; Brambilla, G.; Casoria, P.; Civitareale, C.; Cozzolino, S.; Gaudio, L. (1996) **EFFECT OF SULPHADIMETHOXINE CONTAMINATION ON BARLEY (HORDEUM DISTICHUM L, POACEAE, LILIOPSIDA).** *Agriculture Ecosystems & Environment. 60(2-3):121-128.* English. [UNIV ROMA TOR VERGATA DIPARTIMENTO BIOL VIA RIC SCI SNC I-00133 ROME ITALY].

Animal wastes from intensive farming are generally collected for field fertilisation, They may contain drugs that can become soil pollutants, To evaluate the possible effects of such contamination in terrestrial systems, sulphadimethoxine has been subjected to laboratory tests (in vitro, synthetic medium, and soil) using seeds of barley (Hordeum distichum L.). The drug suppressed normal post-germinative development and growth of roots and leaves in both test conditions; this effect was dependent on the bioaccumulation rate, which was higher on synthetic medium than in soil. Bioaccumulation was higher in roots than foliage and this was markedly evident in soil and, in particular, in soils with a low humus content. The

environmental risk of sludge application on soils and the possible contamination of food chains are discussed. [References: 26].

2159 Penuelas, J.; Isla, R.; Filella, I.; Araus, JL. (1997) **VISIBLE AND NEAR-INFRARED REFLECTANCE ASSESSMENT OF SALINITY EFFECTS ON BARLEY.** *Crop Science. 37(1):198-202.* English. [UNIV AUTONOMA BARCELONA FAC CIENCIES CREAF E-08193 BELLATERRA BARCELONA SPAIN].

We studied the effects of a soil salinity gradient (0.8-1.9 dS m(-1) ECa) on spectral reflectance of 10 genotypes of barley (Hordeum vulgare L.) to determine the efficacy of reflectance as a tool for assessing the responses of barley to salinity. NDVI [normalized difference vegetation index, (R900 mn - R680 nn)/(R900 mn + R680 nm)] and WI (water index, R970 nm/ R900 nm) were the reflectance indices used. In response to increasing salinity, near infrared reflectance decreased and visible reflectance increased, thereby lowering NDVI from 0.85 to 0.4, in parallel with decreases in biomass (from 2500-500 g m(-2)) and yield (from 900-50 g m(-2)). NDVI was, thus, a good indicator of biomass and yield. WI increased from 0.73 to 0.96, delta T (canopy temperature minus air temperature) increased from -2 to 7 degrees C, and C-13 discrimination (Delta(13)C) in mature kernels decreased from 19 to 14.5 with increasing salinity levels. WI was, thus, related to crop water status response to salinity. NDVI and WI were, therefore, useful for measuring agronomic responses of barley to salinity. [References: 35].

2160 Shakirova, F.M. (Russian Academy of Sciences, Ufa (Russian federation). Dept. of Biochemistry and Cytochemistry); Bezrukova, M.V.; Shayakhmetov, I.F. (1996) **Effect of temperature shock on the dynamics of abscisic acid and wheat germ agglutinin accumulation in wheat cell culture.** *Plant Growth Regulation (Netherlands) v. 19(1) p. 85-87.* 10 ref. English. (AGRIS 97-020889).

2161 Singh, S.; Kirkwood, RC.; Marshall, G. (1996) **EVALUATION OF DIFFERENT METHODS OF SURFACE RESIDUE REMOVAL ON THE RECOVERY OF C-14 ISOPROTURON FROM WHEAT AND BIOTYPES OF PHALARIS MINOR.** *Annals of Applied Biology. 128(Suppl S):90-91.* English. [UNIV STRATHCLYDE DEPT BIOSCI & BIOTECHNOL GLASGOW G4 0NR LANARK SCOTLAND].

2162 Slafer, GA.; Rawson, HM. (1997) **CO2 EFFECTS ON PHASIC DEVELOPMENT, LEAF NUMBER AND RATE OF LEAF APPEARANCE IN WHEAT.** *Annals of Botany. 79(1):75-81.* English. [UNIV BUENOS AIRES FAC AGRON DEPT PROD VEGETAL AV SAN MARTIN 4453 RA-1417 BUENOS AIRES DF ARGENTINA].

It has been predicted that the concentration of CO2 in the air could double during the 21st century. Though it is recognized that CO2-doubling could increase yield through its effects on plant photosynthesis and stomatal behaviour, it is unclear whether CO2-doubling will change phasic development in wheat. A phytotron study was conducted with two contrasting cultivars of wheat, Condor (spring) and Cappelle Desprez (winter), to determine whether development is affected by a season-long exposure to 360 and 720 ppmv CO2. Plants were vernalized for 50 d (8/4 degrees C, s h photoperiod) before their exposure to the CO2 treatments. There were significant differences between cultivars in the duration of different phenophases as well as in the final number of leaves. However, CO2 concentration had no effect in either cultivar on the duration of the early developmental phase to terminal spikelet initiation, or on the final number of leaves, though CO2-doubling did slightly increase the later phase from terminal spikelet initiation to heading in Cappelle Desprez. Condor and Cappelle Desprez also differed markedly in the dynamics of leaf appearance. While the former had a constant rate of leaf appearance throughout development, the latter had a fast rate initially (between leaves 1 and 7), similar to that of Condor, which was followed by a slower rate after the appearance of leaf 7. Overall, CO2-doubling did not significantly affect the rates of leaf appearance nor the shape of the relationship. Phyllochron for the first seven leaves was the same for both CO2 concentrations. However, the change in phyllochron associated with CO2-doubling for leaves 7-12 in Cappelle Desprez, although quite small (4%), accounts for part of the slightly increased duration of the phase from terminal spikelet initiation to heading under high CO2 concentration in that cultivar. We conclude that CO2 concentration does not influence development in wheat to a degree relevant to agronomy. (C) 1997 Annals of Botany Company [References: 36].

2163 Stone, PJ.; Nicolas, ME. (1996) **EFFECT OF TIMING OF HEAT STRESS DURING GRAIN FILLING ON TWO WHEAT VARIETIES DIFFERING IN HEAT TOLERANCE .2. FRACTIONAL PROTEIN ACCUMULATION.** *Australian Journal of Plant Physiology. 23(6):739-749.* English. [UNIV MELBOURNE JOINT CTR CROP IMPROVEMENT DEPT AGR & RESOURCE MANAGEMENT PARKVILLE VIC 3052 AUSTRALIA].

Short periods of very high temperature (> 35 degrees C) are common during the grain filling period of wheat, and can significantly alter mature protein composition and consequently grain quality. This study was designed to determine the stage of grain growth at which fractional protein accumulation is most sensitive to a short heat stress, and to examine whether varietal differences in heat tolerance are expressed consistently throughout the grain filling period. Two varieties of wheat differing in heat tolerance (cvv. Egret and Oxley, tolerant and sensitive, respectively) were exposed to a short (5 day) period of very high temperature (40 degrees C max. for 6 h each day) at 5-day intervals throughout grain filling, from 15 to 50 days after anthesis. Grain samples were taken throughout grain growth and analysed for protein content and composition (albumin/globulin, monomer, SDS-soluble polymer and SDS-insoluble polymer) using size-exclusion high-performance liquid chromatography. The timing of heat stress exerted a significant influence on the accumulation of total wheat protein and its fractions, and protein fractions differed in their responses to the timing of heat stress. Furthermore, wheat genotype influenced both the sensitivity of fractional protein accumulation to heat stress and the stage during grain filling at which maximum sensitivity to heat stress occurred. [References: 37].

2164 Van Heerden, P.D.R.; De Villiers, O.T. (Stellenbosch Univ. (South Africa). Dept. of Botany) (1996) **Evaluation of the relative water content and the reduction of 2, 3, 5-triphenyltetrazoliumchloride as indicators of drought tolerance in spring wheat cultivars.** *South African Journal of Plant and Soil (South Africa) v. 13(4) p. 131-135.* 3 fig., 15 ref. English. (AGRIS 97-020888).

2165 Vasilev, A.; Kerin, V.; Jordanov, I. (1995) **[Photosynthetic characteristic of barley plants (H.vulgare L., H. distichum L.) grown in medium containing cadmium]. Fotosinteticheskaya kharakteristika rastenij yachmenya (H. vulgare L., H. distichum L.), vyrashchennykh v srede s kadmiem.** *Izvestiya Timiryazevskoj sel'skokhozyajstvennoj akademii (Russian Federation) (no.1) p. 207-213.* 20 ref. Russian. (AGRIS 97-005923).

The effect of various Cd levels (3 and 6 mg l sup(-1)) on the state and photosynthetic rate of two barley cultivars -Obzor (H. distichum L.) and Hemus (H.vulgare L.) was studied. It was found that Cd inhibited formation of the leaf area and decreased the content of plastide pigments (mg x gDW sup(-1)). Under these conditions the influence of Cd on the photosynthetic rate was not expressed very strongly.

H60 WEEDS

2166 **[Agronomic importance of weed]. Importance agronomique des mauvaises herbes** (1995) *[Weeds of commercial crops, biology, ecology and means of control]. Les mauvaises herbes des grandes cultures, biologie, ecologie et moyens de lutte. Institut Technique des Grandes Cultures, (ITGC), Alger (Algerie) p. 6-7.* ITGC. 4 tableaux; 44 ref. French. (AGRIS 97-020900).

2167 **[Biology and ecology of the weed grasses]. Biologie et ecologie des graminees adventices** (1995) *[Weeds of commercial crops, biology, ecology and means of control]. Les mauvaises herbes des grandes cultures, biologie, ecologie et moyens de lutte. Institut Technique des Grandes Cultures, (ITGC), Alger (Algerie) p. 17-20.* ITGC. 7 fig.; 44 ref. French. (AGRIS 97-020902).

2168 **[Chemical control of weed in commercial crops]. La lutte chimique contre les adventices des grandes cultures** (1995) *[Weeds of commercial crops, biology, ecology and means of control]. Les mauvaises herbes des grandes cultures, biologie, ecologie et moyens de lutte. Institut Technique des Grandes Cultures, (ITGC), Alger (Algerie) p. 27-30.* ITGC. 3 tableaux; 4 fig.; 44 ref. French. (AGRIS 97-020905).

2169 **[Chemical weed control]. La lutte non chimique contre les adventices** (1995) *[Weeds of commercial crops, biology, ecology and means of control]. Les mauvaises herbes des grandes cultures, biologie, ecologie et moyens de lutte. Institut Technique des Grandes Cultures, (ITGC), Alger (Algerie) P. 23-26.* ITGC. 4 tableaux; 4 fig.; 44 ref. French. (AGRIS 97-020904).

2170 **[Integrated weed control in commercial crops]. La lutte integree contre les adventices des grandes cultures** (1995) *[Weeds of commercial crops, biology, ecology and means of control]. Les mauvaises herbes des grandes cultures, biologie, ecologie et moyens de lutte. Institut Technique des Grandes Cultures, (ITGC), Alger (Algerie) p. 31-32.* ITGC. 2 tableaux; 44 ref. French. (AGRIS 97-020906).

2171 **[Noxiousness of weeds and sensitivity of crops]. Nuisibilite des adventices et sensibilite des cultures** (1995) *[Weeds of commercial crops, biology, ecology and means of control]. Les mauvaises herbes des grandes cultures, biologie, ecologie et moyens de lutte. Institut Technique des Grandes Cultures, (ITGC), Alger (Algerie) p. 21-22.* ITGC. 3 tableaux; 44 ref. French. (AGRIS 97-020903).

2172 **[Principal weeds of commercial crops in Algeria]. Principales adventices des grandes cultures en Algerie** (1995) *[Weeds of commercial crops, biology, ecology and means of control]. Les mauvaises herbes des grandes cultures, biologie, ecologie et moyens de lutte. Institut Technique des Grandes Cultures, (ITGC), Alger (Algerie) p. 8-16.* ITGC. 1 tableau; 17 fig.; 44 ref. French. (AGRIS 97-020901).

2173 Anderson, RL. (1996) **DOWNY BROME (BROMUS TECTORUM) EMERGENCE VARIABILITY IN A SEMIARID REGION.** *Weed Technology. 10(4):750-753.* English. [AGR RES SERV USDA AKRON, CO 80720 USA].

This study characterized seedling emergence of downy brome from August to early December over a 6-yr period. Seedlings were counted weekly in quadrats established in winter wheat stubble at Akron, CO. Seedling emergence varied among years, which was caused by erratic seasonal precipitation. Producers delay planting of winter wheat to reduce downy brome density in the crop, but in only 1 yr out of 6 would producers have benefited from this control strategy. Furthermore, delayed planting has negative crop consequences: less grain yield and more susceptibility to plant diseases and wind erosion because of less fall plant growth. Because fall precipitation is erratic in the semiarid Great Plains, other control strategies, such as nitrogen placement and increased seeding rates of winter wheat, would be more effective for downy brome management, yet not detrimental to winter wheat production. [References: 26].

2174 Anderson, RL.; Nielsen, DC. (1996) **EMERGENCE PATTERN OF FIVE WEEDS IN THE CENTRAL GREAT PLAINS.** *Weed Technology. 10(4):744-749.* English. [AGR RES SERV USDA AKRON, CO 80720 USA].

Seedling emergence was characterized for five weeds that infest summer annual crops in the central Great Plains as affected by crop canopy or tillage. The study was established in winter wheat stubble between 1987 and 1990, with seedling emergence recorded weekly between April 1 and November 1. Kochia emerged primarily from early April to late June, whereas green foxtail, wild-prose millet, and redroot pigweed began emerging in late May and continued until August. Volunteer wheat emerged throughout the growing season, Tillage did not affect the emergence pattern of any species, but the numbers of kochia, volunteer wheat, and green foxtail seedlings were increased in no-till. Conversely, wild-prose millet emergence was greater with tillage. Only volunteer wheat's emergence was affected by crop canopy, as fall emergence of volunteer wheat was more than three times greater in corn than in prose millet. [References: 37].

2175 Balyan, RS.; Malik, RK.; Malik, RS. (1996) **EFFICACY OF SULFONYLUREA HERBICIDES AGAINST BROADLEAF WEEDS IN WHEAT.** *Annals of Applied Biology. 128(Suppl S):42-43.* English. [HARYANA AGR UNIV DEPT AGRON HISAR 125004 HARYANA INDIA].

2176 Blackshaw, RE.; Harker, KN. (1996) **GROWTH STAGE AND BROADLEAF HERBICIDE EFFECTS ON CGA184927 EFFICACY.** *Weed Technology. 10(4):732-737.* English. [AGR CANADA RES CTR POB 3000 LETHBRIDGE AB T1J 4B1 CANADA].

Field experiments were conducted to determine the effect of CGA184927 rate, weed growth stage, and tank mixes with various broadleaf herbicides on the control of green foxtail and wild oat in spring wheat. CGA184927 controlled green foxtail and wild oat equally well when applied at the 2- to 3- or 4- to 5-leaf stages. Green foxtail and wild oat were controlled at similar rates of CGA 184927 but the application rate giving > 90% control ranged from 22 to 90 g/ha over locations and years, indicating that CGA184927 efficacy is sensitive to environmental conditions. CGA184927 in tank mixtures was compatible with bromoxynil, clopyralid, and 2, 4-D ester. However, tank mixing with metsulfuron or dicamba reduced activity on green foxtail and wild oat. Broadleaf herbicide activity on kochia and redroot pigweed was not reduced when such herbicides were tank-mixed with CGA184927. Spring wheat tolerated 120 g/ha of CGA184927. CGA184927 provides growers with another herbicide option to control green foxtail and wild oat in wheat. [References: 21].

2177 Boulafa, H. (Institut Technique des Grandes Cultures, ALger (Algerie). Station experimentale) (1995) **[Study of relationships between communities of weeds of wheat and factors of the environment]. Etude des relations entre communautes de mauvaises herbes du ble et facteurs du milieu.** *Cerealiculture (Algerie). Revue technique et scientifique (no. 28) p. 18-22.* 21 ref. French. (AGRIS 97-020907).

2178 Bourdot, GW.; Saville, DJ.; Hurrell, GA.; Daly, MJ. (1996) **MODELLING THE ECONOMICS OF HERBICIDE TREATMENT IN WHEAT AND BARLEY USING DATA ON PREVENTED GRAIN YIELD LOSSES.** *Weed Research. 36(6):449-460.* English. [NEW ZEALAND PASTORAL AGR RES INST LTD POB 60 LINCOLN NEW ZEALAND].

Losses in grain yield prevented by controlling weeds were measured in 59 fields of (southern hemisphere) spring-sown wheat (Triticum aestivum L.) (cv. Otane) and 45 fields of spring-sown barley (Hordeum vulgare L.) (cv. Corniche) in five consecutive growing seasons from 1988/89 until 1992/93 in the Canterbury region of New Zealand. The losses were measured as the differences in yield between weeded and non-weeded plots located in randomly positioned pairs in the fields. In the first 2 years. the weeding was by push hoe in 'organically' grown crops. For the last 3 years, the fields were under prophylactic herbicide regimens with nonweeded plots created by excluding commercial herbicide applications (made mostly in October for wheat and November for barley) with polyethylene sheets placed temporarily over the plots. For each season the distributions of yield losses were modelled using the normal distribution and probabilities of 'breaking even' on herbicide use derived by substituting cumulative probability density functions into a simple break-even model for herbicide use. The model assumed that herbicide application in the current crop has no flow-on economic effect for succeeding crops. The mean annual yield losses prevented by herbicide application were positively correlated with September and October rainfall for wheat and barley respectively. As a consequence, the probabilities of breaking even on herbicide use increased with increasing spring rainfall. Using historical rainfall records, probabilities of breaking even were estimated for each of the 48 years from 1947 to 1994. Averaging over these years, the analysis revealed that at current grain prices prophylactic use of the commonly applied herbicides is likely to be uneconomic in 24% (95% confidence limits 6% and 50%) of fields of average-yielding Otane wheat and in 26% (95% confidence limits 1% and 91%) of fields of average-yielding Corniche barley in Canterbury. It was concluded that there is potential for withholding herbicide treatments without jeopardizing profitability in these crops, particularly in seasons with low spring rainfall. [References: 24].

2179 Debreuil, DJ.; Friesen, LF.; Morrison, JN. (1996) **GROWTH AND SEED RETURN OF AUXIN-TYPE HERBICIDE RESISTANT WILD MUSTARD (BRASSICA KABER) IN WHEAT.** *Weed Science. 44(4):871-878.* English. [UNIV MANITOBA DEPT PLANT SCI WINNIPEG MB R3T 2N2 CANADA].

The growth and seed return of auxin herbicide resistant (R) wild mustard was compared to that of a susceptible (S) biotype in wheat in the field, In the absence of herbicide, the S biotype accumulated shoot dry matter more quickly than the R biotype throughout most of the growing season, However, in only one of the two years did the S biotype set substantially more seed than the R biotype (3120 versus 2520 seeds plant(-1)), The recommended dosage of 2, 4-D for wild mustard control (420 g ai ha(-1)) killed all S plants in both years of the study, and severely inhibited growth and seed return of R plants, Shoot dry matter accumulation and seed return of treated R plants were reduced 75 to 90% compared to the untreated control, However, at a density of 20 plants m(-2) R seed return was still very high; 9000 and 5700 seeds m(-2) in 1992 and 1993, respectively, The recommended dosage of dicamba (300 g ha(-1)) did not

inhibit the growth and seed return of either S or R wild mustard to the same extent as 2, 4-D, Dicamba at 300 g ha(-1) reduced S shoot dry matter and seed return 80 to 90%, while R shoot dry matter and seed return was reduced 60 to 65%. The results of this study indicate a very high selection pressure for R wild mustard at recommended dosages of 2, 4-D, Despite a high selection pressure, and considering the long history of phenoxy herbicide usage on the Prairies, the relatively rare occurrence of phenoxy herbicide resistant weeds implies that the frequency of resistant individuals is very low, From a mathematical model it was determined that the frequency of R wild mustard in an unselected population may be in the order of 10(-30). [References: 21].

2180 Donald, W.W. (CSWQRU, USDA, ARS, Columbia, MO.); Khan, M. (1996) **Canada thistle (Cirsium arvense) effects on yield components of spring wheat (Triticum aestivum).** *Weed science (USA) v. 44(1) p. 114-121.* references. English. (AGRIS 97-021011).

The effect of Canada thistle on major yield components of spring wheat was characterized using path coefficient analysis, which provides insight concerning which yield components are most sensitive to Canada thistle competition. Increasing Canada thistle density decreased wheat stand in each of three years. Canada thistle also reduced spikes per plant and seed per spike to varying extents depending on year, but Canada thistle had comparatively little effect on wheat seed weight per 1000 seed. In the path coefficient model proposed, Canada thistle was assumed to reduce yield by directly reducing wheat yield components and through them, indirectly reducing yield. Path coefficient correlation analysis showed that Canada thistle reduced spring wheat yield chiefly by indirect effects of decreasing wheat density, the earliest formed yield components Canada thistle reduced wheat density which, in turn, reduced wheat yield. These data suggest that Canada thistle must be controlled either before or shortly after wheat emergence if detrimental effects on wheat yield are to be minimized.

2181 Eberlein, C. (University of Idaho, Aberdeen, ID.) (1995) **Development of winter wheat cover crop systems for weed control in potatoes.** SARE. SARE Project Number: LW91-27. Reporting period for this report is September 1991 to December 1994. This is a final report. 16 p. English. (AGRIS 97-020996).

2182 Esfandiari, H.; Mirkamali, H. (1995) **Weeds in Wheat Fields in Chaharmahal Bakhtiari.** Agricultural Research Center of Chaharmahal Bakhtiari, ShahreKord (Iran Islamic Republic); Plant Pests and Diseases Research Institute, Tehran (Iran Islamic Republic). *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 64.* Persian. (AGRIS 97-006150).

Surveys were carried out in 5 different main areas of the province during 1993-1994. One hundred weed species were listed in irrigated wheat fields throughout the province, which belonged to 27 plant families. Sixteen weed species, namely Great bur Parsley Turgenia latifolia, Corn Buttercup Ranunculus arvensis, Common Rye Secale cereale, Field Bindweed Convolvulus arvensis, Cephalaris Cephalaria syriaca, hoary cress Cararia draba, Bedstraw Galium tricorne, Hairy Vetch Vicia villosa, Corn flower Centaurea depressa, Wild Garlic Allium atroviolaceum, Clustered Grape Hyacinth Muscari neglectum, Canada thistle Crisium arvensis, Hare's ear Corningia orientalis, Lythospermum arvense, cow Soapwort Vaccaria pyramidata, Wild Safflower Carthamus oxyacanthus, were each dominant in at least one of the areas.

2183 Espinoza N, Nelson (1995) **[When and how broad-leaved and gramineous weeds in wheat should be controlled with a single herbicide treatment]. Cuando y como controlar las malezas gramineas y hoja ancha en trigo con una sola aplicacion de herbicidas.** Seminario de proteccion vegetal. Temuco (Chile). 29 Ago 1995. [Plant protection seminar]. Seminario de proteccion vegetal. *Serie Carillanca - Instituto de Investigaciones Agropecuarias. Centro Regional Carillanca (Chile); no. 45 p. 211-230. Instituto de Investigaciones Agropecuarias, Temuco (Chile). Centro Regional Carillanca.* INIA. 8 ref. Spanish. (AGRIS 97-005952).

2184 Fatemi, H.; Mirkamali, H. (1995) **The effect of five herbicides against grass weeds in wheat fields.** Agricultural Research Center of Esfahan (Iran Islamic Republic); Plant Pests and Diseases Research Institute, Tehran (Iran Islamic Republic). *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 69.* Persian. (AGRIS 97-006050).

During two successive years in 4 trials, the effects of five herbicides were investigated on grass weeds in wheat fields in two areas of Esfahan province (Esfahan and Zavareh). The trials were carried out as randomized complete blocks with four replicates. Results are as follows: Clodinafop and Fenoxaprop- p reduced the number of wild oat (Avena ludoviciana Dur.) and canary grass (Phalaris minor Retz.) and increased wheat yield effectively. Imazametabenz was effective against wild oat. The herbicides applied post- emergence, caused no visible injury to the crop.

2185 Fernandez C, Sol (1995) **[Study on the allelopathic effect of rye (Secale cereale L.) residues on wheat weeds]. Estudio del efecto alelopatico de residuos de centeno (Secale cereale L.) sobre malezas presentes en trigo.** Chile Univ., Santiago (Chile). Esc. de Agronomia. 47 ref. 77 p. Spanish. (AGRIS 97-005950).

Para evaluar el efecto alelopatico de la incorporacion de residuos de centeno sobre malezas presentes en un cultivo posterior de trigo, se establecieron 5 fechas de siembra de centeno, y dos niveles de control de malezas (con y sin herbicidas). Los objetivos planteados fueron 1) cuantificar el contenido de DIBOA (2, 4-dihidro-1, 4-benzoxazin-3ona) Moles/Kg M.V. presente en el follaje de plantas de centeno de distintos estados fenologicos 2) Evaluar el efecto de la incorporacion de cubiertas verdes de centeno con distintos contenidos de DIBOA sobre el control de malezas en el cultivo del trigo. 3) Correlacionar la concentracion de DIBOA incorporada al suelo, con el rendimiento de trigo (qq/ha) y sus componentes de rendimiento 4) Evaluar, mediante bioensayos, el efecto de distintas concentraciones de DIBOA, sobre la germinacion, largo de hipocotilo y/o coleoptilo y radicula en el trigo y sobre aquellas especies de malezas de mayor importancia en el ensayo de campo. Para evaluar el efecto alelopatico de la incorporacion de residuos de centeno (Secale cereale L., var Baer), sobre malezas presentes en un cultivo posterior de trigo (Triticum aestivum L. var Millaleu), se establecieron cinco fechas de siembra de centeno, y dos niveles de control de malezas (con y sin herbicidas). Se realizaron doce tratamientos, incluido el tratamiento control, al cual no se incorporo centeno.

2186 Froment, MA.; Cooper, ND. (1996) **EVALUATION OF POST-EMERGENCE HERBICIDES FOR THE CONTROL OF WILD OATS (AVENA FATUA) IN WINTER BARLEY.** *Annals of Applied Biology. 128(Suppl S):24-25.* English. [AGR DEV & ADVISORY SERV BRIDGETS RES CTR WINCHESTER S021 1AP HANTS ENGLAND].

2187 Geier, PW.; Stahlman, PW. (1996) **DOSE-RESPONSES OF WEEDS AND WINTER WHEAT (TRITICUM AESTIVUM) TO MON 37500.** *Weed Technology. 10(4):870-875.* English. [KANSAS STATE UNIV AGR RES CTR HAYS HAYS, KS 67601 USA].

Greenhouse studies determined the dose-responses of cheat, downy brome, Japanese brome, jointed goatgrass, and winter wheat to preplant-incorporated MON 37500 and its residual effects on kochia. Concentrations of MON 37500 up to 60 ppbw did not affect winter wheat, MON 37500 did not prevent weed emergence, but increasingly inhibited weed growth as the dose was increased up to about 20 ppbw. GR(50) values were 16, 16, 11, and 31 ppbw for cheat, downy brome, Japanese brome, and jointed goatgrass, respectively. Japanese brome was more susceptible than cheat or downy brome, and jointed goatgrass tolerated two to three times more MON 37500 than the Bromus species. Plant dry weights of kochia seeded after removal of the winter annual grasses decreased with increasing initial MON 37500 concentrations up to 20 ppbw, Kochia density was influenced by which winter annual grass was grown previously. [References: 23].

2188 Haouara, F.; Halouane, R.; Ghenaoui, Y. (1994) **[The effects of many densities of weed infestments on the barley crop in the region of Mostaganem]. Effet de plusieurs densites d'infestation d'adventices sur la culture d'orge dans la region de Mostaganem.** 2eme journee sur les activites de recherche. Mostaganem (Algerie). 7-8 Nov 1993. *Collection of communications. Recueil des communications p. 83-110.* 4 Tableaux; 7 fig.; 13 ref. French. (AGRIS 97-020899).

2189 Helvig, C. (Institut de Biologie Moleculaire des Plantes, Strasbourg, France.); Tardif, F.J.; Seyer, A.; Powles, S.B.; Mioskowski, C.; Durst, F.; Salaun, J.P. (1996) **Selective inhibition of a cytochrome P450 enzyme in wheat that oxidizes both the natural substrate lauric acid and the synthetic herbicide diclofop.** *Pesticide biochemistry and physiology (USA) v. 54(3) p. 161-171.* references. English. (AGRIS 97-006025).

Earlier studies from our laboratory strongly suggested that a single or similar cytochrome P450 isoform(s) isolated from microsomes of wheat catalyze the oxidation of the medium-chain fatty acid, lauric acid, and the wheat selective herbicide diclofop. Lauric acid is mainly hydroxylated at the subterminal position C11 (omega-1) and for that reason P450-dependent reactions were initially designated lauric acid (omega-1)-hydroxylase ((omega-1)-LAH). This report presents data on the in vitro and in vivo irreversible inhibition of both lauric acid and diclofop oxidation by mechanism-based inhibitors targeting lauric acid hydroxylation. Incubation of microsomes from etiolated wheat seedlings with 10-dodecynoic acid (10-DDYA) produces a dramatic inhibition of lauric acid hydroxylation. The inhibition is both time- and concentration-dependent in a process typical for mechanism-based inhibitors. A half-life of 3 min and an apparent inhibition constant of 14 micromolar were determined from pseudo-first order kinetic studies of (omega-1)-LAH inhibition. Similar results were obtained by incubating microsomes with a terminal acetylene, 11-dodecynoic acid (11-DDYA). Based on results of in vitro experiments we have developed a series of new mechanism-based inhibitors to inhibit diclofop metabolism in developing wheat seedlings. To protect the inhibitors from degradation by alpha- and beta-oxidation systems, water-soluble sodium salts of undec-10-yne-1-sulfonic acid (10-UDYS), undec-9-yne-1-sulfonic acid (9-UDYS), and undecan-1-sulfonic acid (SULAUR) were synthesized. Following treatment of wheat coleoptiles for 6 hr with these modified inhibitors, diclofop and chlortoluron metabolism was measured. Both compounds selectively inhibited diclofop metabolism without affecting chlortoluron metabolism. The importance of triple bonds in the inhibition process is clearly demonstrated by the fact that SULAUR had very small inhibitory effects. A 100 micromolar concentration of both inhibito.

2190 Khan, M.; Noor ul Haq (Agricultural Research Inst., Tarnab (Pakistan). Plant Physiology Section) (1994) **Effect of post emergence herbicides on weed control and wheat yield.** *Journal of Agricultural Research (Pakistan) v. 32(3) p. 253-259.* 4 tables, 12 ref. English. (AGRIS 97-021047).

Present study was conducted to see the effect of some post emergence herbicides on weed control and wheat yield. The experiments were conducted at Agricultural Research Institute, Tarnab during 1988 and 1989. The chemicals used were chlortoluron + MCPA, methabenzthiazuron, isoproturon 75WP, isoproturon 50WP, isoproturon 75WP (a different product) and metoxuron 80WP (at the rate of 1.5, 1.4, 1.13, 1.0, 1.7 and 1.6 kg a.i./ha, respectively). All herbicide treatments effectively controlled weeds during both years except metoxuron. It was not effective against Poa annua during 1988. In both years, wheat yield increased significantly with herbicides application. The range in grain yield was between 2326 to 4326 and 2037 to 3750 kg per hectare in 1988 and 1989, respectively. Yields were 4326, 4257, 3750, 3924 and 3924 kg per hectare by the applications of chlortoluron + MCPA, methabenzthiazuron, isoproturon 75WP, isoproturon 50WP and metoxuron, respectively in 1988. Yields were 3772, 3853, 3437 and 3605 kg per hectare in 1989 from plots treated with chlortoluron + MCPA, methabenzthiazuron, isoproturon 75WP, isoproturon 50WP and metoxuron, respectively. Because chlortoluron + MCPA, methabenzthiazuron, and all isoproturons controlled weeds and increased wheat yield and are available in the market; therefore the commercial use of these herbicides is recommended in NWFP to control weed growth in wheat.

2191 Kirkland, KJ. (1996) **USE OF INCORPORATED AND NON-INCORPORATED GRANULAR TRIFLURALIN FOR ANNUAL GRASS CONTROL IN BARLEY (HORDEUM VULGARE), WHEAT (TRITICUM AESTIVUM), AND CANOLA (BRASSICA NAPUS).** *Weed Technology. 10(4):907-913.* English. [AGR & AGRI FOOD CANADA EXP FARM POB 10 SCOTT SK S0K 4A0 CANADA].

The comparison of incorporation vs no incorporation on a mid-October application of the granular formulation of trifluralin to control infestations of wild oat and green foxtail was evaluated in spring barley, wheat, and canola in west central Saskatchewan over a 3 yr period, Incorporation treatments consisted of: no incorporation, one incorporation in fall, one incorporation in fall and a second in spring, one incorporation in fall and two additional incorporations in spring, All treatments eliminated green foxtail, In all three crops wild oat panicle counts were equivalent from incorporated and non-incorporated trifluralin, Wild oat fresh weights in crops grown on stubble were similar for incorporated and non-incorporated trifluralin, In fallow crops, wild oat fresh weight reductions were greater in three of nine site years with incorporation, There was little difference in crop yields from incorporated and non-incorporated trifluralin. [References: 24].

2192 Kristensen, H. (1995) **Site specific weed control.** Site Specific Farming. Aarhus (Denmark). 20-21 Mar 1995. *SP Report, 26: Proceedings of the seminar on site specific farming. Olesen, S.E. (ed.). Statens Planteavlsforsoeg, Foulum (Denmark) p. 161-164.* SP. 3 tables. English. (AGRIS 97-006121).

2193 Lal, RB.; Verma, AK.; Singh, R.; Ahuja, KN. (1996) **WEED MANAGEMENT IN IRRIGATED WHEAT (TRITICUM AESTIVUM).** *Indian Journal of Agronomy. 41(3):406-408.* English. [INDIAN AGR RES INST DIV AGRON NEW DELHI 110012 INDIA].

A field experiment conducted for 2 years on sandy-loam soil revealed that application of isoproturon mixed with soil 35 days after sowing was as effective as its spray application and wheat yield recorded was 95.2% to that of the best treatment. Isoproturon + urea had a toxic effect on the crop. [References: 2].

2194 Longden, P.; Breay, T. (IACR Broom's Barn, Higham, Bury St. Edmunds, Suffolk IP26 6NP (United Kingdom)) (1995) **Weed beet - the future.** *British Sugar Beet Review (United Kingdom) v. 63(4) p. 16-18.* 1 ref. English. (AGRIS 97-006001).

2195 Magnin, M.F. (La Quinoleine (France). Service Developpement); Haverlant, J.; Bonnel, J.P. (1996) **[Magestan [clodinafop-propargyl + cloquintocet-mexyl + ioxynil + mecoprop-P]. Herbicide against grass and broadleaved weeds for winter wheat, durum wheat, winter rye and triticale]. Magestan [clodinafop-propargyl + cloquintocet-mexyl + ioxynil + mecoprop-P]. Herbicide antigraminees et anticotyledones du ble tendre d'hiver, du ble dur, du seigle d'hiver et du triticale.** *Phytoma La Defense des Vegetaux (France) v. 48(488) p. 62-63.* French. (AGRIS 97-020923).

2196 Mirkamali, H.; Shekarian, B. (1995) **Weeds of the irrigated wheat in Lorestan.** Plant Pests and Diseases Research Institute, Tehran (Iran Islamic Republic). Agricultural Research Center of Lorestan. *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 75.* Persian. (AGRIS 97-006153).

Irrigated wheat fields in Lorestan province are mostly infested with weeds. Surveys were carried out in 1991 and 1992 to identify the major problem weeds. More than 32 weed species were listed, of which about 90 were broadleaves. Bedstraw Galium tricornutum, Vetchling Lathyrus spp. and Corn Buttercup Ranunculus arvensis occurred in more than 50 percent of the field. Bedstraw was dominant in all the three main areas Boroojerd, Khoram- Abad and Aleshtar; Great- But- Parsley Turgenia latifolia and Field Bindweed Convolvus arvensis were dominant in two areas and Field Poppy Papaver dubium, Vetch Vicia spp., Charlock Sinapis arvensis and Cornweed Centaurea depressa were each dominant in only one of the three areas. Common Rye Secale cereale and Wild Oats Avena ludoviciana (and A. fatua) occurred on 39 and 30 percent of the fields, respectively. Since Vetching species show some tolerance to 2, 4-D (+MCPA), which is the most common herbicide applied in wheat in the province, continuous annual applications of the herbicide have to be prevented. With regards to Common Rye, since available selective grass killers are not effective against this grass, more attention has to be paid to preventive measures (mainly use of clean seed).

2197 Montazeri, M. (1995) **Evaluation of new herbicides for control of grass weeds in wheat.** Agricultural Research Center of Gorgan-Gonbad (Iran Islamic Republic). *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 74.* Persian. (AGRIS 97-006054).

During 1992- 94, three field experiments were conducted to evalute the effect of fenoxaprop (puma super 7.5), clodinafop (topik 8), tralkoxydim plus oil (grape S.C. 25), illoxan 36 and tarlkoxydim (grasp E.C. 10) on Avena ludoviciana, Phalaris minor and P. brachystachys in wheat. Topik at 0.6, 0.8 and 1 lit/ha and puma super at 1 lit/ha, completely controlled A. ludoviciana and were better than other herbicides. In control of P. minor and P. brachystachys, topik and grasp were the best. All of the herbicides caused some chlorosis on wheat CV Khazar 1 and Flat, but graduatly recovered. Application of the herbicides increased the grain yield significantly.

2198 Panwar, RS.; Malik, RK.; Rathi, SS. (1996) **EFFECT OF TRALKOXYDIM AND ITS COMBINATION WITH OTHER NEW HERBICIDES ON THE CONTROL OF WEEDS IN WHEAT (TRITICUM AESTIVUM).** *Indian Journal of Agronomy. 41(3):401-405.* English. [CHAUDHARY CHARAN SINGH HARYANA AGR UNIV DEPT AGRON HISAR 125004 HARYANA INDIA].

A field experiment was conducted during the winter season of 1991-92 and 1992 93 at Hisar. In both the years tralkoxydim or metsulfuron each applied alone at 300 q/ha and 4.0 q/ha significantly reduced the population and dry weight of total weeds compared with the weedy cheek. their combination at same rate resulted in the excellent control of weeds like Phalaris minor Retz, Chenopodium album (L.) and Meliotus indica All. Number of tillers/m in the weedy check reduced from 94 to 58 in 1991-92 and from 92 to 62 in 1992-93 compared with weed-free check. Similarly, the grain yield of wheat in the weedy check ranged from 3, 005 to 3, 241 kg/ha compared with 4, 728 to 5, 260 kg/ha in the weed-free check. Tank mixture of tralkoxydim + tribenuron at 200 + 7.5 g/ha, tralkoxydim + metsulfuran at 300 + 4.0 g/ha or traldoxydim + fluroxypyr at 300 + 200 q/ha gave significantly higher grain yield of wheat than weedy check. [References: 6].

2199 Salimi, H.; Angadji, S.J. (1995) **Biology and competition of different densities of wild oat in wheat.** Plant Pests and Diseases Research Institute, Tehran (Iran Islamic Republic). *Proceedings of the 12th Iranian Plant Protection Congress 2-7 September 1995 Karadj (Iran Islamic Republic) p. 67.* Persian. (AGRIS 97-006152).

Wild oat (Avena ludoviciana) is a winter annual which seeds germinate in autumn. (Optimum temperature for germination is 15C). Seedlings of wild oat remain at 2-3, leaf stage in winter. It produces tillers and stem in early spring. At this stage, leaf numbers do not increase considerably. There is a significant increase in stem length, but it is only due to inter nodes elongation. More over, leaf area increases in this stage. Plant produces inflorescene in mild spring. Two seeds exist in each spikelets on inflorecence of wild oat: The upper seed in spikelet has deeper dormancy than lower one. The seeds of wild oat fall before naturation of wheat grain and infest the soil. Competition of wild oat in winter wheat reduced spike weight, 1000 seed weight, number of seeds spike, length of spikes, number of tillers and wheat yield.

2200 Tanchev, D. (Kompleksna Opitna Stantsiya po Zemedelie, gr. Sredets (Bulgaria)) (1995) **[Aftereffect of simazine applied with sorghum on development and yield of triticale and winter-barley grain]. Posledejstvie na simazin, upotreben pri sorgoto v"rkhu razvitieto i dobiva ot tritikale i zimuvashch oves.** Selskostopanska Akademiya, Sofia (Bulgaria). *Rasteniev"dni Nauki (Bulgaria). Plant Science v. 32(3) p. 160-162.* 3 tables; 5 ref. Bulgarian. (AGRIS 97-021035).

2201 Wrage, L.J. (South Dakota State University.); Johnson, P.O.; Vos, D.A.; Wagner, S.A. (1996) **Weed control.** *Plant science pamphlet (USA) (no. 84) p. 28-33.* English. (AGRIS 97-021037).

J11 HANDLING, TRANSPORT, STORAGE AND PROTECTION OF PLANT PRODUCT

2202 Aheer, G.M.; Ulfat, M.; Ahmed, R. (Ayub Agricultural Research Inst., Faisalabad (Pakistan). Entomology Section) (1993) **Fumigants test against insect pests of stored grains.** *Journal of Agricultural Research (Pakistan) v. 31(3) p. 323-327.* 1 table, 14 ref. English. (AGRIS 97-021231).

Two old (Agtoxin and Phastoxin) and one new (Phostek) fumigant at the rate of 30 tablets per 28.3 m3 each, as directed by the manufacturers, were tested in two separate trials both glass jars and fumigation chambers against adults of each lesser grain borer Rhizopertha dominica Fb.), red flour beetle (Tribolium castaneum Hbs.), rice weevil (Sitophilus oryzae Linn.), mung dhora (Callosobruchus analis) and adults and grubs of khapra (Trogoderma granarium Everts.) attacking wheat and mung grains. All the fumigants were highly effective giving 100 percent control in laboratory and fumigation Chambers.

2203 Arthur, F.H. (U.S. Grain Marketing Research Laboratory, Manhattan, KS.) (1995) **Aeration alone versus chlorpyrifos-methyl treatment followed by aeration for wheat stored in Georgia: simulated field test.** *Journal of economic entomology (USA) v. 88(16) p. 1764-1770.* references. English. (AGRIS 97-006236).

Wheat treated on 7 July with 6 ppm chlorpyrifos-methyl was artificially infested with lesser grain borer, Rhyzopertha dominica (F.), and rice weevil, Sitophilus oryzae (L.), and subsequently aerated when temperatures cooled, was compared with untreated wheat infested and aerated at the same conditions. Temperatures were monitored from 7 July to 5 April insure the bins and populations of the introduced species and a natural infestation of red flour beetle, Tribolium castaneum (Herbst), were assessed using probe traps and a grain trier. Average daily temperatures at 7 sample positions in untreated wheat were from 17.01 +/- 0.53 to 21.46 +/- 0.52 degrees C, and were not significantly different from average temperatures at corresponding positions in treated wheat, which were from 16.00 +/- 0.63 to 18.98 +/- 0.60 degrees C. Initial chlorpyrifos-methyl residue on treated wheat was 5.75 +/- 0.51 ppm, but after 6 wk residues declined by 67.2-52.7. Lesser grain borers collected from probe traps and trier samples were significantly more numerous in untreated wheat than in treated wheat on the 1st sample date (20 August); however, populations were larger in treated wheat on 2 later sample dates (12 November and 29 March). Few rice weevils or red flour beetles were collected from treated wheat. There was significantly more dockage (ground flour and insect frass) in untreated wheat than in treated wheat on 4 of 6 sample dates, while the percentage of insect-damaged kernels was significantly greater in untreated wheat than in treated wheat on all sample dates.

2204 Baker, J.E. (U.S. Grain Marketing Research Laboratory, Manhattan, KS.); Throne, J.E. (1995) **Evaluation of a resistant parasitoid for biological control of weevils in insecticide-treated wheat.** *Journal of economic entomology (USA) v. 88(16) p. 1570-1579.* references. English. (AGRIS 97-006269).

Interaction of a resistant strain of Anisopteromalus calandrae (Howard) (Hymenoptera: Pteromalidae) and a host, the rice weevil, Sitophilus oryzae (L.) (Coleoptera: Curculionidae), on wheat treated with malathion was studied in the laboratory. Based on dose response and serial time-response bioassays, malathion concentration had no significant effect on longevity, fecundity, or effectiveness of the Bamberg strain of A. calandrae parasitizing S. oryzae in wheat. Suppression of the immature weevil population exceeded 90 on malathion-treated wheat. Bamberg A. calandrae were more successful parasitizing the Savannah laboratory strain of S. oryzae compared with the Bamberg strain of S. oryzae, possibly because of the larger size of the Savannah weevils. The Bamberg strain of S. oryzae (12 times resistant at the LD99 based on vial bioassays) was more tolerant of malathion applied to wheat than was the susceptible Savannah strain of S. oryzae. However, malathion concentration had no significant effect on emergence of adults of either weevil strain when wheat containing immatures was treated. Although oviposition was significantly reduced, both weevil strains oviposited on wheat treated with malathion. These results indicate that the ecology of host development (for example, protected weevil larvae feeding within grain kernels) may be primarily responsible for development of the resistance in Bamberg A. calandrae by providing a food source when the parasitoid is under selection pressure. Use of the resistant strain of A. calandrae in a management system for insect pests in stored grain is discussed.

2205 Flinn, P.W. (U.S. Grain Marketing Research Laboratory, USDA, ARS, Manhattan, KS.); Hagstrum, D.W. (1995) **Simulation model of Cephalonomia waterstoni (Hymenoptera: Bethylidae) parasitizing the rusty grain beetle (Coleoptera: Cucujidae).** *Environmental entomology (USA) v. 24(6) p. 1608-1615.* references. English. (AGRIS 97-021124).

We have developed a simulation model of parasitic grain wasp, Cephalonomia waterstoni (Gahan), parasitizing the rusty grain beetle, Cryptolestes ferrugineus (Stephens). The model predicts host and parasitoid phenology based on grain temperature, using a distributed-delay method to simulate variance in developmental rate. The model accurately predicted both the time and magnitude of peak parasitoid density. Changing the timing of parasitoid release had a greater effect than releasing more parasitoids. Releasing parasitoids at day 20 instead of day 40 reduced the maximum host population by 75. Parasitoids are most effective when releases are timed so that parasitoids find the 1st-produced 4th-instar. This model should be a valuable tool for developing a biological control program for C. ferrugineus on stored wheat. It can be used to predict the optimum time of release, the number of parasitoids to release, and the effects of other controls such as fall aeration.

2206 Hagstrum, D.W. (U.S. Grain Marketing Research Laboratory, USDA, ARS, Manhattan, KS.); Flinn, P.W.; Shuman, D. (1996) **Automated**

monitoring using acoustical sensors for insects in farm-stored wheat. *Journal of economic entomology (USA) v. 89(1) p. 211-217.* references. English. (AGRIS 97-021145).

An automated method using cables with acoustical sensors was compared with the conventional grain sampling method for monitoring insect populations in wheat stored in 1 or 2 bins on each of 6 farms in Kansas. Seven flexible cables, each with 20 sensors 15 cm apart, were installed vertically in the grain mass along a transect across the diameter of the bin. A computer collected and stored the data. The automated system detected insects in all of the bins in which insects were found in grain samples and provided a good estimate of infestation level. Lesser grain beetle, Rhyzopertha dominica (F.) was the dominant species, and red flour beetle, Tribolium castaneum (Herbst), and rice weevil, Sitophilus oryzae (L.) were also detected. The number of times that insect sounds were detected was correlated with insect density in grain samples over a density range of 0-17 insects per kilogram. Insects were most abundant in the top center of the wheat stored in bins, and only a few sensors in this area were needed for early detection. Insects were found in grain samples at 5-37 sensor locations in any bin, but locations differed between bins. Insects were found in grain samples at a total of 50 sensor locations in 10 bins. Sensors will need to be distributed over a representative portion of a bin to determine insect infestation levels accurately.

2207 Hevia H, Felicitas; Vidal J, Leslie; Fuentes G, Jose (Concepcion Univ., Chillan (Chile). Fac. de Ingenieria Agricola); Wilckens E, Rosemarie (1996) **[Design of a porosity meter to determine true density in wheat]. Diseno de un porosimetro para determinar la densidad real del trigo.** *Agro-Ciencia (Chile) v. 12(1) p. 91-97.* 23 ref. Spanish. (AGRIS 97-021081).

Se diseno un porosimetro para medir densidad real, porosidad y eficiencia de empaquetamiento del grano de trigo, basado en la determinacion de la cantidad de aire que queda entre los granos en el recipiente de medida. Posteriormente se probo en 40 muestras de trigo, con caracteristicas agronomicas y de calidad variadas. Los resultados obtenidos sugieren que el porosimetro propuesto detecta diferencias entre cultivares y de manejo en un mismo cultivar.

2208 Iqbal, J.; Irshad, M. (National Agricultural Research Centre, Islamabad (Pakistan). Entomology Research Lab.) (1993) **Response of wheat to Sitotroga cerealella (Oliv.) (Lepidoptera: Gelechiidae).** *Journal of Agricultural Research (Pakistan) v. 31(3) p. 359-362.* 1 table, 9 ref. English. (AGRIS 97-021232).

Higher crop yields lose their significance if the commodity is destroyed during storage. Before a variety is selected, this aspect should also be considered. In this context 32 wheat lines were tested against Sitotroga cerealella (Oliv.) The latter is a serious pest of wheat during storage. Studies revealed that Triticale, TCL-83740 and TCL-85745 were more susceptible. Durum D-82754 was least susceptible. Other lines were intermediate in response.

2209 Kljajic, P.; Peric, Z.; Peric, I. (Institut za istrazivanja u poljoprivredi "Srbija", Beograd Zemun (Yugoslavia). Centar za pesticide i zastitu zivotne sredine) (1994) **[Toxicity of chlorpyrifos-methyl and deltamethrin to adults of granary weevil (Sitophilus granarius L.) after various applications]. Toksicnost hlorpirifos-metila i deltametrina za adulte zitnog ziska (Sitophilus granarius L.) posle razlicitih aplikacija.** Treci jugoslovenski kongres o zastiti bilja. Vrnjacka Banja (Yugoslavia). 3-7 Oct 1994. *Plant protection today and tomorrow: [selected papers from the third Yugoslav congress about plant protection, Vrnjacka Banja (Yugoslavia), October 3-7, 1994]. Sestovic, M.; Neskovic, N.K.; Peric, I. (eds.). Zastita bilja danas i sutra: [odabrani radovi sa Treceg jugoslovenskog kongresa o zastiti bilja, Vrnjacka Banja (Jugoslavija), 3-7. oktobra 1994] p. 479-489.* Drustvo za zastitu bilja Srbije. 6 tables; 22 ref. Serbian. (AGRIS 97-006286).

Toxicity of both chlorpyrifos-methyl and deltamethrin to adults of granary weevil Sitophilus granarius L. was investigated on treated grain, filter paper and in glass jars. Chlorpyrifos-methyl was extremely effective already six hours after insect exposure on the grain treated. At the same time deltamethrin was not effective. Deltamethrin's reaction compared with chlorpyrifos-methyl was faster on the filter paper treated. However, total toxicity of chlorpyrifos-methyl was higher. In glass jars the toxic effects of chlorpyrifos-methyl were significantly higher compared to deltamethrin at all intervals and for all the parameters analyzed. Comparing the insecticide effects on filter paper and in glass jars where the quantities were calculated per square cm, significantly faster activity and significantly higher toxicity of both insecticides were recorded in glass jars.

2210 Mahmood, T.; Ahmad, MS.; Ahmad, H. (1996) **DISPERSION OF STORED GRAIN INSECT PESTS IN A WHEAT-FILLED SILO.** *International Journal of Pest Management. 42(4):321-324.* English. [PAKISTAN AGR RES COUNCIL GRAIN MANAGEMENT CELL GURUMANGAT RD LAHORE 54660 PAKISTAN].

The distribution of insects in a wheat-filled large concrete site was studied by drawing grain samples from the whole vertical depth by means of a special probe. The major insect species found were: Trogoderma granarium (Khapra beetle), Rhyzopertha dominica (Lesser grain borer), and Tribolium castaneum (Red flour beetle). Maximum activity of all species was found on the grain surface although some insects were found at all depths in varying numbers. Breeding activity of major insect pests was detected by incubating grain samples and then counting the number of emerged insects. Maximum emergence of T. granarium and R. dominica was observed in nearly all grain depths in October to November and July to November, respectively. Maximum emergence of T. castaneum was noted in almost all grain depths during August. Breeding activity of all species was mainly restricted to the grain surface and top grain layers during the months of November and December. [References: 8].

2211 Makki, SS.; Tweeten, LG.; Miranda, MJ. (1996) **WHEAT STORAGE AND TRADE IN AN EFFICIENT GLOBAL MARKET.** *American Journal of Agricultural Economics. 78(4):879-890.* English. [WORLD BANK 1818 H ST NW WASHINGTON, DC 20433 USA].

Domestic and international linkages in speculative stockholdings and trade of wheat are analyzed using a dynamic rational expectations model of the world wheat market dominated by the U.S. and the EU. The results demonstrate the importance of endogenizing both storage and trade in studying commodity markets and suggest that past government stockholdings have not followed efficient market outcomes. Results indicate that elimination of the Export Enhancement Program by the U.S. and of export restitution payments by the EU are unlikely to have a major impact on wheat exports from the two regions but will save millions of tax dollars in both regions. [References: 42].

2212 Nielsen, J.; Vind, R. (1995) **[Whole crop biorefinery project [BIORAF]: eventual establishment of a pilot study of a full scale demonstration plant].** Statens Jordbrugs- og Fiskerioekonomiske Inst., Copenhagen (Denmark). *Totalhoestanlaeg og hvede-bioraffinaderi: muligheder for etablering af fuldskala demonstrationsanlaeg 113 p.* SJFI. 22 ill., 31 tables; 23 ref. Danish. (AGRIS 97-006280).

2213 Pietrzyk, W.; Adamkiewicz, J.; Zlonkiewicz, Z. (Politechnika Lubelska, Lublin (Poland). Wydzial Elektryczny); Scibisz, M. (Akademia Rolnicza, Lublin (Poland). Inst. Podstaw Techniki) (1996) **[Measuring resistance of cereal grains exposed to electric field]. Pomiar rezystancji ziarniakow zboz poddanych dzialaniu pola elektrycznego.** *Problemy Inzynierii Rolniczej (Poland) (no.1) p. 91-96.* 2 fig.; 3 ref. Polish. (AGRIS 97-021120).

Electric field applied to dielectric body results in some deformation of its primary electron configuration and in case of solids - in changes of geometric dimensions (known as the electrostriction phenomenon). Electrostatic forces cause the internal deformation of a grain and change its density. Thus, the electric field may considerably affect the resistance of a single grain. The above thesis was verified experimentally in laboratory on spring wheat grain of Sigma cultivar. With increasing electric field intensity the grain resistance decreased and became approximately linear.

2214 Sekulovic, D. (Institut za proucavanje lekovitog bilja "Dr. Josif Pancic", Beograd (Yugoslavia)); Krivokuca Djokic, D.; Sekesan, V.; Jovanovic, Z.; Kostic, M.; Zabel, A. (1996) **[The investigation of the influence of aqueous ethanolic extracts of Taraxacum officinale Web. on Sitophilus oryzae L.]. Ispitivanje uticaja ekstrakta Taraxacum officinale Web. na Sitophilus oryzae L.** *Arhiv za farmaciju (Yugoslavia) v. 46(1-2) p. 31-35.* 2 tables; 7 ref. Serbian. (AGRIS 97-006289).

The investigation on use of plant extracts of Taraxacum officinale Web. (Asteraceae), as biological method for wheat protection from Sitophilus oryzae L. (Coleoptera: Curcuionidae), showed that Taraxacum extract prepared in concentration 100, showed insecticide effect on investigated insect.

2215 Sinicio, R. (Manitoba Univ., Winnipeg, Man. (Canada). Dept. of Agricultural Engineering); Muir, W.E.; Jayas, D.S.; Cenkowski, S. (1995) **Thin-layer drying and wetting of wheat.** *Postharvest Biology and Technology (Netherlands) v. 5(3) p. 261-275.* 35 ref. English. (AGRIS 97-021230).

2216 Wong Corral, F. (Universidad of Sonora, Sonora, Mexico.); Cortez Rocha, M.O.; Borboa Flores, J. (1996) **Abundance and distribution of insect in stored wheat grain in Sonora, Mexico.** *The Southwestern entomologist (USA) v. 21(1) p. 75-81.* references. English. (AGRIS 97-006249).

2217 Zlobecki, A. (Akademia Rolnicza, Krakow (Poland). Katedra Podstaw Budowy Maszyn) (1995) **[Qualitative losses of wheat grain as affected by combine harvesting conditions]. Zaleznosc strat jakosciowych ziarna pszenicy od warunkow zbioru kombajnem.** Scientific Conference: Scientific, Technical and Organizational Progress in Polish Agriculture. Zawoja (Poland). 14-18 Feb 1995. *Scientific, technical and organizational progress in Polish agriculture. Michalek, R.; Haman, J.; Pabis, S.; Bala, W. (eds.). Postep naukowo-techniczny i organizacyjny w rolnictwie polskimZeszyty Problemowe Postepow Nauk Rolniczych (Poland); no. 423. Akademia Rolnicza, Krakow (Poland). Katedra Mechanizacji Rolnictwa; Polska Akademia Nauk, Krakow (Poland). Komitet Techniki Rolniczej; Polskie Towarzystwo Inzynierii Rolniczej, Krakow (Poland) p. 243-253.* Komitet Techniki Rolniczej PAN. 8 tables; 8 ref. Polish. (AGRIS 97-006288).

Variance analysis computation determined the factors affecting grain losses at harvest, while regression analysis enabled quantitative description of grain losses. Applied empirical formulas may also optimize the control parameters of combine operation at harvesting seed grain.

J13 HANDLING, TRANSPORT, STORAGE AND PROTECTION OF ANIMAL PRODUCTS

2218 Wong, Y.C. (Kansas State University, Manhattan, KS.); Herald, T.J.; Hachmeister, K.A. (1996) **Evaluation of mechanical and barrier properties of protein coatings on shell eggs.** *Poultry science (USA) v. 75(3) p. 417-422.* references. English. (AGRIS 97-006304).

Development of a coating material for shell eggs is important because of economic loss from shell damage and decline in interior egg quality. Studies were done to evaluate the interior quality (moisture loss, Haugh unit, and pH) and shell properties (strength, thickness, morphology, and color) of uncoated eggs and eggs coated with mineral oil or with solutions of egg albumen, soy protein isolate, wheat gluten, or corn zein. Coated shell eggs were evaluated during 1, 3, 5, 7, 10, 14, 21, and 28 d of storage at room temperature. Eggshells coated with corn zein solution exhibited the least moisture loss and the strongest shell strength. Light microscopy depicted a more compact structure of eggshells coated with corn zein solution. Shell eggs coated with corn zein exhibited the lowest moisture loss and maintained a higher Haugh unit than eggs coated with other treatments. Results also indicated that the protein-based coatings, corn zein and wheat gluten, added strength to the shell, which, in turn, served as a protective barrier.

L01 ANIMAL HUSBANDRY

2219 Amine Khoda, A. (1995) **[Determining factors of the dependence on barley in sheep husbandry in the steppe: The case of the M'sila region in Algeria]. Les determinants de la dependance en orge de l'elevage ovin steppique : le cas de la region de M'Sila en Algerie.** Centre International de Hautes Etudes Agronomiques Mediterraneennes, Montpellier (France). Institut Agronomique Mediterraneen. *Theses et Masters (CIHEAM); no. 26 110 p.* CIHEAM-IAMM. 15 graphs. 78 tables. 53 ref. French. (AGRIS 97-006971).

Cette etude propose une analyse de la dependance en orge des differents systemes d'elevage de la region steppique de M'Sila. L'augmentation considerable de l'effectif ovin et le developpement d'une activite d'engraissement ont conduit a un recours accru aux ressources fourrageres exterieures a la steppe. Notre etude montre que, quelle que soit l'annee, les potentialites agricoles et artificielles de la region ne peuvent en aucun cas satisfaire les besoins de l'elevage local. Ceci se manifeste de manieres differentes, selon les lieux et les types d'eleveurs. Les eleveurs les mieux places sont ceux qui ont su acquerir un savoir-faire commercial et mettre en place une activite de negoce (animaux et aliments). Cette publication est issue de la these Master of Science soutenue en 1993.

2220 Belzunces, L.P.; Lenfant, C.; Pasquale, S. di; Colin, M. E. (I.N.R.A. Station de Phytopharmacie, BP 91, 84143 Montfavet Cedex (France)) (1994) **In vivo and in vitro effects of wheat germ agglutinin and Bowman-Birk soybean trypsin inhibitor, two potential transgene products, on midgut esterase and protease activities from Apis mellifera.** *Comparative Biochemistry and Physiology. B, Biochemistry and Molecular Biology (United Kingdom) v. 109(1) p. 63-69.* English. (AGRIS 97-006998).

2221 Heitschmidt, R.K. (Fort Keogh Livestock and Range Research Laboratory, USDA, ARS, Miles City, MT.); Short, R.E.; Grings, E.E. (1996) **Ecosystems, sustainability, and animal agriculture.** *Journal of animal science (USA) v. 74(6) p. 1395-1405.* references. Presented at a symposium titled "Toward Sustainability: Animal Agriculture in the Twenty-First Century" at the ASAS 86th Annu. Mtg., Minneapolis, MN. English. (AGRIS 97-021834).

The long-term sustainability of animal agriculture is examined in an ecological context. As an aid to defining agriculture, animal agriculture, and sustainable agriculture, a broad overview of the structural and functional aspects of ecosystems is presented. Energy output/cultural energy input ratios were then calculated for 11 beef cattle management systems as relative measures of their long-term sustainability. Energy output was estimated by direct conversion of whole body mass of steers to caloric values. Cultural energy inputs were estimated using published forage and cereal grain production budgets in combination with estimated organic matter intakes. Cultural energy inputs included raw materials, manufacturing, distribution, maintenance, and depreciation of all equipment and products used in a 250-animal cow-calf farm/ranch operation. Management systems evaluated included 1) spring calving with slaughter beginning at either weaning (age of calf approximately 6 mo) or after 84, 168, or 252 d in postweaning finishing lot; 2) spring calving with slaughter beginning at about 18 mo of age after either 0, 42, 84, or 126 d in finishing lot; and 3) fall calving with slaughter beginning at about 14 mo of age after either 63, 126, or 189 d in finishing lot. Estimate efficiencies were < 1.0 in all treatments, even wine: assumed marketed calf crop was 100. Product energy output/cultural energy input ratios ranged from a high of 0.40 in the spring calving leads to stocker leads to 126 d in finishing lot treatment to a low of 0.23 in the spring calving leads to slaughter at weaning treatment. The low levels of efficiency were found to be largely the result of the interaction effects of the high levels of culture energy required to maintain a productive cow herd and grow and finish calves in the rather harsh environment of the Northern Great Plains. Result pointedly reveal the high level of dependency of the U.S. beef cattle industry on fossil fuels.

2222 Mossab, A.; Achouri, A. (1994) **[The effect of the incorporation of suruty wheat on the zootechnical performances of the broiler chicken]. Effets de l'incorporation d'un ble charbonne sur les performances zootechniques du poulet de chair.** *Bulletin Technique I.T.P.E (Algerie) (no. 6) p. 18-20.* 3 tableaux; 4 ref. French. (AGRIS 97-021791).

L02 ANIMAL FEEDING

2223 Bahman, AM.; Topps, JH.; Rooke, JA. (1997) **USE OF DATE PALM LEAVES IN HIGH CONCENTRATE DIETS FOR LACTATING FRIESIAN AND HOLSTEIN COWS.** *Journal of Arid Environments. 35(1):141-146.* English. [SAC ANIM & FEED TECHNOL DEPT 581 KING ST ABERDEEN AB24 5UD SCOTLAND].

Two production experiments of 12 weeks duration, beginning in week 5 of lactation, were conducted in Kuwait with lactating Friesian and Holstein cows offered a high concentrate diet together with freshly cut alfalfa and either barley straw or shredded senescent date palm leaflets (DPL). Milk yields, milk composition and live weight gains of cows given either DPL or barley straw in the two experiments did not differ significantly. Individual intakes of either roughage, measured in experiment 2, were also similar. Date palm leaves, which are waste byproducts in Kuwait, are therefore an acceptable alternative to imported barley straw as a roughage for dairy cows in Kuwait. (C) 1997 Academic Press Limited [References: 7].

2224 Cooper, S.D.B. (Scottish Agricultural College, Edinburgh, Scotland, UK.); Kyriazakis, I.; Oldham, J.D. (1996) **The effects of physical form of**

feed, carbohydrate source, and inclusion of sodium bicarbonate on the diet selections of sheep. *Journal of animal science (USA) v. 74(6) p. 1240-1251.* references. English. (AGRIS 97-022303).

We proposed an hypothesis that ruminants attempt to select a diet that promotes high levels of feed intake by maintaining optimal ruminal conditions. Three tests of the hypothesis considered whether the diet selection of sheep given either a choice of two high energy density (ED) feeds or a choice between a high and a low ED feed is affected by 1) sodium bicarbonate inclusion (NaHCO3; 1, 2, and 4 [wt/wt]) in the high [ED] feed); 2) dietary carbohydrate source (barley-based, B and sugar beet/ barley, S) of the high ED feed; or 3) physical form (alfalfa: pelleted, ALFP and long chop, ALFL) of the low ED feed. To conduct these, 42 lambs were used in seven 6 x 6 Latin squares, which were either foods ALFL and ALFP offered alone and paired with feed B or S and their NaHCO3 derivatives as a choice, or foods B and S offered alone and paired with their NaHCO3 derivatives as a choice. Each Latin square period lasted for 3 wk. For the choices between a NaHCO3-supplemented high ED feed and either a high or a low ED one, the inclusion of NaHCO3 increased feed intake. Its level of inclusion had a marked effect on the proportion of unsupplemented high ED feed selected ($P < 0.05$) but not on the proportion of low ED feed (alfalfa) selected. More alfalfa was selected when the high ED feed was based on barley (B) rather than sugar beet/barley (S) ($P < 0.05$). The physical form of the alfalfa affected diet selection because its selection was greater ($P < 0.001$) when ALFP (pelleted) was offered in the feed choice rather than ALFL (long-chop). The significant effects of NaHCO3 level, dietary carbohydrate, and physical form on the diet selection and feed intake of the sheep are consistent with the proposed experimental hypothesis.

2225 Forbes, J.M.; Covasa, M. (Department of Animal Physiology and Nutrition, University of Leeds, Leeds LS2 9JT (United Kingdom)) (1995) **Application of diet selection by poultry with particular reference to whole cereals.** *World's Poultry Science Journal (United Kingdom) v. 51(2) p. 149-165.* 94 ref. English. (AGRIS 97-007322).

2226 Golushko, V.M. (Belarus Research Institute of Animal Production, Minsk (Belarus)); Marusich, A.G.; Kovalenko, S.A. (Belarus Agricultural Academy, Gorki (Belarus)) (1996) **[Triticale in mixed fodders for feeder pigs]. Triticale v kombikormakh dlya otkarmlivaemogo molodnyaka svinej.** *Vestsi Akadehmii Agrarnykh Navuk Belarusi (Belarus) (no.2) p.64-67.* 4 tables; 5 ref. Russian. (AGRIS 97-007390).

It is defined that unprocessed grain of triticales should be added in mixed fodders for feeder pigs up to 40.5 per cent, processed grain - up to 73.5 per cent and by jetting methods. The daily increasing of live weight of animals grew accordingly to 8.5-10.6 per cent and feed expenditure per 1 kg of weight reduced by 7.4-9.0 per cent. The quality of slaughtering indices and pork carcass improved as well.

2227 Hadjipanayiotou, M.; Koumas, A. (Agricultural Res. Inst., Nicosia (Cyprus)) (1996) **Performance of sheep and goats on olive cake silages.** *Technical Bulletin (Cyprus); no. 176 12 p.* 7 tables; 1 illus. 16 ref. English. (AGRIS 97-022292).

Fresh olive cake was ensiled alone or with addition of urea, or poultry litter. The silages were tested for their nutritional value with Chios sheep ewe lambs, Damascus goat kids, and mature Chios ewes. Their digestion coefficients were determined with five Chios wethers per silage. Ensiled olive cake when fed as part of a finished diet of ewe lambs, goat kids and mature ewes, at moderate to low body weight gains has nutritional value greater than that obtained in vitro. Ensiling of olive cake with poultry litter gives a safe product that is nutritionally more balanced than olive cake ensiled alone.

2228 Hamrouni, S.; Amella, A.; Broca, A.; Maestro, M.; Sancho, J.V. (Universidad de Zaragoza, Zaragoza (Spain). Facultad de Veterinaria, Departamento de Agricultura y Economia Agrarias) (1995) **[Some trials on the use of barley for fattening Rasa Aragonesa (Aragon-Spain) lambs]. Quelques essais d'utilisation de l'orge dans l'engraissement des agneaux de la race Rasa Aragonesa (Aragon-Espagne).** Seminaire de l'Association Tunisienne des Anciens de l'Institut Agronomique Mediterraneen de Zaragoza (ATA-IAMZ). Kairouan (Tunisia). 18-19 Nov 1992. [Sheep production in arid and semi-arid zones]. L'Elevage ovin en zones arides et semi-arides. Caja, G. (Universidad Autonoma de Barcelona, Barcelona (Spain)); Djemali, M. (Institut National Agronomique de Tunisie, Tunis (Tunisie). Departement des Sciences Animales); Gabina, D. (Centre International de Hautes Etudes Agronomiques Mediterraneens, Zaragoza (Spain). Institut Agronomique Mediterraneen); Nefzaoui, A. (Institut National de la Recherche Agronomique de Tunisie, Ariana (Tunisie). Laboratoire de Nutrition Animale). *Cahiers Options Mediterraneennes (CIHEAM); v. 6 p. 81-85.* CIHEAM-IAMZ. 3 tables; 7 ref. French. (AGRIS 97-007241).

L'objectif principal de ce travail est de repondre a la necessite d'etudier quantitativement des systemes alternatifs de production d'agneaux en Aragon (nord-est de l'Espagne) bases sur l'utilisation des propres ressources de la region. Les essais realises consistent en une introduction de modifications legeres dans les systemes habituels d'engraissement (dilution a 50 pour cent du concentre commercial granule avec de l'orge et complementation de l'orge avec du foin). A meme poids vif a l'abattage, le melange concentre plus orge donne des gains de poids et des indices de transformation tres similaires a ceux du concentre commercial seul pour une duree d'engraissement un peu plus longue (une semaine). Il presente, en plus, des indices de frais d'alimentation par kg de gain de poids vif inferieurs. Il parait aussi que la distribution du foin au lieu de la paille (dans le cas de l'orge et du melange) donne des resultats semblables, c'est-a-dire des frais d'alimentation moins eleves.

2229 Huhtanen, P.; Heikkila, T. (1996) **EFFECTS OF PHYSICAL TREATMENT OF BARLEY AND RAPESEED MEAL IN DAIRY COWS GIVEN GRASS SILAGE-BASED DIETS.** *Agricultural & Food Science in Finland. 5(4):399-412.* English. [AGR RES CTR FINLAND INST ANIM PROD FIN-31600 JOKIOINEN FINLAND].

Twenty-four Ayrshire cows were used to study the effects of physical treatment of barley, rapeseed meal (RSM) supplementation and heat-moisture treatment of RSM on silage intake and milk production. Experimental design was a cyclic change-over with six dietary treatments. The treatments in a 2 x 3 factorial arrangement consisted of either untreated (UB) or heat-moisture treated barley (TB), given without protein supplementation (control) or with untreated or heat-moisture treated RSM. Grass silage was given nd libitum and the concentrates at a rate of 10 kg/d. For the RSM diets, 2 kg/d of the basal concentrate was replaced with either untreated or treated RSM. Treatment of barley decreased silage intake, the effect being greater when the supplement did not contain RSM. There was no effect on milk yield, but due to the lower milk fat content, energy corrected milk yield was lower in cows given TB than in those given UB. Feeding the TB diets was also associated with lower milk urea content, and with increased milk protein content but not protein yield. Faster initial rate of gas production in vitro suggested that the treatment of barley increased the rate of fermentation. Compared with the control diets, RSM supplementation significantly increased silage intake, milk yield, milk protein content and yields of all milk constituents. Heat-moisture treatment of RSM did not produce any further production response. [References: 45].

2230 Jeroch, H.; Danicke, S. (Institute of Animal Nutrition, Faculty of Agriculture, Martin Luther University Halle Wittenberg, Emil Abderhalden Strasse 25b, 06108 Halle (Saale) (Germany)) (1995) **Barley in poultry feeding: a review.** *World's Poultry Science Journal (United Kingdom) v. 51(3) p. 271-291, 337, 339, 342, 344.* 113 ref. English. (AGRIS 97-007371).

2231 Jukola, E. (Cultor Ltd., Helsinki, Finland.); Hakkarainen, J.; Saloniemi, H.; Sankari, S. (1996) **Effect of selenium fertilization on selenium in feedstuffs and selenium, vitamin E, and beta-carotene concentrations in blood of cattle.** *Journal of dairy science (USA) v. 79(5) p. 831-837.* references. English. (AGRIS 97-022217).

Selenium (n = 56), total vitamin E, and homologues of natural vitamin E in feedstuffs (n = 52) and the concentrations of Se (n = 241), vitamin E (n = 244), and beta-carotene (n = 227) in blood were measured. The mean (+/- SD) Se content in hay, grass silage, oats, and barley produced using fertilizers enriched with Se was 0.13 (+/- 0.169), 0.17 (+/- 0.704), 0.23 (+/- 0.107) and 0.21 (+/- 0.119) mg/kg of DM, respectively, and the mean (+/- SD) vitamin E contents, calculated as dl-alpha-tocopherol acetate equivalents, were 39.7 (+/- 13.0), 120.0 (+/- 40.27), 24.4 (+/- 3.83) and 34.5 (+/- 3.57) IU/kg of DM, respectively. The mean Se concentrations in whole blood of cows, heifers, bulls and calves fed hay (n = 62), silage (n = 111), or pasture (n = 68) varied from 183 to 244 micrograms/l. The mean concentrations of total vitamin E in serum of lactating cows fed hay (n = 21), silage (n = 29) or pasture (n = 26) were 2.8 (+/- 1.43), 6.5 (+/- 3.03) and 8.2 (+/- 2.64) mg/l, respectively. For calves, concentrations of vitamin E in serum were as low as 0.25 mg/L. The mean concentration of beta-carotene

in serum of lactating cows fed grass silage (n = 26) or pasture (n = 28) was 13.7 (+/- 6.61) and 15.4 (+/- 6.15) mg/L, respectively, but, in lactating cows fed hay (n = 20), concentrations were 2.5 (+/- 1.07) mg/L.

2232 Jurjanz, S.; Colinschoellen, O.; Laurent, F. (1996) **EFFECT OF THE STARCH NATURE OF THE ENERGY CONCENTRATE AND OF A METHIONINE SUPPLY ON THE REARING PERFORMANCE OF DAIRY COWS.** *Annales de Zootechnie. 45(5):467-476.* French. [INRA ENSAIA LAB SCI ANIM 2 AVE FORET DE HAYE BP 172 F-54505 VANDOEUVRE LES NANCY FRANCE].

The effect of two starch sources (potatoes and wheat) as a supply of rumen-protected methionine is studied in a latin square design using 12 dairy cows. Both diets are composed of maize silage, wheat straw soybean meal, formaldehyde-treated mixed meal (rape and soybean) and minerals supplemented by wheat or potato peeling residues. The diets have similar contents of energy (0.91 UFL/kg dry matter [DM]) and protein (105 g PDI/kg DM). They are supplied with or without 19 g of rumen-protected methionine. No effect was observed on the DM intake (22.1 kg/day), the milk yield (27.0 kg/day), the lactose content (50 g/kg), the protein yield (912 g/day) and the weight gain (338 g/day). The fat content, the fat yield and the yield of standard milk (4% of fat) were lower with the wheat diet (respectively, 34.2 vs 38.0 g/kg for potato diet, $P < 0.01$; 958 vs 1 045 g/day, $P < 0.01$; 25.5 vs 26.5 kg/day, $P < 0.10$); however. the ureamia and the nonprotein nitrogen content of the milk were higher (respectively, 0.38 vs 0.27 g/L, $P < 0.01$; 320 vs 272 mg/L, $P < 0.01$). The methionine supply increases the protein content (33.0 vs 32.2 g/kg, $P < 0.01$) but there is no significant effect of the starch source on this parameter. [References: 33].

2233 Khorasani, G.R. (University of Alberta, Edmonton, AB, Canada.); De Boer, G.; Kennelly, J.J. (1996) **Response of early lactation cows to ruminally undegradable protein in the diet.** *Journal of dairy science (USA) v. 79(3) p. 446-453.* references. English. (AGRIS 97-022192).

The objective of this study was to determine the response of dairy cows in early lactation to diets based on the recommendations of the Agricultural Research Council or the NRC for sustaining milk yield. Diets were formulated to satisfy the nutrient requirements of Holstein cows weighing 600 kg and yielding 35 kg of 3.5 fat milk/d according to either Agricultural Research Council recommendations or NRC recommendations for RUP. A third diet was a 1:1 (wt/wt) mixture of the Agricultural Research Council and the NRC diets. The same forage was fed in all diets at a forage to concentrate ratio of 40:60, and the RUP supply was altered by substituting fish and corn gluten meal for canola meal. The calculated effective degradabilities of CP for the TMR were 70.1, 66.1, and 62.1 for the Agricultural Research Council diet, the mixture of Agricultural Research Council and NRC diets, and the NRC diet, respectively. Milk composition was similar for the three dietary treatments. Multiparous cows showed a linear yield response (30.4, 31.6, and 33.7 kg/d) to increasing inclusion of the NRC concentrate in the diet. No response to additional RUP was observed for first lactation heifers. Agricultural Research Council recommendations for dietary RUP underestimated the requirements for multiparous cows in early lactation yielding > 25 kg of milk/d.

2234 Khorasani, G.R. (University of Alberta, Edmonton, AB, Canada.); Okine, E.K.; Kennelly, J.J. (1996) **Forage source alters nutrient supply to the intestine without influencing milk yield.** *Journal of dairy science (USA) v. 79(5) p. 862-872.* references. English. (AGRIS 97-022195).

Eight Holstein cows in early lactation and fitted with ruminal and duodenal cannulas were used in a 4 X 4 Latin square design experiment to determine the influence of forage source on microbial digestion in the rumen and nutrient supply to the intestine and to determine relationships between DMI, ruminal fill, and NDF content of silage. Cows were fed a TMR formulated to contain a 50:50 concentrate:forage ratio. A significant negative correlation was found between dietary NDF concentration (range 32.2 to 37.9) and DMI (16.7 to 19.6 kg/d). In addition to forage NDF concentration, the lower DMI of cows fed oat or triticale silage (16.7 and 17.2 kg/d, respectively) relative to that of cows fed barley or alfalfa silage (18.6 and 19.6 kg/d, respectively) might reflect a lower true rate of NDF digestion (range 2.39 to 4.09/h), higher ruminal turnover time (12.9 to 17.1 h), and lower rate of NDF intake (3.31 to 3.96/h). However, differences in ruminal bacterial yield, ruminal metabolites, and nutrient supply to the intestine associated with different silages had no major effect on dairy cow performance. We concluded that the dairy cow can maintain similar milk yield despite marked differences in the type of end products arising from carbohydrate and protein digestion.

2235 Lia, A.; Sundberg, B.; Aman, P.; Sandberg, AS.; Hallmans, G.; Andersson, H. (1996) **SUBSTRATES AVAILABLE FOR COLONIC FERMENTATION FROM OAT, BARLEY AND WHEAT BREAD DIETS - A STUDY IN ILEOSTOMY SUBJECTS.** *British Journal of Nutrition. 76(6):797-808.* English. [GOTHENBURG UNIV DEPT CLIN NUTR GOTHENBURG SWEDEN].

Nutrients not absorbed in the small bowel will form substrates for microbial growth in the colon which may have implications for the development of colon cancer. The aim of the present study was to investigate whether fibre-rich oat and barley diets increase the excretion of energy-supplying nutrients from the small bowel compared with a low-fibre wheat diet, and whether a possible increase could be related to the beta-glucan content. Nine ileostomy subjects were served four types of bread together with a low-fibre basal diet (12 g dietary fibre/d). The breads were based on either wheat flour (W diet, 7 g dietary fibre/d), oat bran (OB diet, 29 g dietary fibre/d), the same amount of oat bran with addition of beta-glucanase (EC 3.2.1.4) (OBE diet, 19 g dietary fibre/d) or a fibre-rich barley fraction (B diet, 35 g dietary fibre/d). An increased ileal excretion of starch was observed with the barley diet but no effect of the oat beta-glucan on starch recovery was found. The NSP + Klason lignin in the ileostomy effluents accounted only for 24, 31, 24 and 35% of the gross energy excretion in the W, OB, OBE and B diet periods respectively. A large part of the dry weight and energy (30, 21, 28 and 27%, in the W, OB, OBE and B diets respectively) in the effluents could not be identified as fat, protein, total starch or NSP + Klason lignin. This unidentified part was probably made up of oligosaccharides, endogenous losses and nutrient complexes. Methods for identifying and analysing these components should be developed and their role as substrates for colonic fermentation and colon cancer development ought to be investigated. [References: 53].

2236 Mayne, C.S.; Doherty, J.G. (Agricultural Research Institute of Northern Ireland, Co. Down BT26 6DR (United Kingdom)) (1996) **The effect of fine grinding or sodium hydroxide treatment of wheat, offered as part of a concentrate supplement, on the performance of lactating dairy cows.** *Animal Science (United Kingdom) v. 63(1) p. 11-19.* 21 ref. English. (AGRIS 97-022159).

2237 Moorby, J.M.; Dewhurst, R.J.; Thomas, C.; Marsden, S. (Grassland and Ruminant Science Department, Scottish Agricultural College, Auchincruive, Ayr KA6 5HW (United Kingdom)) (1996) **The influence of dietary energy source and dietary protein level on milk protein concentration from dairy cows.** *Animal Science (United Kingdom) v. 63(1) p. 1-10.* 44 ref. English. (AGRIS 97-007411).

2238 Petit, HV.; Santos, GTD. (1996) **MILK YIELD AND COMPOSITION OF DAIRY COWS FED CONCENTRATE BASED ON HIGH MOISTURE WHEAT OR HIGH MOISTURE CORN.** *Journal of Dairy Science. 79(12):2292-2296.* English. [AGR & AGRI FOOD CANADA SHEEP RES FARM LA POCATIERE PQ G0R 1Z0 CANADA].

Thirty-six Ayrshire cows were assigned to 18 pairs and were blocked within parity (5 pairs of primiparous heifers and 13 pairs of multiparous cows); pairs had similar calving dates. The study, which was conducted over 3 yr, was designed to determine the effects of high moisture grain on milk yield and composition and to determine in vitro DM digestibility and ruminal degradabilities of DM, N, and starch of high moisture grains. Treatment diets consisted of isonitrogenous and isoenergetic concentrates that were based on high moisture wheat or high moisture corn. Both groups were fed a mixture of grass silage, grass hay, protein supplement, and a vitamin and mineral mix for ad libitum intake. Treatment diets were fed from wk 4 to 29 and from wk 4 to 37 of lactation for cows in first and second lactations, respectively. There was no interaction between treatment diet and year of lactation. Cows fed high moisture wheat had higher 4% FCM than did cows fed high moisture corn. Milk composition was similar for the two treatment diets. Ruminal degradabilities of DM and starch were higher for high moisture wheat than for high moisture corn. In vitro DM digestibility was higher for high moisture wheat (90.5%) than for high moisture corn (71.6%). This greater digestibility contributed to the higher milk yield of dairy cows fed high moisture wheat. [References: 13].

2239 Pomianowski, J.F. (Akademia Rolniczo Techniczna, Olsztyn (Poland). Inst. Zywienia Czlowieka); Majewska, T. (Akademia Rolniczo Techniczna, Olsztyn (Poland). Katedra Drobiarstwa); Borowski, J. (1995) **[Influence of turkey feedings methods on changes occurred during cooking meat]. Wplyw sposobu zywienia indykow na zmiany zachodzace podczas obrobki cieplnej miesa.** *Acta Academiae Agriculturae ac Technicae Olstenensis. Technologia Alimentorum (Poland) (no.28) p. 89-98.* 4 tables; 19 ref. Polish. (AGRIS 97-022349).

It was shown that the greatest percentage of white meat, the highest water absorption and greatest protein digestibility was characteristic of carcass of the turkeys that the 4th week had a free choice between feed mixtures and whole wheat grain. The greatest percentage of indispensable unsaturated fatty acids was found in the fat extracted from carcass of control group birds fed on standard mixtures.

2240 Richter, G.; Ochrimenko, W.I.; Lemser, A.; Mueller, A. (1995) **[Testing of enzymes in fattening turkeys with wheat basal rations]. Pruefung von Enzymen in der Putenmast mit Weizenbasalrationen.** 5. Symposium. Jena (Germany). 28-29 Sep 1995. *[Vitamins and additives in the nutrition of human and animal]. Schubert, R.; Flachowsky, G.; Bitsch, R. (eds.). Vitamine und Zusatzstoffe in der Ernaehrung von Mensch und Tier. Thueringer Landesanstalt fuer Landwirtschaft, Remderoda (Germany) p. 412-417.* Kessler GmbH. 3 tables; 8 ref. German. (AGRIS 97-007409).

Verschiedene Enzyme (ZY 28, ZY 88) bzw. -dosierungen (1000-0 g/t Futter) hatten in einem 6-phasigen Putenmastversuch keinen sign. Einfluss auf die Gewichtszunahmen. 500 mg ZY 28 ueber die gesamte Mastperiode von 20 Wochen waren am guenstigsten (3 hoehere Gewichtszunahme, 5.6 bessere Futterverwertung).

2241 Rose, S.P. (National Institute of Poultry Husbandry, Harper Adams College, Newport, Shropshire TF10 8NB (United Kingdom)) (1996) **The use of whole wheat in poultry diets.** *World's Poultry Science Journal (United Kingdom) v. 52(1) p. 59-60.* 4 ref. English. (AGRIS 97-022223).

2242 Samuli, E. (Estonian Agricultural Univ., Tartu (Estonia)) (1995) **[The effect of feed energy level, calcium source and free choice feeding of wheat grains and concentrate mash on layers feed intake]. Erineva soeoedaenergia taseme, erinevate kaltsiumiallikate ja nisu ning segajousoeoeda isu jaergi soeoetmise moju munakanade soeoedavotule.** Estonian Agricultural Univ., Tartu (Estonia). Institute of Animal Husbandry. *Proceedings of Institute of Animal Husbandry of Estonian Agricultural University (Estonia) (no.66) p. 145-149.* 1 ill., 3 tables; 8 ref. Estonian. (AGRIS 97-007296).

Feed intake of layers was significantly influenced by feed energy level. In case of feeding the laying hens with 12.00 MJ/kg energy level feed the fodder consumption was by 7.6 per cent lower than in case of feeding with 10.85 MJ/kg energy level feed. Feed consumption was higher in case of free choice feeding with wheat grains and concentrate mixture. Thus in case of application of free choise feeding more attention should be paid to reducing the costs per grains, grinding and mashing of feed. Calcium source affected the feed intake only in case of feeding with concentrate mixture. Feed intake increased in case of feed containing ground and coarse limestone. The experiment showed that layers can to a certain extent regulate their feed intake according to organism's requirements.

2243 Valaja, Jarmo; Siljander Rasi, Hilkka; Alaviuhkola, Timo; Rantanen, Asko (1996) **Lysine supplementation of barley wet distillers' solids diets for growing-finishing pigs.** *Agricultural and food science in Finland (Finland) v. 5(2) p. 157-166.* 31 ref.; 4 tables. English. (AGRIS 97-022328).

2244 Zinn, R.A. (University of California, El Centro.); Montano, M.; Shen, Y. (1996) **Comparative feeding value of hulless vs covered barley for feedlot cattle.** *Journal of animal science (USA) v. 74(6) p. 1187-1193.* references. English. (AGRIS 97-022145).

One hundred twenty medium-frame crossbred steers (364 kg) were used in a 106-d feedlot trial to compare the feeding value of Condor, a hulless barley (HB), with Leduc, a conventional covered barley (CB). Dietary treatments consisted of a finishing diet containing 77 grain (DM basis) as 1) steam-flaked corn (SFC); 2) dry-rolled HB (DRB-H); 3) steam-flaked HB (SFB-H); 4) dry-rolled CB (DRB-C); and 5) steam-flaked CB (SFB-C). Feed intake was lower (8.6, $P < 0.01$) for HB than for CB. Diet NE was greater for HB than for CB ($P < 0.01$) and for SFB than for DRB ($P < 0.01$). Incidence of liver abscess was greater for DRB than for SFB (239, $P < 0.05$) and for HB than for CB (167, $P < 0.10$). Diet NE were greater ($P < 0.10$) for SFC than for barley treatments. Treatment effects on characteristics of digestion were evaluated using five Holstein steers (202 kg) with cannulas in the rumen and proximal duodenum. There were barley variety X grain processing interactions on ruminal digestion of OM ($P < 0.10$), ADF ($P < 0.05$), and starch ($P < 0.05$). Ruminal OM digestion increased (9.0) with steam flaking HB and decreased slightly (1.9) with steam flaking CB. Ruminal digestion of starch was enhanced more dramatically (21.5 vs 8.4, respectively) with steam flaking HB than with CB. Steam flaking decreased ruminal ADF digestion of HB only slightly (6.2), whereas with CB the decrease was more dramatic (54.3). Ruminal degradable N was greater ($P < 0.10$) for CB than for HB and for DRB than for SFB (19.8, $P < 0.05$). Estimates of ruminal degradable N in DRB-H, SFB-H, DRB-C, and SFB-C were 69.7, 53.9, 78.5, and 65.0, respectively. Postruminal digestion of OM ($P < 0.01$), starch ($P < 0.05$), and N ($P < 0.10$) were greater for HB than for CB. Steam flaking barley increased ($P < 0.01$) postruminal N digestibility. Total tract digestibility of OM ($P < 0.01$), ADF ($P < 0.05$), starch ($P < 0.01$), and energy ($P < 0.01$) were greater for HB than for CB. Digestibility of ADF in barley hulls was only 6.4.

L20 ANIMAL ECOLOGY

2245 Kim, C.M.; Chung, T.Y. (Konkuk University, Seoul (Korea Republic). College of Animal Husbandry) (1995) **Studies on the eating and ruminating behaviour of sheep-(2)-Effect of cutting length of ammoniated barley straw.** *Korean Journal of Animal Nutrition and Feedstuffs (Korea Republic) v. 19(2) p. 166-171.* 6 tables; 18 ref. Korean. (AGRIS 97-022845).

L51 ANIMAL PHYSIOLOGY-NUTRITION

2246 Adams, N.R.; Sanders, M.R.; Briegel, J.R.; Peter, D.W.; Rigby, R.D.G. (CSIRO Division of Animal Production, PO Wembley, WA 6014 (Australia)) (1996) **Responses of sheep to annual cycles in nutrition. 2. Effects of diet and endogenous growth hormone during replenishment.** *Animal Science (United Kingdom) v. 62(2) p. 287-292.* 12 ref. English. (AGRIS 97-008382).

2247 Branton, SL.; Lott, D.; Deaton, JW.; Maslin, WR.; Austin, FW.; Pote, LM.; Keirs, RW.; Latour, MA.; Day, EJ. (1997) **THE EFFECT OF ADDED COMPLEX CARBOHYDRATES OR ADDED DIETARY FIBER ON NECROTIC ENTERITIS LESIONS IN BROILER CHICKENS.** *Poultry Science. 76(1):24-28.* English. [USDA ARS S CENT POULTRY RES LAB MISSISSIPPI STATE, MS 39762 USA].

Two trials utilizing two corn diets and four wheat diets were conducted. Ln Trial 2, all chicks were crop-infused at 9 d of age with Eimeria acervulina. Ln both trials, a broth culture of Clostridium perfringens was mixed with the diets for 3 consecutive d. Necrotic enteritis lesion scores were lowest in chickens consuming the corn diet with no C. perfringens and highest in chickens fed the wheat diets with C. perfringens. Chickens consuming a wheat diet with no added complex carbohydrates or added fiber exhibited the highest lesion score. Chickens on wheat diets with 4% new, ground, pine shavings had intestinal lesion scores intermediate to those of chickens that consumed the wheat or corn diets. Chickens consuming corn diets yielded the lowest lesion scores. Chickens provided diets containing either guar gum or pectin were not fully consumed and thus probably reduced the number of challenge organisms ingested. [References: 24].

2248 Cole, D.J.A.; Bourne, S.J.; Hunt, L.M. (1995) **Beta-glucanase and pentosanase in barley based diets for weaner pigs.** 5. Symposium. Jena (Germany). 28-29 Sep 1995. [Vitamins and additives in the nutrition of human and animal]. Schubert, R.; Flachowsky, G.; Bitsch, R. (eds.). *Vitamine und Zusatzstoffe in der Ernaehrung von Mensch und Tier p. 388-391. Nottingham Univ., Loughborough, Leics (United Kingdom). Sutton Bonington Campus.* Kessler GmbH. 4 tables; 2 ref. English. (AGRIS 97-008337).

Absetzferkeln wurde bei einer Diaet auf Gerstenbasis dem Futter 2.85 bzw. 5.70 kg beta-Glucanase/t Futter oder 2.0 bzw. 4.0 kg Pentosanase/t oder 1.43+1.0 kg bzw. 2.85+2.0 kg der Mischung zugesetzt. Die Verdaulichkeit von Trockensubstanz und Energie wurde sign. verbessert, das Wachstum wurde nicht beeinflusst. Pentosanase allein hatte geringe Wirkung.

2249 Eggum, B.O.; Damgaard, B.M.; Petersen, V.E.; Soerensen, P.; Hedemand, J.E. (1994) **[The influence of Cerone treated barley on reproduction in rats, mink, and hens]. Effekten af ceronebehandlet byg paa reproduktionsforholdene hos rotter, mink og hoens.** Statens Husdyrbrugsforsoeg, Foulum (Denmark).. *Forskningsrapport fra Statens Husdyrbrugsforsoeg (Denmark); no. 17 74 p.* SH. 77 tables; 18 ref. Legends in En. Danish. (AGRIS 97-008327).

2250 Freire, J.P.B. (Instituto Superior de Agronomia, Lisboa (Portugal)); Peiniau, J.; Cunha, L.F.; Almeida, J.A.A.; Aumaitre, A. (1996) **[Effect of level of wheat bran and fat source on digestive performance and serum cholesterol of Alentejano weaned piglets]. Effet du son de ble et de la nature des lipides du regime sur la digestibilite, l'activite des enzymes digestives et de la lipemie des porcelets mediterraneens de la race Alentejana [glucides parietaux].** *Annales de Zootechnie (France) v. 45(4) p. 357-368.* 33 ref., 5 tableaux. French. (AGRIS 97-008162).

2251 Glaeser, K.; Dusel, G.; Simon, O.; Jeroch, H. (1996) **[Effect of enzym preparations containing xylanase- and beta-glucanase activities on the viscosity of feed extracts and digesta of broiler chicken]. Einfluss von Enzympraeparaten mit Xylanase- und beta-Glucanaseaktivitaet auf die Futtermittelextrakt- und Digestaviskositaet bei Broilerkueken.** 50. Tagung der Gesellschaft fuer Ernaehrungsphysiologie. Goettingen (Germany) 27-29 Feb 1996. *[Proceedings of the Society of Nutrition Physiology]. Giesecke, D. (ed.). Berichte der Gesellschaft fuer Ernaehrungsphysiologieund TierProceedings of the Society of Nutrition Physiology (Germany); no. 5. Halle-Wittenberg Univ., Halle (Germany). Inst. fuer Tierernaehrung und Vorratshaltung p. 33.* DLG. 1 table. German. (AGRIS 97-008213).

2252 Goll, M.; Bokern, M.; Valenta, H.; Harms, H. (1996) **[Bioavailability to rats of plant non-extractable residues of Ochratoxin A]. Bioverfuegbarkeit pflanzlicher nicht-extrahierbarer Rueckstaende von Ochratoxin A in Ratten.** 50. Tagung der Gesellschaft fuer Ernaehrungsphysiologie. Goettingen (Germany) 27-29 Feb 1996. *[Proceedings of the Society of Nutrition Physiology]. Giesecke, D. (ed.). Berichte der Gesellschaft fuer Ernaehrungsphysiologieund TierProceedings of the Society of Nutrition Physiology (Germany); no. 5. Bundesforschungsanstalt fuer Landwirtschaft, Braunschweig (Germany). Inst. fuer Tierernaehrung p. 65.* DLG. 2 ref. German. (AGRIS 97-008361).

Zellwandgebundenes Ochratoxin A war teilweise verfuegbar.

2253 Hadjipanayiotou, M. (Agricultural Research Inst., Nicosia (Cyprus)); Antoniou, I.; Theodoridou, M.; Photiou, A. (1996) **In situ degradability of forages cut at different stages of growth.** *Livestock Production Science (Netherlands) v. 45(1) p. 49-53.* 20 ref. English. (AGRIS 97-023209).

2254 Holst, PJ.; Hall, DG.; Stanley, DF. (1996) **BARLEY GRASS SEED AND SHEARING EFFECTS ON SUMMER LAMB GROWTH AND PELT QUALITY.** *Australian Journal of Experimental Agriculture. 36(7):777-780.* English. [NSW AGR AGR RES STN COWRA NSW 2794 AUSTRALIA].

The effects of mature barley grass (Hordeum spp.) pasture on lamb growth rates, carcass weights and tanned pelt quality were examined for 180 crossbred lambs finished on summer pastures. The effect of shearing at weaning, using 2 types of combs (traditional or cover) was compared with a 'no shearing' treatment. Exposure to barley grass pasture over November and December produced growth rates of 82 +/- 5 g/day for lambs slaughtered in January compared with growth rates of 141 +/- 5 g/day on lucerne pasture over the same period. On the barley grass pasture, shearing gave an immediate and sustained advantage ($P<0.05$) in growth rate but no difference between cover or traditional comb. Carcass weights were 21.4 +/- 0.3 and 19.0 +/- 0.4 kg for lambs grazing lucerne pasture and barley grass pasture, respectively. Shearing reduced pelt damage from barley grass seed to the extent that 85% of unshorn pelts had >5 scars per pelt compared with 13% in pelts from shorn lambs. Type of shearing comb did not influence the result. The results suggest that maturing barley grass pastures must be avoided if adequate growth rates are to be achieved in weaner lambs. [References: 10].

2255 Ishizuka, S.; Kasai, T. (1996) **INHIBITORY EFFECT OF DIETARY WHEAT BRAN ON FORMATION OF ABERRANT CRYPT FOCI IN RAT COLON INDUCED BY A SINGLE INJECTION OF 1, 2-DIMETHYLHYDRAZINE.** *Bioscience Biotechnology & Biochemistry. 60(12):2084-2085.* English. [HOKKAIDO UNIV FAC AGR DEPT BIOSCI & CHEM KITA KU KITA 9 NISHI 9 SAPPORO HOKKAIDO 060 JAPAN].

The frequency of appearance of aberrant crypt foci (ACF) in the distal colon was significantly lower in rats fed a high fiber (20% wheat bran) diet than in those fed a fiber-free one at 4 weeks after a single injection of 1, 2-dimethylhydrazine (DMH, 20 mg/kg), although crypt/ACF was high in the former relative to the latter, This result suggests that dietary wheat bran effectively serves as a regulator of ACF frequency at early stages after DMH injection. [References: 17].

2256 Jamroz, D.; Wiliczkiewicz, A.; Skorupinska, J.; Orda, J.; Voelker, L. (Landwirtschaftliche Univ., Wroclaw (Poland). Lehrstuhl fuer Tierernaehrung und Futtermittelwirtschaft) (1996) **[The effect of increased Roxazyme G supplement in the broiler fed with triticale rich mixtures]. Zur Wirkung steigender Roxazyme-G-Zulagen bei Triticale-Verfuetterung an Broiler.** *Archiv fuer Gefluegelkunde (Germany) v. 60(4) p. 165-173.* 8 tables; 31 ref. German. (AGRIS 97-008202).

Der Einsatz von 45/55 Triticale in der Ration verminderte gegenueber der Kontrollration das Gewicht um 2, ein gleichzeitiger Einsatz von Roxazyme verbesserte das Gewicht um 4.3 (130 ppm, I) bzw. 2.3 (200 ppm, II) und 1.4 (250 ppm, III). Die Futterverwertung wurde bei I-III um 2.3, 1.8 und 1.3 verbessert, die Schlachtausbeute um 2 Einheiten verbessert. Die N-Verwertung wurde um 5.7 vermindert, Roxazyme verbesserte sie bei I um 4.3 und bei III um 11, entsprechend die P-Verwertung bei III um 15.6, obwohl die Tiere 6.5 weniger N und 4.2 weniger P aufgenommen hatten. Roxazyme erhoehte die Konz. fluechtiger Fettsaeuren im Duenndarm.

2257 Joo, J.W.; Kim, H.J.; Maeng, W.J. (Konkuk University, Seoul (Korea Republic). College of Animal Husbandry); Song, B.C. (Konkuk University, Seoul (Korea Republic). College of Natural Sciences) (1994) **Effects of processing method of barley and corn on the fermentation characteristics and degradability in the rumen.** *Korean Journal of Animal Nutrition and Feedstuffs (Korea Republic) v. 18(3) p. 196-204.* 6 tables; 22 ref. Korean. (AGRIS 97-023248).

2258 Jung, K.K. (Yeungnam University, Kyungsan (Korea Republic). Department of Animal Science); Jang, I.S. (Korea FDA, Seoul (Korea Republic). Department of Laboratory Animal Resources); Kim, D.Y. (Jeil Feed Company Limited, Seoul (Korea Republic). Department of Research and Technology) (1996) **A study on digestible nutrients, in situ nitrogen degradation, and pepsin digestibility of barley malted sprout.** *Korean Journal of Animal Nutrition and Feedstuffs (Korea Republic) v. 20(4) p. 355-359.* 4 tables; 16 ref. Korean. (AGRIS 97-008380).

2259 Jung, K.K. (Yeungnam University, Kyungsan (Korea Republic). Department of Animal Science); Jang, I.S. (Korea FDA, Seoul (Korea Republic). Department of Laboratory Animal Resources); Kim, D.Y. (Jeil Feed Company Limited, Seoul (Korea Republic). Department of Research and Technology) (1996) **Palatability, apparent digestibilities, nitrogen retention, and characteristics in the rumen and plasma of sheep fed barley malted sprout as a protein source.** *Korean Journal of Animal Nutrition and Feedstuffs (Korea Republic) v. 20(4) p. 347-354.* 5 tables; 36 ref. Korean. (AGRIS 97-008379).

2260 Kanauchi, O.; Agata, K. (1997) **PROTEIN, AND DIETARY FIBER-RICH NEW FOODSTUFF FROM BREWERS SPENT GRAIN INCREASED EXCRETION OF FECES AND JEJUNUM MUCOSAL PROTEIN CONTENT IN RATS.** *Bioscience Biotechnology & Biochemistry. 61(1):29-33.* English. [KIRIN BREWERY CO LTD CTR CORP RES & DEV APPL BIORES CTR 3 MIYAHARA CHO TAKASAKI GUMMA 37012 JAPAN].

We made a new protein-rich and fibrous foodstuff by milling and sieving brewer's spent grain, This product contained glutamine-rich protein and the dietary fibers cellulose, hemicellulose, and lignin. We called this product germinated barley foodstuff (GBF), GBF had the effect of increasing fecal dry weight and number of feces and of significantly increasing jejunum mucosal protein content in rats over the cellulose group, In GBF, Gin-rich protein is thought to have strong chemical bonds with dietary fiber, an arrangement which would be important in the way these physiological effects arise, As dietary supplements of Gin or dietary fibers (i.e., cellulose, hemicellulose, lignin, and a mixture of these) did not improve defecation and jejunum mucosal protein simultaneously, the effects of GBF are thought to be caused not by the individual ingredients, but by the combination of protein, vith dietary fiber. [References: 32].

2261 Kim, B.K. (Gyeongsang National University, Chinju (Korea Republic). Department of Dairy Science); Moon, Y.H. (Gyeongsang National University, Chinju (Korea Republic). Institute for Development of Livestock Production); Lee, S.C. (Rural Development Administration, Suwon (Korea Republic). National Livestock Research Station) (1995) **Evaluation of nutrient availabilities of NaOH-treated whole barley in digestive tracts of dairy cows using mobile nylon bag technique.** *Korean Journal of Animal Nutrition and Feedstuffs (Korea Republic) v. 19(4) p. 291-300.* 11 tables; 24 ref. Korean. (AGRIS 97-023179).

2262 Kluenter, A.M.; Devaud, A.; Voelker, L.; Steinberg, W. (1996) **[Influence of supplemental enzymes on performance and nutrient utilization of broiler chickens fed freshly-harvested wheat]. Einfluss einer Enzymzulage auf Leistung und Naehrstoffverwertung von Mastkueken bei Verfuetterung von frisch geerntetem Weizen.** 50. Tagung der Gesellschaft fuer Ernaehrungsphysiologie. Goettingen (Germany) 27-29 Feb 1996. *[Proceedings of the Society of Nutrition Physiology]. Giesecke, D. (ed.). Berichte der Gesellschaft fuer Ernaehrungsphysiologieund TierProceedings of the Society of Nutrition Physiology (Germany); no. 5. Ste Chimique Roche Ltd., Village-Neuf (France). Research Centre for Animal Nutrition p. 32.* DLG. German. (AGRIS 97-008212).

2263 Krawielitzki, K.; Kreienbring, F.; Schadereit, R.; Voelker, T. (Rostock Univ. (Germany). Agrarwissenschaftliche Fakultaet. Inst. fuer Umweltgerechte Tierhaltung) (1995) **[Time course of amino acid absorption in growing rats estimated after feeding of a (15)N-labelled wheat/yeast ration]. Untersuchungen zum zeitlichen Verlauf der Aminosaeurenresorption bei wachsenden Ratten nach Verfuetterung einer (15)N-markierten Weizen/Heferation.** *Archives of Animal Nutrition (Germany) v. 48(1-2) p. 37-51.* 7 tables; 22 ref. German. (AGRIS 97-008354).

Die Kombination von (15)N-Tracer- und TiO2-Markertechnik ist geeignet, den zeitlichen Verlauf des Transits und die Variation des Verhaeltnisses exogene AS:endogene AS fuer die einzelnen Abschnitte des Verdauungstraktes zu bestimmen und die faekale u. praezaekale Verdaulichkeit der einzelnen AS abzuschaetzen. Der zeitliche Verlauf der Sekretion u. Resorption einzelner AS sollte mittels GC-MS- bzw. GC-C-IRMS-Technik noch mehr praezisiert werden. Eine Uebertragbarkeit der Methode auf Schweine scheint moeglich.

2264 Lalles, J.P. (Institut National de la Recherche Agronomique, Rennes (France). Centre de Rennes, Jeune Ruminant); Toullec, R. (1996) **[Digestion of plant proteins and gut hypersensitivity in the preruminant calf]. Digestion des proteines vegetales et hypersensibilite digestive chez le veau preruminant.** *Productions Animales (France) v. 9(4) p. 255-264.* 30 ref. French. (AGRIS 97-008177).

2265 Lee, S.C.; Kim, B.K.; Chung, Y.H. (Rural Development Administration, Suwon (Korea Republic). National Livestock Research Institute); Moon, Y.H. (Gyeongsang National University, Chinju (Korea Republic). Institute for Development of Livestock Production); Kang, H.S. (Gyeongsang National University, Chinju (Korea Republic). Department of Dairy Science) (1996) **Effects of dietary energy and protein sources on the nutrient metabolism and microbial protein synthesis-(1)-Effects of combinations of formaldehyde treated-energy feed and protein source on characteristics of rumen fermentation and blood composition in dairy cows.** *Korean Journal of Animal Nutrition and Feedstuffs (Korea Republic) v. 20(2) p. 159-168.* 7 tables; 24 ref. Korean. (AGRIS 97-008266).

2266 Lee, S.C.; Kim, B.K.; Chung, Y.H. (Rural Development Administration, Suwon (Korea Republic). National Livestock Research Institute); Moon, Y.H. (Gyeongsang National University, Chinju (Korea Republic). Institute for Development of Livestock Production); Kang, H.S. (Gyeongsang National University, Chinju (Korea Republic). Department of Dairy Science) (1996) **Effects of dietary energy and protein sources on the nutrient metabolism and microbial protein synthesis-(2)-Effects of combinations of formaldehyde treated-energy feed and protein source on digestibility and nutrient flow to duodenum, and rumen microbial protein synthesis in dairy cow.** *Korean Journal of Animal Nutrition and Feedstuffs (Korea Republic) v. 20(2) p. 169-180.* 6 tables; 35 ref. Korean. (AGRIS 97-008267).

2267 Lee, S.C.; Moon, Y.H.; Kim, B.K.; Chung, Y.H. (Rural Development Administration, Suwon (Korea Republic). Livestock Experiment Station) (1994) **The effect of processings on digestive tract degradation of corn and barley grains in dairy cow-(1)-Ruminal degradabilities of physically processed corn and barley grains.** *Korean Journal of Animal Nutrition and Feedstuffs (Korea Republic) v. 18(1) p. 20-29.* 8 tables; 20 ref. Korean. (AGRIS 97-023176).

2268 Liebert, F.; Iv, P.; Koehler, R.; Wecke, C. (1995) **[Effects of enzyme supplementation in wheat based chicken diets on gut viscosity and nutrient utilization]. Zum Einfluss von Enzymgaben in weizenreichen Futtermischungen auf Chymusviskositaet und Naehrstoffverwertung beim Broiler.** 5. Symposium. Jena (Germany). 28-29 Sep 1995. *[Vitamins and additives in the nutrition of human and animal]. Schubert, R.; Flachowsky, G.; Bitsch, R. (eds.). Vitamine und Zusatzstoffe in der Ernaehrung von Mensch und Tier. Leipzig Univ. (Germany). Wissenschaftsbereich Tierernaehrungsphysiologie und Futtermittelkunde p. 453-456.* Kessler GmbH. 5 tables. German. (AGRIS 97-008211).

Nur bei extremer Intensitaet des Expandierens (120 C) trat ein sign. Anstieg der Chymusviskositaet auf, der jedoch durch Supplementation von Avizyme tx vollstaendig beseitigt wurde. Die Futterbehandlungen waren ohne sign. Auswirkungen auf Parameter der N- und Energieverwertung.

2269 Madrid, J.; Hernandez, F.; Pulgar, MA.; Cid, JM. (1996) **DRIED LEMON AS ENERGETIC SUPPLEMENT OF DIET BASED ON UREA-TREATED BARLEY STRAW - EFFECTS ON INTAKE AND DIGESTIBILITY IN GOATS.** *Animal Feed Science & Technology. 63(1-4):89-98.* English. [UNIV MURCIA DEPT ANIM PROD CAMPUS ESPINARDO E-30071 MURCIA SPAIN].

Voluntary intake and in vivo digestibility of diets based on treated straw (40 g urea kg(-1) straw dry matter) supplemented with dried lemon were determined. Twenty-four castrated male goats of the Murciano-Granadina breed were used in the eight digestion trials. Four digestibility trials with alfalfa hay (100%) and alfalfa hay/dried lemon, untreated or urea-treated barley straw (50:50%) diets were conducted and digestibility by difference of dried lemon, untreated straw and urea-treated straw was calculated. Four trials were conducted using urea-treated straw based diets with dried lemon at four levels of supplementation (0, 100, 200 and 300 g DM per animal per day) in a completely randomized experiment. The urea treatment increased ($P < 0.05$) the DM digestibility of the straw. Digestible OM intake of supplemented diet increased ($P < 0.001$) with the inclusion of high levels of dried lemon. DM intake of urea-treated straw decreased ($P < 0.01$) as the level of dried lemon in the diet increased, but ME intake of the diet was increased ($P < 0.01$) by dried lemon supplementation ranging from 445.9 to 599.2 kJ kg(-1) LW(0.75) day(-1). DM and OM digestibility of the diets was increased ($P < 0.001$) by dried lemon supplementation. There were no differences ($P > 0.05$) in CP, CF, NDF, ADF or cellulose digestibility when the levels of supplement in diets increased. The digestibility of urea-treated straw was determined by difference. In general, a dried lemon supplement had no effect ($P > 0.05$) on digestibility of the proximate principles or cell wall constituents of the urea-treated barley straw. Results from the present study indicate that dried lemon could be used as a supplement to raise the digestible organic matter concentration of the urea-treated straw based diets without affecting the digestive utilization of the basal roughage. However, a decrease in treated straw intake when the level of supplement in the diet increased was observed. [References: 37].

2270 Martin, C.; Michalet Doreau, B. (Institut National de la Recherche Agronomique, Saint Genes Champanelle (France). Station de Recherches sur la Nutrition des Herbivores) (1996) **Influence of barley and buffer supplements on quantitative aspects of ruminal fiber digestion of cows.** *Archives of Animal Nutrition (Germany) v. 49(3) p. 203-211.* 5 tables; 34 ref. English. (AGRIS 97-008254).

Gerste (Ration aus 65 Heu u. 35 Gerste) senkte die NDF-und ADF-Verdauung, die Passagerate der festen und fluessigen Fraktionen im Pansen wurde nicht beeinflusst. Eine Bicarbonatloesung verbesserte die Verdaulichkeit gegenueber der Gersteration, sie war aber geringer als die der Kontrollration (Heu). Die Passageraten wurden nicht beeinflusst.

2271 Moon, Y.H. (Gyeongsang National University, Chinju (Korea Republic). Institute for Development of Livestock Production); Kim, B.K. (Gyeongsang National University, Chinju (Korea Republic). Department of

Dairy Science); Lee, S.C. (Rural Development Administration, Suwon (Korea Republic). National Livestock Research Institute) (1995) **Effects of NaOH-treated whole barley on ruminal characteristics and digestive tract availabilities of nutrients in dairy cow.** *Korean Journal of Animal Nutrition and Feedstuffs (Korea Republic) v. 19(5) p. 379-386.* 4 tables; 25 ref. Korean. (AGRIS 97-023181).

2272 Nonn, H.; Caneta, G.; Kracht, W.; Jeroch, H.; Simon, O. (1996) **[Effect of supplementation of a carbohydrate hydrolysing enzyme preparation on the digestibility of cereal diets in weaning piglets]. Auswirkungen des Zusatzes eines kohlenhydratspaltenden Enzympraeparates auf die Verdaulichkeit von getreidereichen Futtermischungen bei Absetzferkeln.** 50. Tagung der Gesellschaft fuer Ernaehrungsphysiologie. Goettingen (Germany) 27-29 Feb 1996. *[Proceedings of the Society of Nutrition Physiology]. Giesecke, D. (ed.). Berichte der Gesellschaft fuer Ernaehrungsphysiologieund TierProceedings of the Society of Nutrition Physiology (Germany); no. 5. Halle-Wittenberg Univ., Halle (Germany). Inst. fuer Tierernaehrung und Vorratshaltung p. 31.* DLG. 1 table. German. (AGRIS 97-008340).

2273 Ojowi, MO.; Christensen, DA.; Mckinnon, JJ.; Mustafa, AF. (1996) **THIN STILLAGE FROM WHEAT-BASED ETHANOL PRODUCTION AS A NUTRIENT SUPPLEMENT FOR CATTLE GRAZING CRESTED WHEATGRASS PASTURES.** *Canadian Journal of Animal Science. 76(4):547-553.* English. [UNIV SASKATCHEWAN DEPT ANIM & POULTRY SCI SASKATOON SK S7N 5B5 CANADA].

An 84-d trial was conducted to evaluate the use of thin stillage from wheat based ethanol production as a nutrient supplement for cattle grazing crested wheatgrass. Forty medium-frame steers were allotted to eight CWG pastures (5 pasture(-1)) and supplied with either water or thin stillage as a fluid source. Measurements included daily intake of fluid, biweekly weight gains, start and end of test ultrasonic backfat measurements, and blood plasma samples on days 42, 56, and 70 of the trial. Samples of thin stillage and biweekly clippings of the CWG pastures were collected throughout the trial for analysis. Thin stillage averaged 8.4 +/- 0.35, 48.5 +/- 1.83, 9.6 +/- 1.63, 34.5 +/- 4.55, and 3.4 +/- 0.44% (DM basis) CP, EE, NDF and ADF, respectively. Cattle with access to thin stillage exhibited superior ($P < 0.05$) weight gains from day 42 through day 84 of the trial. Cumulative weight gains were 1.39 +/- 0.14 and 0.91 +/- 0.27 kg d(-1), respectively, for the thin stillage and water fed cattle ($P < 0.05$), an increase of 53%. Fluid intake of the cattle on stillage was 48.2 +/- 2.7 L d(-1) or 67% greater ($P < 0.05$) than that for animals on water (28.9 +/- 1.53 L d(-1)). Daily DM intake from thin stillage estimated from fluid intake was 4.1 kg. The superior liveweight gain of cattle fed thin stillage was reflected in higher ($P < 0.05$) backfat levels at the end of test (2.51 vs. 0.6 mm) and higher ($P < 0.05$) plasma urea, Mg, and P levels. The results of this study indicate that thin stillage from wheat-based ethanol production is a valuable nutrient source for cattle grazing CWG. [References: 26].

2274 Oloffs, K.; Kluge, H.; Jeroch, H.; Schoener, F.J. (1996) **[Effectiveness of NSP hydrolyzing enzymes on nutrient digestibility and metabolizable energy in laying hens]. Wirksamkeit Nicht-Staerke-Polysaccharide (NSP) hydrolysierender Enzyme insbesondere auf die Naehrstoffverdaulichkeit und die Umsetzbarkeit der Bruttoenergie bei Legehennen.** 50. Tagung der Gesellschaft fuer Ernaehrungsphysiologie. Goettingen (Germany) 27-29 Feb 1996. *[Proceedings of the Society of Nutrition Physiology]. Giesecke, D. (ed.). Berichte der Gesellschaft fuer Ernaehrungsphysiologieund TierProceedings of the Society of Nutrition Physiology (Germany); no. 5. Halle-Wittenberg Univ., Halle (Germany). Inst. fuer Tierernaehrung und Vorratshaltung p. 37.* DLG. 1 table. German. (AGRIS 97-008312).

2275 Petkevicius, S.; Knudsen, KEB.; Nansen, P.; Roepstorff, A. (1996) **THE INFLUENCE OF DIET ON INFECTIONS WITH ASCARIS SUUM AND OESOPHAGOSTOMUM DENTATUM IN PIGS ON PASTURE.** *Helminthologia (Bratislava). 33(4):173-180.* English. [ROYAL VET & AGR UNIV DANISH CTR EXPT PARASITOL DEPT VET MICROBIOL BULOWSVEJ 13 DK-1870 FREDERIKSBERG C COPENHAGEN DENMARK].

The influence of two diets varying in type and level of carbohydrates on pasture-reared pigs naturally infected with Ascaris suum and Oesophagostomum dentatum was investigated. Twenty worm-free pigs, from a specific pathogen-free farm were divided into two comparable groups and pastured for 20 weeks. The diets consisted of a traditional ground barley plus protein feed (diet A) and barley flour plus Raftiline" plus sugar beet fibre plus protein (diet B), respectively. The faecal egg excretion was followed and subsequently all pigs were slaughtered and worm numbers, worm location, sex, developmental stage and female worm fecundities were determined. A. suum and O. dentatum faecal eggs counts, worm burdens and female worm fecundities were significantly higher in group A than in group B ($P < 0.001$). The diet (A) rich in insoluble non-starch polysaccharides and lignin apparently provided favourable conditions for the establishment of A. suum and O. dentatum, whereas diet B low in lignin and with a higher content of soluble non-starch polysaccharides, led to significant reduction in worm numbers and female worm fecundities. [References: 23].

2276 Riveros V, Edmundo (Chile Univ., Santiago (Chile). Fac. de Ciencias Agrarias y Forestales. Dept. de Produccion Animal); Alvarez G, Loreto; Mansilla M, Alberto (1995) **[Predictive efficiency of an enzymatic method to estimate the in vivo organic matter digestibility of alfalfa (Medicago sativa) and wheat (Triticum aestivum)]. Eficiencia predictiva de un metodo enzimatico de estimacion de la digestibilidad in vivo de la materia organica de cultivos de alfalfa (Medicago sativa) y trigo (Triticum aestivum).** *Avances en Produccion Animal (Chile) v. 20(1-2) p. 137-150.* 30 ref. Parte de tesis de grado del segundo autor. Spanish. (AGRIS 97-023128).

Con el fin de conocer la eficiencia predictiva de metodos enzimaticos para estimar la digestibilidad in vivo de la MO (Do) de forrajes en diferentes estados de desarrollo, se usaron 20 muestras de alfalfa y 22 de trigo, desde la iniciacion de su rebrote anual o de su crecimiento, hasta su madurez. A cada muestra se le determino su Do y posteriorpnente se sometieron a mediciones de digestibilidad enzimatica de la MO usando una celulosa comercial de 10.000 unidades de actividad por gramo (Der10) y otra de 16.000 (Ders); medicion de la digestibilidad in vitro dos etapas (Di) y contenidos de N, MO, lignina, hemicelulosa, FDN, FDA, celulosa y silice. Con los resultados, se calcularon ecuaciones de regresion simple y multiples paso a paso, para obtener una ecuacion de predicion de la Do. Cuando el coeficiente de determiinacion resulto bajo (<0, 5), se eliminaron los puntos mas alejados a la curva y se analizo el mejoramiento logrado de R2. Conjuntamente, con el mismo objetivo se incorporaron otras variables en la ecuacion. Para la alfalfa ninguno de los metodos resulto satisfactorio para predecir la Do, obteniendose valores de R2 inferiores a 0, 4 (P>0, 05). La eliminacion de puntos y la incorporacion de otras variables no permitieron mejorar la eficiencia predicitva. La ecuacion mas eficiente resulto ser Do = 171, 84 - 1, 13 De - 1, 57 Li con R2 = 0, 26 y P = 0, 03. Para trigo los metodos enzimaticos resultaron de gran eficiencia predictiva, obteniendose valores de R2 entre 0, 66 y 0, 99 con P<0, 001. Aunque la eliminacion de puntos y la incorporacion de otras variables tendio a mejorar la eficiencia, las ecuaciones que solo consideraron los valores de De como variable independiente, resultaron suficientemente eficientes como predictoras, obteniendose las ecuaciones Do = 16, 26 + 0, 87 Ders y Do = 19, 55 + 0, 86 Der 10, con valores de R2 de 0, 67 y 0, 66, respectivamente (ambas con P<0, 001). Los resultados de los metodos enzimaticos fueron consistentes con los obtenidos con el metodo de Di usado como referente.

2277 Schulz, E.; Berk, A. (1995) **[Efficacy of microbial phytase in diets differing in native phytase activities]. Wirksamkeit mikrobieller Phytase in Futtermischungen mit unterschiedlicher Eigenphytaseaktivitaet.** 5. Symposium. Jena (Germany). 28-29 Sep 1995. *[Vitamins and additives in the nutrition of human and animal]. Schubert, R.; Flachowsky, G.; Bitsch, R. (eds.). Vitamine und Zusatzstoffe in der Ernaehrung von Mensch und Tier. Bundesforschungsanstalt fuer Landwirtschaft, Braunschweig (Germany). Inst. fuer Tierernaehrung p. 434-439.* Kessler GmbH. 4 tables; 7 ref. German. (AGRIS 97-008190).

Durch Erhitzung bei Extrusion von Getreide wurde die pflanzeneigene (native) Phytaseaktivitaet reduziert und damit die P-Verdaulichkeit von 44 auf 18 verringert. Zusatz von mikrobieller Phytase (ZY 98) erhoehte die P-Verdaulichkeit in der Ausgangsmischung um 7 und bei der phytaseinaktivierten Mischung um 29. Die bei erhitztem Getreide sign. reduzierte P-Retention wurde durch Phytasezusatz fast ausgeglichen. Die Ca- zeigte eine Beziehung zur P-Verdaulichkeit.

2278 Vukic Vranjes, M. (Federal Institute of Technology, Zurich, Switzerland.); Wenk, C. (1996) **Influence of Trichoderma viride enzyme complex on nutrient utilization and performance of laying hens in diets**

with and without antibiotic supplementation. *Poultry science (USA) v. 75(4) p. 551-555.* references. English. (AGRIS 97-023167).

The experiment was designed to test possible interactions of an enzyme complex (product from Trichoderma viride) and a feed antibiotic (flavophospholipol) in a barley diet on metabolism variables and egg production performance of Warren Brown laying hens. The basal diet contained 40 winter barley (French cultivar "Express", six-row). The four treatments were as follows: O, control (without supplement); E, enzyme complex, 600 ppm; A, flavophospholipol, 10 ppm; EA, enzyme complex, 600 ppm and flavophospholipol, 10 ppm. The enzyme complex contained the following main activities: cellulase (10, 500 U/g), endo-beta-(1:3)(1:4)-glucanase (24, 000 U/ g), and xylanase (32, 000 U/g). The enzyme positively influenced AME content of the feed, organic matter (OM) utilization, and neutral detergent fiber (NDF) degradability (P less than or equal to 0.01). When supplemented alone, the antibiotic had no influence on energy and nutrient utilization. No significant differences in egg production due to dietary treatments were observed. A significant enzyme by antibiotic interaction for AME (P less than or equal to 0.01) and OM utilization (P less than or equal to 0.001) as well as NDF degradability (P less than or equal to 0.01) indicated a reduced enzyme effect in the diet containing antibiotic. Negative enzyme by antibiotic interaction for energy utilization in laying hens suggested that the positive response to dietary enzyme supplementation in the mature laying hen (Treatment O vs E) was to great extent mediated by the activity of intestinal microbes.

2279 Yang, WZ.; Beauchemin, KA.; Rode, LM. (1996) **RUMINAL DIGESTION KINETICS OF TEMPER-ROLLED HULLESS BARLEY.** *Canadian Journal of Animal Science. 76(4):629-632.* English. [AGR & AGRI FOOD CANADA RES CTR POB 3000 LETHBRIDGE AB T1J 4B1 CANADA].

In situ ruminal digestion kinetics of temper-rolled hulless barley were affected by the moisture content of grain prior to processing. A moisture content of 21% resulted in optimum ruminal digestion of temper-rolled hulless barley. [References: 7].

L52 ANIMAL PHYSIOLOGY-GROWTH AND DEVELOPMENT

2280 Blummel, M.; Paul, C.; Goodchild, A.; Becker, K. (1996) **GRINDING ENERGY AND IN VITRO GAS TECHNIQUE FOR THE ASSESSMENT OF SYRIAN BARLEY STRAWS - PHYSICAL AND MICROBIAL DEGRADATION AND VOLUNTARY FEED INTAKE BY SHEEP.** *Journal of Animal Physiology & Animal Nutrition-Zeitschrift fur Tierphysiologie Tierernahrung und Futtermittelkunde. 76(2-3):132-140.* English. [UNIV HOHENHEIM INST ANIM PROD TROP & SUBTROP 480 FRUWIRTHSTR 12 D-70599 STUTTGART GERMANY].

The extent and rate of in vitro gas production of 40 Syrian barley straws, from various varieties with known dry matter intakes (DMI), were examined. The physical resistance of those straws to particle size reduction was also investigated, by using a grinding method (GER) which measures the electrical energy required to reduce a defined amount of straw to a 1-mm particle size. In vitro gas-production parameters, and the logarithm of GER, were combined in multiple regressions to predict DMI. About 87 % ($p < 0.0001$) of the variation in DMI was accounted for by the combined measurements, with log GER alone accounting for 83.4 %; in vitro gas-production parameters contributed 2.9 % ($p < 0.01$) to the variation in DMI explained. The extent and rate of gas production, without log GER, explained 84 % of the variation in DMI, with the rate accounting for 80 % of the variation in DMI. The combination of any gas-volume measurement between 12 and 96 h of incubation and log GER accounted for 86-87 % of the variation in DMI. Log GER was found to be inversely related to the rate ($r = -0.93$, $p < 0.0001$) and extent ($r = -0.78$, $p < 0.0001$) of in vitro gas production. [References: 27].

2281 Helander, E.; Nasi, M.; Partanen, K. (1996) **EFFECTS OF SUPPLEMENTARY ASPERGILLUS NIGER PHYTASE ON THE AVAILABILITY OF PLANT PHOSPHORUS, OTHER MINERALS AND NUTRIENTS IN GROWING PIGS FED ON HIGH-PEA DIETS.** *Journal of Animal Physiology & Animal Nutrition-Zeitschrift fur Tierphysiologie Tierernahrung und Futtermittelkunde. 76(2-3):66-79.* English. [SUOMEN REHU OY KYLLINPORTTI 2 FIN-00241 HELSINKI FINLAND].

The effect of Aspergillus niger phytase on phytin-phosphorus utilization in barley-pea diets was measured with eight pigs (28-75 kg live weight) in a digestibility and balance experiment using a 2 x 2 x 2 factorial arrangement of treatments in a 6 x 8 cyclic change-over design. The experimental factors were pea level, phosphorus (P) level and phytase addition. The diets were composed of ground barley (500 or 750 g) and peas (500 or 250 g) and were supplemented with methionine, vitamins and minerals. A semi-leafless, white-flowered pea variety, 'Pika', was used in the experiment. The calculated total P content of high-P diets was 6.5 g/kg (the estimated digestible P, dP, 4.0 g/kg) and low-P diets 3.9 g/kg (1.4 g dP/kg) on average. Each diet contained 8.0 g/kg of calcium (Ca). The phytase supplementation, 1000 PU/g diet, was carried out with Finase(R) FP500. On low-P diets, the average improvement in ash digestibility due to phytase was 0.05 units, and 0.02 units on high-P diets. Phytase enhanced the digestibility of dry matter (DM, $p < 0.01$), organic matter ($p < 0.05$), crude protein ($p < 0.05$), crude fat ($p < 0.001$) and acid-detergent fibre ($p < 0.05$) on low-P diets. It also improved both P absorption ($p < 0.001$) from 0.40 to 0.56, and P retention ($p < 0.001$) from 0.40 to 0.55, and decreased P excretion in faeces by 0.25 ($p < 0.001$). The effects of phytase were less pronounced on high-P diets. On low-P diets, phytase supplementation increased Ca absorption by 0.08 units ($p < 0.01$) and Ca retention by 0.09 units ($p < 0.01$). Phytase did not affect Ca balance on high-P diets. The digestibility of P from peas was higher than from barley (0.47 vs. 0.36) and phytase improved it, in peas by 0.22 and in barley by 0.12 units. The digestibility coefficient for organic matter in peas was 0.93 and the digestible crude-protein content 194 g/kg DM. The NE-value for peas was 11.11 MJ/kg DM. On the basis of these results, supplementation of a barley-pea diet with microbial phytase seems to be an effective way of improving the utilization of vegetable P and consequently of decreasing the faecal output of P in growing pigs. The 'Pika' pea variety appears to be a good source of energy and protein for growing pigs. [References: 55].

L72 PESTS OF ANIMALS

2282 Seo, J.B.; Jin, B.R.; Kang, S.K. (Seoul National University, Suwon (Korea Republic). College of Agriculture and Life Sciences); Park, H.Y. (Korea Institute of Science and Technology, Taejon (Korea Republic). Korea Research Institute of Bioscience and Biotechnology); Shin, S.C.; Lee, B.Y.; Lee, C.K. (Forestry Administration, Seoul (Korea Republic). Forestry Research Institute) (1995) **Development of liquid culture media for the mass production of Beauveria bassiana blastospore.** *Korean Journal of Sericultural Science (Korea Republic) v. 37(2) p. 172-175.* 5 illus.; 8 ref. Korean. (AGRIS 97-024153).

L73 ANIMAL DISEASES

2283 Branton, S.L. (USDA, ARS, South Central Poultry Research Laboratory, Mississippi State, MS.); Lott, B.D.; May, J.D.; Hedin, P.A.; Austin, F.W.; Latours, M.A.; Day, E.J. (1996) **The effects of nonautoclaved and autoclaved water-soluble wheat extracts on the growth of Clostridium perfringens.** *Poultry science (USA) v. 75(3) p. 335-338.* references. English. (AGRIS 97-009712).

Clostridium perfringens is the causative agent of necrotic enteritis, a commonly diagnosed disease in chickens that is also observed in turkeys and geese. Two trials were conducted to determine the in vitro effect of filter-sterilized, water-soluble wheat extracts on the growth of C. perfringens. The extracts were either nonautoclaved or autoclaved at 121 C for 40 min and were used to reconstitute thioglycolate broth media. Results of this study suggest that growth of C. perfringens is suppressed in vitro by inclusion of either extract. Glycosyl composition analysis revealed no significant differences in arabinose, xylose, or mannose content between the nonautoclaved and autoclaved extracts. Galactose, glucose, and total glycosyl content were significantly higher in the nonautoclaved extract.

L74 MISCELLANEOUS ANIMAL DISORDERS

2284 Smith, W.J.; Edwards, S.A. (SAC Veterinary Services, Mill of Craibstone, Bucksburn, Aberdeen (United Kingdom)) (1996) **Ulceration of the pars oesophagea - the role of a factor in wheat.** *Pig Journal (United Kingdom) v. 36 p. 194-200.* 11 ref. English. (AGRIS 97-025434).

M12 AQUACULTURE PRODUCTON AND MANAGEMENT

2285 Al Ogaily, S.M.; Al Asgah, N.A.; Ali, A. (King Abdul Aziz City for Science and Technology, PO Box 6085, Riyadh 11442 (Saudi Arabia)) (1996) **Effect of feeding different grain sources on the growth performance and body composition of tilapia, Oreochromis niloticus (L.).** *Aquaculture Research (United Kingdom) v. 27(7) p. 523-529.* 31 ref. English. (AGRIS 97-010666).

N10 AGRICULTURAL STRUCTURES

2286 Bucklin, R.A. (University of Florida, Gainesville, FL.); Molenda, M.; Bridges, T.C.; Ross, I.J. (1996) **Slip-stick frictional behavior of wheat on galvanized steel.** *Transactions of the ASAE (USA) v. 39(2) p. 649-653.* references. English. (AGRIS 97-025741).

Test blades of galvanized steel were pulled through wheat to study the frictional behavior between wheat and the blades. The effects of wear and dust accumulation on wheat grains were studied by pulling three blades through grain samples which had been conveyed in repeated cycles in mass flow and bucket conveyors. The test blades were pulled at a velocity of 0.05 mm/min and at overbearing grain pressures of 3.9, 6.6, 9.2, and 11.8 kPa. No statistically significant influences (a = 5) of grain wear or overbearing pressure were found on the coefficient of friction between wheat and galvanized steel. Slip-stick behavior was observed in all of the tests of the effects of wear on wheat grains. Slip-stick behavior between wheat and galvanized steel was studied by pulling six blades of galvanized steel (three new blades and three preconditioned blades) through a bed of wheat at varying velocities from 0.05 to 50 mm/min and at overbearing pressures of 3.9, 6.6, 9.2, and 11.8 kPa. The velocity at which slip-stick behavior ended and smooth behavior began was defined as the critical velocity. Pressure had no statistically significant influence on the critical velocity. However, a statistically significant (a = 5) relationship was found between the coefficient of friction and the critical velocity.

2287 Hardin, B.O. (University of Kentucky, Lexington.); Bucklin, R.A.; Ross, I.J. (1996) **Shear-beam analysis for seismic response of metal wheat bins.** *Transactions of the ASAE (USA) v. 39(2) p. 677-687.* references. English. (AGRIS 97-025742).

Grain bins are often located in areas where the risk of earthquakes requires they be designed to resist seismic loading. A description of the shear-beam method of seismic analysis, including discussion of an appropriate constitutive model for particulate materials, is presented. This is followed by formulation of the constitutive properties database for two types of wheat at two packing densities and three moisture contents, and the procedure for obtaining composite shear-beam properties from the individual wheat and bin wall properties. The results of seismic response computations for a large steel bin filled with wheat are given to illustrate the shear-beam analysis method.

P06 RENEWABLE ENERGY RESOURCES

2288 Kristensen, J.K.; Joergensen, M.H. (1995) **[Optimization of combustion in minor straw boilers: Testing HZT oxygen control]. Optimering af forbraendingen i mindre halmkedler: Afproevning af HTZ iltstyring.** Statens Husdyrbrugsforsoeg, Foulum (Denmark).. *Intern Rapport fra Statens Husdyrbrugsforsoeg (Denmark); no. 50 16 p.* SH. 6 ill. Danish. (AGRIS 97-011368).

P10 WATER RESOURCES AND MANAGEMENT

2289 Narang, R.S. (Punjab Agricultural University, Ludhiana (India)) (1995) **Water management of crops; wheat.** *Indian Farming (India) v. 45(6) p. 11, 13.* English. (AGRIS 97-011610).

P31 SOIL SURVEYS AND MAPPING

2290 Hennebert, P.A.; Tessens, E.; Tourenne, D.; Delvaux, B. (Universite du Burundi, Faculte des Sciences Agronomiques, Departement Amenagement du Milieu, BP 2940, Bujumbura (Burundi)) (1996) **Validation of a FAO land evaluation method by comparison of observed and predicted yields of five food crops in Burundi.** *Soil Use and Management (United Kingdom) v. 12(3) p. 134-142.* 20 ref. English. (AGRIS 97-026484).

P33 SOIL CHEMISTRY AND PHYSICS

2291 Agenbag, G.A.; Beyers, C.P. de L. (Stellenbosch Univ. (South Africa)) (1994) **Effect of tillage and crop rotation on some chemical soil properties of a shallow, sandy loam soil.** Soil Tillage for Crop Production and Protection of the Environment. Aalborg (Denmark). 24-29 Jul 1994. *ISTRO: Proceedings of the 13th international conference, 2: Soil tillage for crop production and protection of the environment. Jensen, H.E.; Schjoenning, P.; Mikkelsen, S.A.; Madsen, K.B. (eds.). International Soil Tillage Research Organization, ISTRO, Ohio (USA) p. 905-910.* Kongelige Veterinaer- og Landbohoejskole. 18 ref. English. (AGRIS 97-012021).

2292 Bonari, E.; Mazzoncini, M.; Peruzzi, A.; Angelini, L. (Pisa Univ. (Italy)) (1994) **Evaluation of conventional and minimum tillage effects on winter barley (Hordeum vulgare L.) in a sandy soil.** Soil Tillage for Crop Production and Protection of the Environment. Aalborg (Denmark). 24-29 Jul 1994. *ISTRO: Proceedings of the 13th international conference, 2: Soil tillage for crop production and protection of the environment. Jensen, H.E.; Schjoenning, P.; Mikkelsen, S.A.; Madsen, K.B. (eds.). International Soil Tillage Research Organization, ISTRO, Ohio (USA) p. 671-676.* Kongelige Veterinaer- og Landbohoejskole. 3 ill., 6 tables; 13 ref. English. (AGRIS 97-011861).

2293 Bonciarelli, F.; Bonciarelli, U.; Archetti, R. (1994) **Soil bulk density profiles after 10 years of different tillage methods in central Italy.** Soil Tillage for Crop Production and Protection of the Environment. Aalborg (Denmark). 24-29 Jul 1994. *ISTRO: Proceedings of the 13th international conference, 2: Soil tillage for crop production and protection of the environment. Jensen, H.E.; Schjoenning, P.; Mikkelsen, S.A.; Madsen, K.B. (eds.). International Soil Tillage Research Organization, ISTRO, Ohio (USA) p. 893-898.* Kongelige Veterinaer- og Landbohoejskole. 2 ill., 8 ref. English. (AGRIS 97-012041).

2294 Colibas, I.; Colibas, M.; Canarache, A. (1994) **Effects of repeated deep ripping of a surface waterlogged luvisol.** Soil Tillage for Crop Production and Protection of the Environment. Aalborg (Denmark). 24-29 Jul 1994. *ISTRO: Proceedings of the 13th international conference, 2: Soil tillage for crop production and protection of the environment. Jensen, H.E.; Schjoenning, P.; Mikkelsen, S.A.; Madsen, K.B. (eds.). International Soil Tillage Research Organization, ISTRO, Ohio (USA) p. 899-904.* Kongelige Veterinaer- og Landbohoejskole. 10 ref. English. (AGRIS 97-012042).

2295 Czyz, E.; Tomaszewska, J. (1994) **Compaction of a sandy soil as related to root system and aerial parts development and yields of spring barley.** Soil Tillage for Crop Production and Protection of the Environment. Aalborg (Denmark). 24-29 Jul 1994. *ISTRO: Proceedings of the 13th international conference, 2: Soil tillage for crop production and protection of the environment. Jensen, H.E.; Schjoenning, P.; Mikkelsen, S.A.; Madsen, K.B. (eds.). International Soil Tillage Research Organization, ISTRO, Ohio (USA) p. 695-698.* Kongelige Veterinaer- og Landbohoejskole. 4 tables; 6 ref. English. (AGRIS 97-011862).

2296 Dang, Y.P. (Queensland Wheat Research Inst., Toowoomba, QLD.); Dalal, R.C.; Edwards, D.G.; Tiller, K.G. (1994) **Kinetics of zinc desorption from vertisols.** *Soil Science Society of America (USA) v. 58(5) p. 1392-1399.* references. English. (AGRIS 97-012034).

The rate of Zn desorption from soil surfaces into soil solution is a dynamic factor that regulates its continuous supply to growing plants. To ascertain the pattern of Zn desorption, the soil characteristics affecting it, and whether cropping alters its rate, the kinetics of Zn desorption from the <2-mm fraction of 14 Vertisols by diethylenetriaminepentaacetic acid (DTPA) and ethylenediaminetetraacetic acid (EDTA) were investigated using soil samples taken before and after one wheat (Triticum aestivum L.) crop. Nine kinetic models were evaluated to describe the rate of desorption of soil Zn by DTPA, which was rapid initially but gradually declined with time. The parabolic double diffusion, the two-constant rate, and the simple Elovich equations adequately described Zn desorption from Vertisols. Rate constants for the parabolic double diffusion equation (kp'), the two-constant (a and b) rate equation, and the initial Zn desorption rate constant (a) from the simple Elovich equation were closely associated with clay content, soil pH, and amorphous Fe and Al contents of the soil--the soil characteristics that affect solubility, sorption and desorption, and diffusion of Zn in Vertisols. Rate constants from the latter

two equations for Zn desorption by DTPA from 14 Vertisols were highly correlated with those from Zn desorption by EDTA and also with those for Zn desorption by DTPA on soil samples taken after one wheat crop. Thus, the rate constants obtained on initial samples can be used to predict Zn availability for at least two cropping seasons.

2297 Datt, N.; Bhardwaj, K.K.R. (Himachal Pradesh Krishi Vishavidyalaya, Palampur (India)) (1995) **Nitrogen contribution and soil improvement by legume green-manuring in rice-wheat cropping on an acid clay loam soil.** *Journal of the Indian Society of Soil Science (India) v. 43(4) p. 603-607.* 6 tables; 11 ill. English. (AGRIS 97-011914).

2298 Dawelbeit, M.I. (Gezira Research Station, Medani (Sudan)) (1994) **Effect of soil compaction and method of seeding on wheat establishment and yield in vertisols of Gezira.** Soil Tillage for Crop Production and Protection of the Environment. Aalborg (Denmark). 24-29 Jul 1994. *ISTRO: Proceedings of the 13th international conference, 2: Soil tillage for crop production and protection of the environment. Jensen, H.E.; Schjoenning, P.; Mikkelsen, S.A.; Madsen, K.B. (eds.). International Soil Tillage Research Organization, ISTRO, Ohio (USA) p. 887-892.* Kongelige Veterinaer- og Landbohoejskole. 2 ill., 2 tables; 5 ref. English. (AGRIS 97-012020).

2299 Debosz, K.; Kristensen, K. (1995) **Spatial covariability of N mineralization and textural fractions in two agricultural fields.** Site Specific Farming. Aarhus (Denmark). 20-21 Mar 1995. *SP Report, 26: Proceedings of the seminar on site specific farming. Olesen, S.E. (ed.). Statens Planteavlsforsoeg, Foulum (Denmark) p. 174-180.* SP. 2 ill., 2 tables; 9 ref. English. (AGRIS 97-011860).

2300 Finlay, M.J.; Tisdall, J.M.; McKenzie, B.M. (1994) **Tillage below the seed hastens the emergence of wheat seedlings on a hardsetting soil: the causes and the implications for direct-drilling.** Soil Tillage for Crop Production and Protection of the Environment. Aalborg (Denmark). 24-29 Jul 1994. *ISTRO: Proceedings of the 13th international conference, 2: Soil tillage for crop production and protection of the environment. Jensen, H.E.; Schjoenning, P.; Mikkelsen, S.A.; Madsen, K.B. (eds.). International Soil Tillage Research Organization, ISTRO, Ohio (USA) p. 677-682.* Kongelige Veterinaer- og Landbohoejskole. 4 ill., 15 ref. English. (AGRIS 97-012023).

2301 Kevvai, L.; Sippola, J.; Kevvai, T. (Estonian Agricultural Univ., Tartu (Estonia)) (1996) **[Agrochemical situation of Estonian agricultural soils]. Eesti pollumuldade agrokeemilisest seisundist.** Estonian Academic Agricultural Society, Tartu (Estonia). *Transactions of the Estonian Academic Agricultural Society (Estonia) (no.1) p. 51-53.* 1 ill., 2 tables; 5 ref. Estonian. (AGRIS 97-011839).

In 1991 and 1993 a total of 86 samples of soils and respective wheat samples were collected from different sites in Estonia at the wheat midtillering stage. All samples were analysed for P, K, Ca, Mg, B, Co, Mn, Zn, Cd and Pb. For soil analyses the AAAC-EDTA extraction method was used. Plants were analysed for total contents. The data presented in this study are compared with reports from Finland, and with data presented in FAO Soils Bulletins No 48, No 63 and No 65. The main difference as compared with the Finnish results is the relatively high content of Ca in Estonian soils which is also a reason for relatively low intakes of P, B, Mn and Cu by wheat shoots. The level of Cd and Pb in Estonian soils and plants is at the same level as presented in the Finnish data and not very high contents was present.

2302 Lipiec, J.; Szustak, A.; Szatanik Kloc, A.; Ksiezopolska, A. (Polish Academy of Science, Lublin, (Poland)) (1994) **Effects of soil compaction on the growth and nutrient uptake of barley and maize.** Soil Tillage for Crop Production and Protection of the Environment. Aalborg (Denmark). 24-29 Jul 1994. *ISTRO: Proceedings of the 13th international conference, 2: Soil tillage for crop production and protection of the environment. Jensen, H.E.; Schjoenning, P.; Mikkelsen, S.A.; Madsen, K.B. (eds.). International Soil Tillage Research Organization, ISTRO, Ohio (USA) p. 683-688.* Kongelige Veterinaer- og Landbohoejskole. 5 ill., 11 ref. English. (AGRIS 97-011857).

2303 Maillard, A.; Vez, A. (Federal Agricultural Research Station, Nyon (Switzerland)) (1994) **Long term effects of ploughless tillage on soil chemical properties and crop yields.** Soil Tillage for Crop Production and Protection of the Environment. Aalborg (Denmark). 24-29 Jul 1994. *ISTRO: Proceedings of the 13th international conference, 2: Soil tillage for crop production and protection of the environment. Jensen, H.E.; Schjoenning, P.; Mikkelsen, S.A.; Madsen, K.B. (eds.). International Soil Tillage Research Organization, ISTRO, Ohio (USA) p. 723-727.* Kongelige Veterinaer- og Landbohoejskole. 5 ill., 11 ref. English. (AGRIS 97-012019).

2304 Morard, P.; Silvestre, J. (1996) **PLANT INJURY DUE TO OXYGEN DEFICIENCY IN THE ROOT ENVIRONMENT OF SOILLESS CULTURE - A REVIEW [Review].** *Plant & Soil. 184(2):243-254.* English. [ENSAT LAB PHYSIOL VEGETALE 145 AVE MURET F-31076 TOULOUSE FRANCE].

The deficiency of oxygen concentration in root environment linked to waterlogging conditions caused important injuries for plants. These effects could be reproduced by oxygen deficient nutrient solution. This bibliographical synthesis has been centered on experimental results obtained on plants cultivated in soilless culture. This review paper presents a methodology used to study oxygen depletion in a nutrient solution and to calculate root respiration rates. The main factors influencing root respiration are reviewed as well as the consequences of oxygen deficiency on roots and shoots functioning. This study would not be complete without some information on the main mechanisms of plant adaptation to oxygen deficiency. [References: 66].

2305 Nevgen', I.P. (Grodno Agricultural Research Institute (Belarus)) (1996) **[Efficiency of the different methods of soil cultivation within the system of nonmoldboard one for barley in spring]. Ehffektivnost' razlichnykh priemov vesennej obrabotki pochvy pod yachmen' v sisteme bezotval'noj obrabotki.** *Vestsi Akadehmii Agrarnykh Navuk Belarusi (Belarus) (no.2) p. 40-41.* 2 tables. Russian. (AGRIS 97-011809).

Spring soil cultivation for barley should be performed by heavy-duty harrows following cultivation in unit with harrowing or by heavy-duty harrows following cultivation in unit "RVK - 3.6" in case of changing of autumn ploughing of sod podzolic loamy sandy soil towards to chiseling.

2306 Nicoullaud, B. (Institut National de la Recherche Agronomique, Olivet (France). Centre d'Orleans, Science du Sol); Darthout, R.; Duval, O. (1995) **Vertical distribution of winter wheat and maize roots in loamy clay soils of Petite Beauce (France). Etude de l'enracinement du ble tendre d'hiver et du mais dans les sols argilo-limoneux de la Petite Beauce (France). Estudio del enraizamiento del trigo de invierno y del amiz en los suelos arcillo-limosos de "La Petite Beauce" (Francia).** *Etude et Gestion des Sols (France) v. 2(3) p. 183-199.* 24 ref., 7 tableaux, 9 graph. French. (AGRIS 97-011749).

2307 Petrickova, N. (Mendelova Zemedelska a Lesnicka Univ., Brno (Czech Republic)) (1995) **[Changes in nitrate concentration in soil under spring barley monoculture and in crop rotation]. Dynamika dusicnanu v pude pod jecmenem jarnim v monokulture a v osevnim postupu.** Agriculture in marginal conditions. Ceske Budejovice (Czech Republic). 29-31 Aug 1995. *Proceedings of the International Scientific Conference to the 35th anniversary of Faculty foundation. Sbornik referatu z mezinarodni vedecke konference k 35. vyroci zalozeni fakulty. Jihoceska Univ., Ceske Budejovice (Czech Republic). Zemedelska Fakulta p. 213-220.* Jihoceska Univerzita. Zemedelska Fakulta. 1 grap, 1 table. Czech. (AGRIS 97-026622).

2308 Roger Estrade, J.; Caneill, J.; Manichon, H. (CIRAD, Montpellier (France)) (1994) **Modelling long term effects of cropping systems on soil structure.** Soil Tillage for Crop Production and Protection of the Environment. Aalborg (Denmark). 24-29 Jul 1994. *ISTRO: Proceedings of the 13th international conference, 2: Soil tillage for crop production and protection of the environment. Jensen, H.E.; Schjoenning, P.; Mikkelsen, S.A.; Madsen, K.B. (eds.). International Soil Tillage Research Organization, ISTRO, Ohio (USA) p. 1149-1154.* Kongelige Veterinaer- og Landbohoejskole. 5 ill., 3 tables; 4 ref. English. (AGRIS 97-012022).

2309 Singh, B.; Arora, B.R.; Sharma, K.N. (Punjab Agricultural Universit, Ludhiana (India). Department of Soils) (1995) **Determination of available phosphorus by iron oxide impregnated filter, paper soil test for wheat.** *Journal of the Indian Society of Soil Science (India) v. 43(4) p. 623-627.* 4 tables; 10 ref. English. (AGRIS 97-012025).

2310 Stamboliev, M. (Kompleksna Opitna Stantsiya, Lom (Bulgaria)) (1996) **[Factors influencing the total content and labile forms of nitrogen in soil under wheat growing on calcareous chernozem]. Faktori, vliyaeshchi v"rkhu podvizhnite formi na azota v pochvata pri otglezhdane na pshenitsa na karbonaten chernozem.** Selskostopanska Akademiya, Sofia

(Bulgaria). *Pochvoznanie, Agrokhimiya i Ekologiya (Bulgaria). Soil Science, Agrochemistry and Ecology v. 31(2) p. 15-17.* 3 tables; 11 ref. Bulgarian. (AGRIS 97-026550).

2311 Tosheva, E. (Institut po Pochvoznanie i Agroekologiya "N. Pushkarov", Sofia (Bulgaria)) (1996) **[Content and supply of nitrogen, phosphorus and potassium from wheat under different saturation of leached smolnitza]. S"d"rzhanie i iznos na azot, fosfor i kalij ot pshenitsa pri razlichna zapasenost na izluzhena smolnitsa.** Selskostopanska Akademiya, Sofia (Bulgaria). *Pochvoznanie, Agrokhimiya i Ekologiya (Bulgaria). Soil Science, Agrochemistry and Ecology v. 31(2) p. 4-7.* 3 tables; 14 ref. Bulgarian. (AGRIS 97-026656).

P34 SOIL BIOLOGY

2312 Concheri, G. (Padova Univ. (Italy). Dipartimento di Biotecnologie Agrarie); Nardi, S.; Reniero, F.; Dell'Agnola, G. (1996) **The effects of humic substances within the Ah horizon of a Calcic Luvisol on morphological changes related to invertase and peroxidase activities in wheat roots.** *Plant and Soil (Netherlands) v. 179(1) p. 65-72.* 34 ref. English. (AGRIS 97-026821).

2313 Grayston, SJ.; Vaughan, D.; Jones, D. (1997) **RHIZOSPHERE CARBON FLOW IN TREES, IN COMPARISON WITH ANNUAL PLANTS - THE IMPORTANCE OF ROOT EXUDATION AND ITS IMPACT ON MICROBIAL ACTIVITY AND NUTRIENT AVAILABILITY [Review].** *Applied Soil Ecology. 5(1):29-56.* English. [MACAULAY LAND USE RES INST CRAIGIEBUCKLER ABERDEEN AB15 8QH SCOTLAND].

The release of organic substances from roots is a key process influencing nutrient availability in the rhizosphere. Rhizodeposition, including root exudation can influence plant growth directly by making cations available for uptake through processes such as chelation or indirectly by influencing soil microbial activity. It is important to gain knowledge about the range of compounds released and the factors influencing their release, to understand their effects on the microbial community and enable development of techniques to enhance microbial activity. The increasing growth of trees in various land use systems is coupled with a limited knowledge of the interactions between nutrient availability and tree growth. This highlights the need for a greater understanding of factors affecting nutrient availability in these systems. The purpose of this paper is to review the various strategies which are used to measure rhizodeposition by plants and demonstrate that root exudates are an important component of carbon loss from plants and that they may have a more important role in nutrient acquisition and plant growth than previously thought. The paper will discuss the character of carbon loss from trees in comparison to annual plants and discuss the increasing evidence of the importance of non-nutrient components of root exudates as host specific recognition signals. The factors affecting exudate release and the impact of these compounds on nutrient availability will be discussed. The Limitations of previous studies of rhizodeposition and root exudation through omission of a mycorrhizal component, and the need for further research in this neglected area, will be highlighted. Manipulation of plant-microbial interactions is discussed in relation to improving or maintaining plant growth in sustainable systems. [References: 277].

2314 Konnova, S.A.; Skvortsov, I.M.; Makarov, O.E.; Prokhorova, R.N.; Rogova, T.A.; Ignatov, V.V. (1995) **[Polysaccharide complexes secreted by Azospirillum brasilense and their possible role in the interaction of bacteria with wheat roots]. Polisakharidnye kompleksy, vydelyaemye Azospirillum brasilense, i ikh vozmozhnaya rol' vo vzaimodejstvii bakterij s kornyami pshenitsy.** *Mikrobiologiya (Russian Federation) v. 64(6) p. 762-768.* 26 ref. Russian. (AGRIS 97-012203).

Mixtures of complex biopolymers were washed off from the cell surface of 11 strains of Azospiirillum brasilense. The presence of at least two exopolysaccharide complexes, which we conventionally named lipopolysaccharide-protein and polysaccharide-lipid complexes, was shown by chromatographic methods for all strains. The biopolymer composition of the complexes was studied. Exposure of wheat seedling roots (Triticum aestivum cv. Saratovskaya 29) to the action of these polymers caused the same morphological changes in root hairs as the exposure to whole cells of azospirilla. Data were obtained pointing to the ability of the complexes to bind to the wheat germ agglutinin, which is located on the seedling roots. Environment of bacterial complexes in the interaction of azospirilla with the wheat roots was suggested. Based on the quantitative assessment of deformations caused by the lipopolysaccharide-protein and polysaccharide-lipid complexes of a series of strains, strain specificity of azospirilla in relation to the host plant and the involvement of the polysaccharide-containing components of the bacterial surface in bacterium-plant interactions were suggested.

2315 Marschner, P.; Crowley, DE. (1997) **IRON STRESS AND PYOVERDIN PRODUCTION BY A FLUORESCENT PSEUDOMONAD IN THE RHIZOSPHERE OF WHITE LUPINE (LUPINUS ALBUS L.) AND BARLEY (HORDEUM VULGARE L.).** *Applied & Environmental Microbiology. 63(1):277-281.* English. [INST PFLANZENERNAHRUNG & BODENKUNDE OLSHAUSENSTR 40 D-24118 KIEL GERMANY].

Induction of high-affinity iron transport during root colonization by Pseudomonas fluorescens Pf-5 (pvd-inaZ) was examined in lupine and barley growing in microcosms, P. fluorescens Pf-5 (pvd-inaZ) contains a plasmid carrying pvd-inaZ; thus, in this strain, ice nucleation activity is regulated by pyoverdin production, Lupine or barley plants were grown for 18 or 8 days, respectively, in soil amended with 2% calcium carbonate and inoculated with P. fluorescens Pf-5 (pvd-inaZ) at a density of 4 x 10(8) CFU g (dry weight) of soil(-1). A filter paper blotting technique was used to sample cells from the rhizosphere in different root zones, and then the cells were resuspended for enumeration and measurement of ice nucleation activity, The population density of P. fluorescens Pf-5 (pvd-inaZ) in the rhizosphere decreased by one order of magnitude in both lupine and barley over time, The ice nucleation activity ranged from -3.4 to -3.0 log ice nuclei CFU-1 for lupine and -3.0 to -2.8 log ice nuclei CFU-1 for barley, was similar in all root zones, and did not change over time, An in vitro experiment was conducted to determine the relationship between ice nucleation activity and pyoverdin production in P. fluorescens Pf-5 (pvd-inaZ), An ice nucleation activity of approximately -3.0 log ice nuclei CFU-1 was measured in the in vitro experiment at 25 to 50 mu M FeCl3. By using the regression between ice nucleation activity and pyoverdin production determined in vitro and assuming a P. fluorescens Pf-5 (pvd-inaZ) population density of 10(8) CFU g of root(-1), the maximum possible pyoverdin accumulation by P. fluorescens Pf-5 (pvd-inaZ) in the rhizosphere was estimated to be 0.5 and 0.8 nmol g of root(-1) for lupine and barley, respectively, The low ice nucleation activity measured in the rhizosphere suggests that nutritional competition for iron in the rhizosphere may not be a major factor influencing root colonization by P. fluorescens Pf-5 (pvd-inaZ). [References: 29].

2316 Rengel, Z.; Gutteridge, R.; Hirsch, P.; Hornby, D. (1996) **PLANT GENOTYPE, MICRONUTRIENT FERTILIZATION AND TAKE-ALL INFECTION INFLUENCE BACTERIAL POPULATIONS IN THE RHIZOSPHERE OF WHEAT.** *Plant & Soil. 183(2):269-277.* English. [UNIV WESTERN AUSTRALIA FAC AGR PERTH WA 6907 AUSTRALIA].

The relationship between micronutrient efficiency of four wheat (Triticum aestivum L.) genotypes, tolerance to take-all disease (caused by Gaeumannomyces graminis (Sacc.) Arx and Olivier var. tritici Walker), and bacterial populations in the rhizosphere was tested in soil fertilized differentially with Zn and Mn. Plant growth was reduced by Mn or Zn deficiency and also by take-all. There was an inverse relationship between micronutrient efficiency of wheat genotypes when grown in deficient soils and the length of take-all lesions on roots (efficient genotypes had shorter lesions than inefficient ones). In comparison to the rhizosphere of control plants of genotypes Aroona and C8MM receiving sufficient Mn and Zn, the total numbers of bacterial cfu (colony forming units) were greater in the rhizosphere of Zn-efficient genotype Aroona under Zn deficiency and in Mn-efficient genotype C8MM under Mn deficiency. These effects were not observed in other genotypes. Take-all decreased the number of bacterial cfu in the rhizosphere of fully-fertilized plants but not of those subjected to either Mn or Zn deficiency. In contrast, the Zn deficiency treatment acted synergistically with take-all to increase the number of fluorescent pseudomonads in the rhizosphere. Although numbers of Mn-oxidising and Mn-reducing bacteria were generally low, take-all disease increased the number of Mn reducers in the rhizosphere of Mn-efficient genotypes Aroona and C8MM. Under Mn-deficiency conditions, the number of Mn reducers in the rhizosphere increased in Aroona but not in C8MM wheat. The results suggest that bacterial microflora may play a role in the expression of Mn and Zn efficiency and tolerance to take-all in some wheat genotypes. [References: 48].

2317 Singh, JS.; Singh, S.; Raghubanshi, AS.; Singh, S.; Kashyap, AK. (1996) **METHANE FLUX FROM RICE/WHEAT AGROECOSYSTEM AS AFFECTED BY CROP PHENOLOGY, FERTILIZATION AND WATER LEVEL.** *Plant & Soil. 183(2):323-327.* English. [BANARAS HINDU UNIV DEPT BOT VARANASI 221005 UTTAR PRADESH INDIA].

Methane flux was measured for a rice/wheat agroecosystem of Gangetic Plains, with and without application of chemical fertilizer and wheat straw (WS). Three treatments of control, fertilizer application and fertilizer + WS application, were established in a completely randomized block design and measurements were made for two consecutive years (1993 and 1994). CH4 measurements during growth of the rice crop period showed that there were significant difference in flux rates during the two years. Maximum emission occurred at the time of anthesis and minimum at the seedling stage. The flux rates were significantly higher for fertilizer or fertilizer + WS treatments. The effects of the treatments were similar across phenological stages and years. In the subsequent wheat crop and fallow period, the soils consumed CH4. There were significant differences in CH4 uptake rates between the two years. Fertilizer treatments reduced CH4 uptake in both the years. The results suggested that tropical agroecosystems may consume substantial amounts of CH4 and that the methane output can be reduced by lowering the submergence level in rice paddies. [References: 23].

2318 Troncoso V, Hector Ivan (1995) **[Seasonal variation of the microbial biomass nitrogen in a soil under different management systems]. Variacion estacional del nitrogeno de la biomasa microbiana en un suelo bajo diferentes sistemas de manejo.** Concepcion Univ., Chillan (Chile). Fac. de Agronomia. 32 ref. 32 p. Spanish. (AGRIS 97-012046).

El objetivo de este estudio es determinar el efecto de tres tipos de manejo del suelo sobre el nitrogeno de la biomasa microbiana y su evolucion estacional: i) praderas permanentes bajo pastoreo, con y sin fertilizacion nitrogenada, ii) rotaciones culturales remolacha-trigo y maiz-trigo y iii) influencia de la fuente de nitrogeno en una rotacion trigo-avena.

2319 Vreekenbuijs, MJ.; Brussaard, L. (1996) **SOIL MESOFAUNA DYNAMICS, WHEAT RESIDUE DECOMPOSITION AND NITROGEN MINERALIZATION IN BURIED LITTERBAGS.** *Biology & Fertility of Soils. 23(4):374-381.* English. [AGR UNIV WAGENINGEN DEPT TERR ECOL & NAT CONSERVAT BORNSESTEEG 69 NL-6708 PD WAGENINGEN NETHERLANDS].

The effect of soil microarthropods and enchytraeids on the decomposition of wheat straw in buried litterbags was studied by selective admission and exclusion. Litterbags with 20 mu m mesh size admitted nematodes, but excluded microarthropods, although temporarily. After 27 weeks of incubation part of these litterbags were colonized, probably through egg-deposition of mainly fungivorous Collembola and mites. When litterbags with a complete microarthropod community (1.5 mm mesh size) were compared to Litterbags with strongly reduced microarthropod numbers (20 mu m mesh size), no differences between decomposition rates were found. However, in colonized 20-mu m mesh bags, we found reduced decomposition rates compared to the coarse mesh litterbags, probably due to overgrazing of the fungal population by large numbers of fungivorous microarthropods. These large numbers might be caused by the absence of predators. Extraction of microarthropods as well as enchytraeids and nematodes from the coarse mesh litterbags showed a distinct succession during decomposition. The decomposition process was dominated in the first phase by bacterivorous nematodes, nematophagous and bacterivorous mites, and in the later phase by fungivorous nematodes, fungivorous and omnivorous mites and Collembola, and predatory mites. This succession is indicative of a sequence from bacterial to fungal dominated decomposition of the buried organic matter. The results indicate that the decomposition rate is predator controlled. [References: 42].

P35 SOIL FERTILITY

2320 Bergstrom, Lars; Jokela, William E. (1995) **Nitrate leaching of 15N-labeled NH4NO3 as affected by a ryegrass cover crop in barley.** *NJF-utredning/rapport (Finland) (no. 99) p. 206-212.* 3 ref. English. (AGRIS 97-026862).

2321 Bhojvaid, PP.; Timmer, VR.; Singh, G. (1996) **RECLAIMING SODIC SOILS FOR WHEAT PRODUCTION BY PROSOPIS JULIFLORA (SWARTZ) DC AFFORESTATION IN INDIA.** *Agroforestry Systems. 34(2):139-150.* English. [CENT SOIL SALIN RES INST KARNAL HARYANA INDIA].

A green house pot trial was conducted to assess the impact of Prosopis afforestation on the productivity and fertility of degraded sodic soils in Haryana, India. Wheat (Triticum aestivum, L; cultivar HD 2329) plants were grown from seed on top soils collected from a chronosequence of 0, 5, 7, and 30-year-old Prosopis juliflora plantations established on highly sodic soils and a non-sodic reference soil collected from a local farm. The afforestation improved physical and chemical properties of surface soils by decreasing pH, electrical conductivity and exchangeable Na levels, and increasing infiltration capacity, organic C, total N, available P, and exchangeable Ca, Mg, and, K levels. The amelioration effect of the trees on top soil increased with duration of tree occupancy. Soil nutrient status under the 30-year-old plantation was higher than that of the non-sodic farm soil. The reduced soil sodicity and improved fertility contributed to higher germination, survival, growth, and grain yield of wheat plants grown on the Prosopis chronosequence soils, even surpassing the yield attained on the farm soil in the case of 30-year-old plantation soil. Sodium accumulation in the crop declined while N, P, K, Ca, and Mg uptake increased with soil plantation age reflecting the changing nutrient status of the rooting zone due to afforestation. Results confirmed that successful tree plantation may restore the productivity and fertility of highly degraded sodic soils. [References: 30].

2322 Cook, CM.; Vardaka, E.; Lanaras, T. (1997) **CONCENTRATIONS OF CU, GROWTH AND CHLOROPHYLL CONTENT OF FIELD-CULTIVATED WHEAT GROWING IN NATURALLY ENRICHED CU SOIL.** *Bulletin of Environmental Contamination & Toxicology. 58(2):248-253.* English. [UNIV THESSALONIKI DEPT BOT POB 109 GR-54006 THESSALONIKI GREECE].

2323 Lehrsch, GA.; Robbins, CW. (1996) **CHEESE WHEY EFFECTS ON SURFACE SOIL HYDRAULIC PROPERTIES.** *Soil Use & Management. 12(4):205-208.* English. [USDA ARS NW IRRIGAT & SOILS RES LAB 3793 N 3600 E KIMBERLY, ID 83341 USA].

Whey, the liquid byproduct of cheese production, can improve the physical condition of sodic soils or those susceptible to erosion by increasing their aggregate stability. The effects of whey on soil hydraulic properties, however, are not known. In this experiment, we used tension infiltrometers to determine whey effects on infiltration rates of water (at suctions greater than or equal to 30 mm of water) and unsaturated hydraulic conductivities of Ap horizons of a Portneuf silt loam (coarse-silty, mixed, mesic Durixerollic Calciorthid) after a winter wheat crop. In the summer of 1993 near Kimberly, ID, USA, liquid whey was flood-applied at either 0, 200, 400, or 800 t/ha to plots planted to wheat the previous September. At suctions of 60 and 150 mm, infiltration rates decreased linearly by about 0.7 mu m/s with each additional 100 t/ha of whey applied. As whey applications increased, hydraulic conductivities at 60 mm suction increased slightly but as applications exceeded 400 t/ha decreased significantly. We concluded that summer whey applications up to 400 t/ha would not adversely affect surface hydraulic properties. [References: 24].

2324 Nayak, A.K.; Gupta, M.L. (Institute of Agricultural Sciences, Varanasi (India). Department of Soil Science and Agricultural Chemistry) (1995) **Phosphorus, zinc and organic matter interaction in relation to uptake, tissue concentration and absorption rate of phosphorus in wheat.** *Journal of the Indian Society of Soil Science (India) v. 43(4) p. 633-636.* 4 tables; 11 ref. English. (AGRIS 97-012241).

2325 Nikolova, D. (Institut po Pochvoznanie i Agroekologiya "N. Pushkarov, Sofia (Bulgaria)) (1996) **[Nitrogen, phosphorus and potassium extraction with produce of some winter preceding crops]. Izvlichane na azot, fosfor i kalij s produktsiyata na nyakoi zimni predkulturi.** Selskostopanska Akademiya, Sofia (Bulgaria). *Pochvoznanie, Agrokhimiya i Ekologiya (Bulgaria). Soil Science, Agrochemistry and Ecology v. 31(2) p. 22-25.* 2 ill., 2 tables; 6 ref. Bulgarian. (AGRIS 97-026874).

2326 Regmi, A.P. (Regional Agricultural Research Station, Bhairahawa (Nepal)) (1996) **Study on soil fertility improvement in rice-rice-wheat system.** National Winter Crops Research Workshop. Siddharthanagar, Bhairahawa (Nepal). 12-15 Sep 1996. *Summary of the wheat research reports. National Wheat Research Programme (Nepal) p. 159-174.* National Wheat Research Programme. 8 tables; 3 ref. English. (AGRIS 97-026884).

2327 Torstensson, Gunnar; Aronsson, Helena; Linden, Boerje (1995) **Winter crops as green cover crops : nitrogen uptake capacity and effects on nitrogen leaching.** *NJF-utredning/rapport (Finland) (no. 99) p. 257-263.* 6 ref. English. (AGRIS 97-026879).

2328 Vuuren, M.M.I. van (Scottish Crop Research Inst., Invergowrie, Dundee (United Kingdom). Dept. of Cellular and Environmental Physiology); Robinson, D.; Griffiths, B.S. (1996) **Nutrient inflow and root profilation during the exploitation of a temporally and spatially discrete source of nitrogen in soil.** *Plant and Soil (Netherlands) v. 178(2) p. 185-192.* 33 ref. English. (AGRIS 97-026891).

P40 METEOROLOGY AND CLIMATOLOGY

2329 Cochrane, M.P.; Paterson, L.; Duffus, C.M. (Crop Science and Technology Department, Scottish Agricultural College, West Mains Road, Edinburgh EH9 3JG (United Kingdom)) (1996) **The effect of temperature on grain development and starch quality in barley.** *Aspects of Applied Biology (United Kingdom) (no.45) p. 139-146.* 14 ref. Implications of 'Global environmental change' for crops in Europe, 1-3 April 1996, Churchill College, Cambridge, UK. English. (AGRIS 97-012353).

2330 Harrison, P.A. (Environmental Change Unit, University of Oxford, 1a Mansfield Road, Oxford OX1 3TB (United Kingdom)) (1996) **Modelling the effects of climate change on wheat productivity in Europe.** *Aspects of Applied Biology (United Kingdom) (no.45) p. 41-48.* 20 ref. Implications of 'Global environmental change' for crops in Europe, 1-3 April 1996, Churchill College, Cambridge, UK. English. (AGRIS 97-012395).

2331 Theobald, J.C.; Mitchell, R.A.C.; Parry, M.A.J.; Lawlor, D.W. (Biochemistry and Physiology Department, IACR Rothamsted, Harpenden, Hertfordshire AL5 2JQ (United Kingdom)) (1996) **The interacting effects of nitrogen supply and CO2 concentration on photosynthetic capacities in leaves of spring wheat.** *Aspects of Applied Biology (United Kingdom) (no.45) p. 171-175.* 3 ref. Implications of 'Global environmental change' for crops in Europe, 1-3 April 1996, Churchill College, Cambridge, UK. English. (AGRIS 97-012375).

2332 Veisz, O.B.; Harnos, N.; Tischner, T. (Agricultural Research Institute of the Hungarian Academy of Sciences, H 2462 Martonvasar (Hungary)) (1996) **The effects of CO2 levels on the development and yield of cereals.** *Aspects of Applied Biology (United Kingdom) (no.45) p. 107-111.* 13 ref. Implications of 'Global environmental change' for crops in Europe, 1-3 April 1996, Churchill College, Cambridge, UK. English. (AGRIS 97-012355).

Q01 FOOD SCIENCE AND TECHNOLOGY

2333 Dahl, B.L.; Wilson, W.W. (1996) **Grades/classes of hard wheats exported from North America: analysis of demand and trends.** *Agricultural economics report (USA); no. 348 96 p.* Dept. of Agricultural Economics, Agricultural Experiment Station, North Dakota State University. ill. bibliographical ref.(p. 83-86). Cover title. "June 1996.". English. (AGRIS 97-027060).

Q02 FOOD PROCESSING AND PRESERVATION

2334 Autran, JC. (1996) **THE INDUSTRIAL USE OF EU WHEATS.** *Outlook on Agriculture. 25(4):243-251.* English. [INRA 2 PL VIALA F-34060 MONTPELLIER 1 FRANCE].

A four-year coordinated wheat research programme was recently conducted with the aim of advancing understanding of wheat processing and quality under the specific conditions of the European Union. The main areas examined included milling quality, starch/gluten separation, the basis of breadmaking quality, the basis of biscuit quality, flour composition, dough development, the genetics of wheat storage proteins and sprouting resistance. The programme produced a range of results which will contribute to developments in the processing industry, wheat breeding and trade. [References: 14].

2335 Cho, M.K.; Lee, W.J. (Kangnung National University, Kangnung (Korea Republic). Department of Food Science) (1996) **Preparation of high-fiber bread with barley flour.** *Korean Journal of Food Science and Technology (Korea Republic) v. 28(4) p. 702-706.* 1 illus.; 8 tables; 8 ref. Korean. (AGRIS 97-012547).

2336 Cleemput, G. (1996) **Characterisation of water-extractable non-starch polysaccharides and non-starch polysaccharide hydrolysing enzymes in European wheat flours.** Katholieke Univ. Leuven (Belgium). Faculteit Landbouwkundige en Toegepaste Biologische Wetenschappen. *Dissertationes de Agricultura (Belgium); no. 299 164 p.* 29 ill.; 33 tables; bibliography p. 145-161. English. (AGRIS 97-027417).

2337 Collar, C. (1996) **BIOCHEMICAL AND TECHNOLOGICAL ASSESSMENT OF THE METABOLISM OF PURE AND MIXED CULTURES OF YEAST AND LACTIC ACID BACTERIA IN BREADMAKING APPLICATIONS [Review].** *Food Science & Technology International. 2(6):349-367.* English. [CSIC INST AGROQUIM & TECNOL ALIMENTOS POLIGONO COMA S-N PATERNA 46980 VALENCIA SPAIN].

The production of varieties of breads with the quality required at present by the European consumer closely relates to the proper use of starting microorganisms in controlled and optimized breadmaking conditions. The relationship between processing requirements and wheat bread quality involves an understanding of the metabolism of the starting microflora which regulate production or assimilation of suitable and unsuitable metabolites during the breadmaking process, mediated by the specific enzyme activities and nutritional requirements of yeast and lactic acid bacteria. In this paper, recent advances in the biochemical and technological assessment of pure and mixed cultures of yeast and lactic acid bacteria in breadmaking applications are reviewed. Metabolite profiles in model and simplified wheat flour systems, performance of breadmaking starters in straight and sourdough systems, and relationships between process conditions, technological performance and metabolism of fermentation starters are discussed. [References: 63].

2338 Cox, TS.; Bequette, RK.; Bowden, RL.; Sears, RG. (1997) **GRAIN YIELD AND BREADMAKING QUALITY OF WHEAT LINES WITH THE LEAF RUST RESISTANCE GENE LR41.** *Crop Science. 37(1):154-161.* English. [INT CROPS RES INST SEMI ARID TROP PATANCHERU 502324 ANDHRA PRADESH INDIA].

Some of the many disease-resistance genes transferred into common wheat (Triticum aestivum L.) by interspecific hybridization have been underutilized in agriculture because of associated negative effects on productivity and end-use quality. The Lr41 gene conferring resistance to leaf rust (caused by Puccinia recondita Rob. ex Desm.) was transferred from the wild diploid goatgrass [Triticum tauschii (Coss.) Schmal], the chromosomes of which recombine readily with those of common wheat (Fritz et al., 1995a). Thus its chromosomes recombine readily with those of wheat. This study had three objectives: (i) to determine the direct and linked effects of Lr41 on 15 productivity and quality traits in hard red winter wheat under disease-free conditions; (ii) to determine the effects of resistance conferred by Lr41 under a severe leaf rust epidemic and under a light infection; and (iii) to determine the amount of damage inflicted by diseases other than leaf rust in those environments. Six BC2F2-derived common wheat lines with Lr41, along with their recurrent parents (hard red winter wheat cultivars TAM 107, TAM 200, and Century), were evaluated in three field experiments with and without fungicide treatment in 1992 and 1994. Lr41 increased grain yield and milling quality under heavy leaf rust infection with no negative effects on those traits in disease-free plots. However, Lr41 was associated with reduced bake-mixing time and water absorption in the absence of disease. Effects of other diseases depended heavily upon the genetic backgrounds (i.e., recurrent parents) of backcross lines. There should be no serious impediments to the use of Lr41 in breeding programs. [References: 36].

2339 Dobrzeniecka, A. (Szkola Glowna Gospodarstwa Wiejskiego, Warszawa (Poland). Katedra Technologii Przemyslu Fermentacyjnego i Owocowo Warzywnego); Haberowa, H.; Sobczak, E. (1996) **[Comparison of the quality of raw spirit obtained from rye, triticale, amaranthus]. Porownanie jakosci spirytusu surowego z zyta, pszenzyta i amarantusa.** *Przemysl Fermentacyjny i Owocowo-Warzywny (Poland) v. 40(3) p. 12-13.* 5 ref. Polish. (AGRIS 97-012872).

2340 Dozet, J. (ed.) (1996) **Abstracts: [Wheat - bread '96], the 22nd cereal and flour technology conference, Novi Sad [Yugoslavia], April 24-26,**

1996. 22. savetovanje strucnjaka iz oblasti tehnologije zita i brasna Zito hleb '96 Novi Sad (Yugoslavia). 24-26 Apr 1996. *Zbornik izvoda: Zito hleb '96, 22. savetovanje strucnjaka iz oblasti tehnologije zita i brasna, Novi Sad [Jugoslavija], 24-26. april 1996. 78 p.* Tehnoloski fakultet, Zavod za tehnologiju zita i brasna. English. (AGRIS 97-012893).

2341 Gaines, C.S. (USDA, ARS, Soft Wheat Quality Laboratory, Wooster, OH.); Kassuba, A.; Finney, P.L. (1996) **Using wire-cut and sugar-snap formula cookie test baking methods to evaluate distinctive soft wheat flour sets: implications for quality testing.** *Cereal foods world (USA) v. 41(3) p. 155-160.* references. English. (AGRIS 97-012559).

2342 Hwang, J.J.; Son, Y.K.; Kim, S.L.; Yoon, E.B.; Hur, H.S. (Rural Development Administration, Suwon (Korea Republic). National Crop Experiment Station) (1996) **Development of Korean glutinous wet cake (Bori-injeulmi) made with waxy barley.** *RDA Journal of Agricultural Science (Korea Republic) v. 38(2) p. 871-879.* 3 illus.; 7 tables; 16 ref. Korean. (AGRIS 97-027172).

2343 Jones, ME.; Vickers, JE.; Dejersey, J.; Henry, RJ.; Symons, MH.; Marschke, RJ. (1997) **BACTERIAL EXPRESSION OF THE BIFUNCTIONAL ALPHA-AMYLASE/SUBTILISIN INHIBITOR FROM BARLEY.** *Journal of the Institute of Brewing. 103(1):31-33.* English. [UNIV QUEENSLAND DEPT BIOCHEM ST LUCIA QLD 4072 AUSTRALIA].

The bifunctional alpha-amylase/subtilisin inhibitor (BASI) is an endogenous inhibitor of the high pi cereal alpha-amylases encoded by the amyl genes. Evaluation of the potential role of this protein in malting and brewing would be greatly assisted by the availability of large quantities of the protein. We have produced the protein by expression of the barley gene in bacteria. The barley gene was cloned into a pMAL vector and expressed as a fusion protein. The purified fusion protein was successfully cleaved with a specific protease to release the native BASI protein. The BASI produced by bacterial expression will be a useful source of the protein for studies of interactions with barley alpha-amylases and studies of the influence of this protein on malting and brewing. [References: 22].

2344 Lapvetelaeinen, Anja (1994) **Barley and oat protein products from wet processes : food use potential.** Turku Univ. (Finland). University of Turku. Bibliography p. 38-46; Includ. 5 articles. 114 p. English. (AGRIS 97-027171).

2345 Mani Lindberg, K. (Lund Univ. (Sweden). Kemicentrum) (1995) **Rheological studies of wheat flour doughs. The development of structure during mixing.** Lund Univ. (Sweden). Lund Univ. Bibliography: p. 48-54. A dissertation bound with a collection of 6 reprints. 54 p. LUTKDH/TKLT--96/1020-SE. English. (AGRIS 97-012628).

2346 Rasanen, J.; Laurikainen, T.; Autio, K. (1997) **FERMENTATION STABILITY AND PORE SIZE DISTRIBUTION OF FROZEN PREFERMENTED LEAN WHEAT DOUGHS.** *Cereal Chemistry. 74(1):56-62.* English. [TECH RES CTR FINLAND POB 1500 FIN-02044 ESPOO FINLAND].

Fermentation stability of frozen prefermented doughs was studied with a maturograph, an instrument that allows monitoring of dough rise, gas production, and gas retention during fermentation. Maturograph curves excellently predicted the baking quality, measured as form ratio, after frozen storage. The greatest decrease in dough level occurred after seven days of storage, after which the level remained constant. With some flours, decreased amount of water improved both the fermentation stability and form ratio of breads baked after seven days of frozen storage of dough. However, no improvement was observed in loaf volume. Preliminary experiments with longer final fermentation time (after thawing) showed that the reduced water content also resulted in higher loaf volumes than did optimal water content. Microscopic studies showed that with most doughs, porosity decreased with reduced water content. However, these changes depended on flour type. In one dough, reduction of water by 2 percentage units decreased the area of pores per total area of section from 56.6 to 46.4%, whereas in another dough the same water reduction had no effect on the pore area. [References: 27].

2347 Samson, M.F. (Institut National de la Recherche Agronomique, Montpellier, France.); Morel, M.H. (1995) **Heat denaturation of durum wheat semolina beta-amylase effects of chemical factors and pasta processing conditions.** *Journal of food science (USA) v. 60(6) p. 1313-1320.* references. English. (AGRIS 97-012901).

The susceptibility to heat denaturation of durum wheat beta-amylase was studied in aqueous solution at 50 to 65 degrees C. The activation energy of the reaction of denaturation was 439 kJ/mole between 56 and 65 degrees C. Additives were tested to determine their protective effects on enzyme activity (at 65 degrees C) in aqueous solution. Maltose, resulting from degradation of starch by beta-amylase, appeared to be the most protective. The beta-amylase became more resistant to heat with higher concentrations of maltose, indicating an enzyme-maltose complex which was more stable to heat than the enzyme alone. The same mechanism occurred when durum wheat pasta was processed: maltose produced either during mixing and sheeting or during extrusion protected the enzyme. The degree of protection was proportional to the intensity of mechanical work imparted to the dough.

2348 Strecker, T.D. (Kellogg Company, Battle Creek, MI.); Cavalieri, R.P.; Zollars, R. (1995) **Heat transfer to and transport properties of wheat gluten in a tubular reactor.** *Journal of food process engineering (USA) v. 18(4) p. 431-447.* references. English. (AGRIS 97-012686).

2349 Taylor, J.R.N.; Blyth, M.E.; Snyman, E. (Pretoria Univ. (South Africa). Dept. of Food Science); Randall, P.G. (1996) **Evaluation of simple methods for the detection of heat damage in wheat.** *SA Journal of Food Science and Nutrition (South Africa) v. 8(3) p. 96-101.* 9 tables; 12 ref. English. (AGRIS 97-027418).

Q03 FOOD CONTAMINATION AND TOXICOLOGY

2350 Dalcero, A.; Torres, A.; Etcheverry, M.; Chulze, S.; Varsavsky, E. (1997) **OCCURRENCE OF DEOXYNIVALENOL AND FUSARIUM GRAMINEARUM IN ARGENTINIAN WHEAT.** *Food Additives & Contaminants. 14(1):11-14.* English. [UNIV NACL RIO CUARTO FAC CIENCIAS EXACTAS FIS QUIM & NAT DEPT MICROBIOL & IMMUNOL RA-5800 RIO CUARTO ARGENTINA].

During the 1993 harvest period there was a high incidence of Fusarium head blight in wheat in Argentina. Fusarium species that produce trichothecenes in wheat have been reported in several countries including Argentina. Several studies have shown that F. graminearum and deoxynivalenol (DON) were the main contaminants defected in wheat and by-products in Argentina. The objective of this study was to evaluate the occurrence of Fusarium spp. and DON contamination in wheat from Cordoba, Argentina during the 1993/94 harvest season. F. graminearum was the main Fusarium species isolated. From 40 samples analysed, 80% showed DON contamination. The levels of DON found ranged between 300 and 4500 mu g/kg. There was goad correlation between F. graminearum and DON contamination. Only five samples showed levels of DON higher than those established in the guidelines in Canada and the USA for food and feedstuffs. [References: 13].

2351 Ramakrishna, N.; Lacey, J.; Smith, JE. (1996) **COLONIZATION OF BARLEY GRAIN BY PENICILLIUM VERRUCOSUM AND OCHRATOXIN A FORMATION IN THE PRESENCE OF COMPETING FUNGI.** *Journal of Food Protection. 59(12):1311-1317.* English. [AFRC INST ARABLE CROPS RES HARPENDEN AL5 2JQ HERTS ENGLAND].

Colonization of barley grain by Penicillium verrucosum and the formation of ochratoxin A were studied, both in pure culture and when paired with Aspergillus flavus, Fusarium sporotrichioides, and Hyphopichia burtonii, at 20 degrees and 30 degrees C and at 0.97, 0.95 and 0.90 a(w) over a 3-week period. Grain colonization was assessed on the basis of visible molding, seed infection, and numbers of CFU and by observing hyphal extension on the grain surface by scanning electron microscopy. Ochratoxin A concentrations were assayed by enzyme-linked immunosorbent assay using a monoclonal antibody. Germination of P. verrucosum spores was unaffected by the presence of other species. However, seed infection under most conditions was markedly decreased, relative to pure culture, by the presence of A. flavus and H. burtonii, but only slightly by F. sporotrichioides. The number of CFU of P. verrucosum was only slightly decreased in the presence of other species under most conditions. Generally, production of ochratoxin A by P. verrucosum was inhibited, sometimes significantly, in the presence of A. flavus and H. burtonii, but was changed only slightly by the presence of F.

sporotrichioides. There was occasionally temporary enhancement in ochratoxin A production with all species during the 3-week incubation period. [References: 16].

2352 Subirade, I. (1996) **FATE OF OCHRATOXIN A DURING BREADMAKING.** *Food Additives & Contaminants. 13(Suppl S):25-26.* English. [DIRECT SCI GRP DANONE 7 RUE TEHERAN F-75381 PARIS FRANCE].

2353 Wolf Hall, C.E. (University of Nebraska at Lincoln, Lincoln, NE.); Bullerman, L.B. (1996) **Comparison of thin-layer chromatography and an enzyme-linked immunosorbent assay for detection and quantification of deoxynivalenol in corn and wheat.** *Journal of food protection (USA) v. 59(4) p. 438-440.* references. English. (AGRIS 97-013041).

The trichothecene, deoxynivalenol (DON), is a common mycotoxin found in wheat and corn. Detection methods for DON have limitations in accuracy, sensitivity, ease of use, and turn-around time. Two methods, thin-layer chromatography (TLC) and an enzyme-linked immunosorbant assay (ELISA) for DON detection and quantification were compared. The methods varied considerably in the amounts of DON detected in 51 different grain samples, with the ELISA method showing higher concentrations than the TLC method. Much of the unaccounted-for DON may have been lost during sample preparation for the TLC method. Recovery rates for the TLC method at DON levels of 1 and 5 ppm were 46 and 25 in corn grits and 32 and 26 in ground wheat respectively. Recovery rates for the ELISA method at 1 and 5 ppm levels were both 96 in corn grits and respectively 83 and 69 in ground wheat. The ELISA method was much faster and less laborious than the TLC method and did not use organic solvents, which are required in the TLC method.

Q04 FOOD COMPOSITION

2354 Agu, RC.; Palmer, GH. (1997) **ALPHA-GLUCOSIDASE ACTIVITY OF SORGHUM AND BARLEY MALTS.** *Journal of the Institute of Brewing. 103(1):25-29.* English. [HERIOT WATT UNIV DEPT BIOL SCI EDINBURGH EH14 4AS MIDLOTHIAN SCOTLAND].

Sorghum malt alpha-glucosidase activity was highest at pH 3.75 while that of barley malt was highest at pH 4.6. At pH 5.4 employed in mashing sorghum malt alpha-glucosidase was more active than the corresponding enzyme of barley malt. alpha-Glucosidase was partly extracted in water but was readily extracted when L-cysteine was included in the extraction buffer, pH 8. Sorghum malt made at 30 degrees C had higher alpha-glucosidase activities than the corresponding malts made at 20 degrees C and 25 degrees C. Nevertheless, the sorghum malts made at 20 degrees C and 25 degrees C produced worts which contained more glucose than worts of malt made at 30 degrees C. Although barley malts contained more alpha-glucosidase activity than sorghum malts, the worts of barley had the lowest levels of glucose. The limitation to maltose production in sorghum worts, produced at 65 degrees C, is due to inadequate gelatinization of starch and not to limitation to beta-amylase and alpha-amylase activities. Gelatinization of the starch granules of sorghum malt in the decantation mashing procedure resulted in the production of sorghum worts which contained high levels of maltose, especially when sorghum malt was produced at 30 degrees C. Although the beta-amylase and alpha-amylase levels of barley malt was significantly higher than those of sorghum *masted optimally* at 30 degrees C, sorghum worts contained higher levels of glucose and equivalent levels of maltose to those of barley malt. It would appear that the individual activities of alpha-glucosidase, alpha-amylase and beta-amylase of sorghum malts or barley malts do not correlate with the sugar profile of the corresponding worts. In consequence, specifications for enzymes such as alpha-amylase and beta-amylase in malt is best set at a range of values rather than as single values. [References: 26].

2355 Almana, HA.; Mahmoud, RM. (1996) **EVALUATION OF DURUM WHEAT CULTIVARS GROWN IN SAUDI ARABIA AND THEIR FLOUR PERFORMANCE FOR SPAGHETTI-MAKING QUALITY.** *Arab Gulf Journal of Scientific Research. 14(3):659-674.* English. [KING SAUD UNIV COLL AGR DEPT FOOD SCI POB 2460 RIYADH 11451 SAUDI ARABIA].

Five durum wheat cultivars, CHAMI, YOVAROS, SEBUO 4, KOREFLA, and K.F.U.I were subjected to detailed physical, chemical, mixing, cooking and sensory tests to evaluate their flour performances for spaghetti-making quality. Test weights for all cultivars have met the specification for European Union (EU) durum wheat. Only CHAMI and SEBUO 4 were characterized by larger kernel size while YOVAROS and K.F.U.I were about 30% less in yellow color intensity than other cultivars. In spite of all cultivars being generally of higher protein contents, they varied in their mixing characteristics. Wheat ash contents ranged from 1.39 to 2.21%, and falling numbers were from 63 to 872 sec. Spaghetti samples prepared from all cultivars, except, K.F.U.I were characterized by lower cooking losses, and an extremely high cooking loss (17%) was observed for spaghetti prepared from K.F.U.I. In addition, cooked spaghetti samples from all cultivars except YOVAROS and K.F.U.I had an intense desirable yellow color. Sensory panel evaluation of cooked spaghetti revealed that spaghetti from CHAMI and SEBUO 4 had excellent overall sensory properties as indicated by good firmness and almost absent stickiness and bulkiness. To the contrary, spaghetti from YOVAROS and K.F.U.I had poor sensory attributes as indicated by insufficient firmness and high or very high stickiness and bulkiness. Only spaghetti prepared from KOREFLA was rated fair as indicated by sufficient firmness and high stickiness and rare bulkiness. [References: 22].

2356 Angelino, SAGF.; Vanlaarhoven, HPM.; Vanwesterop, JJM.; Broekhuijse, BM.; Mocking, HCM. (1997) **TOTAL NITROGEN CONTENT IN SINGLE KERNEL MALTING BARLEY SAMPLES.** *Journal of the Institute of Brewing. 103(1):41-46.* English. [TNO NUTR & FOOD RES INST POB 360 NL-3700 AJ ZEIST NETHERLANDS].

It was demonstrated that the Dumas method is suitable to analyse single kernel barley samples for their total nitrogen content directly without milling. The method was compared to the nitrogen analysis in milled samples over a range of 1.5-3.0 %N. These samples consisted of kernel size grading fractions from barley cultivated at different N-dressings and using a shading regime. A good correlation was found between milled and whole barley kernels (r(2)=0.852). The method was used to determine the nitrogen content of individual kernels in the barley grading fractions. The nitrogen content in these fractions decreased with increasing kernel size depending on growth conditions. A large variation in nitrogen content between individual kernels was found for all grading fractions. In a study of barley main spikes the variation in kernel nitrogen content within spikes was smaller than the variation between spikes, especially when the barley was grown at a 60% tight reduction regime during the kernel filling period. The average kernel total nitrogen content under the latter condition was about two times as high as in the control experiment. The kernel position along the spike did not clearly affect its nitrogen content. Acid and SDS polyacrylamide get electrophoresis (PAGE) revealed similar banding patterns for proteins from kernels at different positions of both low and high hi barley spikes. The single kernel method for nitrogen may be used by the breeder as a quality criterion for new barley varieties to test their spike development at different cultivation conditions. It can suit the maltster to screen rapidly the homogeneity in nitrogen (protein) content of barley batches. [References: 12].

2357 Aremu, C.Y. (Calabar Univ. (Nigeria). Coll. of Medical Sciences, Dept. of Biochemistry); Agiang, M.A.; Ayatse, J.O.I. (1995) **Protein profiles and organoleptic properties of bread from wheat flour and full-fat or defatted fermented cocoa bean powder.** *Plant Foods for Human Nutrition (Netherlands) v. 48(4) p. 287-295.* 14 ref. English. (AGRIS 97-027701).

2358 Bergman, CJ.; Gualberto, DG.; Weber, CW. (1996) **NUTRITIONAL EVALUATION OF A HIGH-TEMPERATURE DRIED SOFT WHEAT PASTA SUPPLEMENTED WITH COWPEA (VIGNA UNGUICULATA (L) WALP).** *Archivos Latinoamericanos de Nutricion. 46(2):146-153.* English. [UNIV ARIZONA TUCSON, AZ USA].

The objective of this study was to determine the nutritional quality of the pasta described above. The work was unique in the following aspects: 1) the drying process was a nonconventional method, consisting of a high-temperature short-time (HTST) process; 2) the nutritional quality of the wheat pasta was improved by the cowpea supplementation. Cowpea was especially chosen due to it being a staple food in the diet of the people in Northeast Brazil. Benefits attributed to the HTST drying process include a reduction in bacterial counts, shorter processing time and less energy consumption. In addition, there are reports in the literature of improved pasta firmness, colorintensity, and cooking characteristics, when non Triticum durum materials plus drying are used. The pasta produced in this work was made using 100% soft wheat flour(SP), and soft wheat flour(SF) mixed supplemented with 10, 20 and 30% dehulled cowpea meal (CM); refered to as 10, 20 and 30% SP, respectively. The methods utilized

in this project included: AACC methods for proximate analyses and trypsin inhibitor activity determination, atomic absorption spectrophotometry for mineral determination, a dye binding procedure for measuring available lysine, HPLC for amino acid quantification, , FAO/WHO amino acid scoring patterns for chemical scores and AOAC for protein digestibility. The protein content of the pastas supplemented with CM ranged from 11.3 to 14.2%, while the 100% SF pasta (SP) contained 10.9 %. CM supplementation resulted in 52 to 113% more total lysine, and 26 to 82% more available lysisne in the CIM pasta compared to the SP. Chemical scores for SP were 45 and 59% for preschool and school-age children, respectively. Adding 30% CM to SP improved the above chemical scores to 89 and 100+, respectively. However, the addition of CM compromised the in vitro protein digestibility of SP from 4 to 6%. The addition fo 30% CM provided the SP with greater calcium (Ca), iron (Fe), zinc (Zn) and copper (Cu): 44, 49, 91 and 402% respectively. Cooking the CM pasta resulted in a 50 to 90% retention of mineral content, with the greatest loss being for Cu. In the cooked 30% CM pasta, the contents of Fe, Zn and Cu were, respectively, 50, 67 and 243% greater than their content in the cooked SP. Of the cooked pasta, the only one displaying trypsin inhibitor activity was the 30% CM pasta, which had 0.8 TIU. [References: 61].

2359 Botham, RL.; Cairns, P.; Faulks, RM.; Livesey, G.; Morris, VJ.; Noel, TR.; Ring, SG. (1997) **PHYSICOCHEMICAL CHARACTERIZATION OF BARLEY CARBOHYDRATES RESISTANT TO DIGESTION IN A HUMAN ILEOSTOMATE.** *Cereal Chemistry. 74(1):29-33.* English. [AFRC INST FOOD RES COLNEY LANE NORWICH RES PK NORWICH NR4 7UA NORFOLK ENGLAND].

Physicochemical techniques, monosaccharide, and linkage analysis, have been used to investigate the digestibility of different forms of cooked barley starch in an ileostomist model. An ileostomate volunteer consumed a flapjack-type biscuit containing either barley flake, flour, or starch. Both starch and mucin were identified in the effluent and were found to make a significant contribution to the potentially fermentable substrate available to the large intestine. Chemical analysis of the effluents showed that the content of resistant starch in the effluent varied with presence and form of nonstarch polysaccharide and after consumption of barley flake and flour was 10.1 and 5.9% of the starch ingested, respectively. Wide-angle X-ray diffraction showed the excreted starch to be A-type only, indicating that the starch consumed in all three flapjack types was ungelatinized. These data demonstrate the potential of physico-chemical techniques in the analysis of physiological samples. [References: 32].

2360 Bredie, WLP.; Hassell, GM.; Guy, RCE.; Mottram, DS. (1997) **AROMA CHARACTERISTICS OF EXTRUDED WHEAT FLOUR AND WHEAT STARCH CONTAINING ADDED CYSTEINE AND REDUCING SUGARS.** *Journal of Cereal Science. 25(1):57-63.* English. [UNIV READING DEPT FOOD SCI & TECHNOL POB 226 READING RG6 6AP BERKS ENGLAND].

The aromas generated in wheat flour or wheat starch extruded with or without the addition of cysteine and reducing sugars (0.044 mol/kg feed) were evaluated by descriptive sensory profiling. A trained sensory panel (n = 9) developed a consensus vocabulary of 24 attributes, of which 17 varied significantly ($P < 0.05$) between the samples in analysis of variance (ANOVA). The extrudates were characterised by four loading domains in principal component analysis (PCA). Biscuity, cornflakes, sweet and cooked milk were discriminative For extruded flour. Addition of cysteine and glucose resulted in stronger popcorn, nutty/roasted and puffed wheat aromas. Savoury and sulphur notes were more evident in the flour-cysteine extrudate when glucose was replaced by xylose. In starch extrudates modified by the addition of. cysteine and sugar, the more objectionable attributes, sharp/acidic, stale cooking oil, cooked apple and wet washing, became dominant. Flour appeared to contain important aroma precursors not present in starch. (C) 1997 Academic Press Limited [References: 24].

2361 Chetana, R.; Reddy, SY.; Prabhakar, JV. (1996) **EFFECT OF FAT AND EMULSIFIERS ON TEXTURE OF CHIROTI - AN INDIAN TRADITIONAL SWEETMEAT.** *Journal of Food Science & Technology-Mysore. 33(6):474-478.* English. [CENT FOOD TECHNOL RES INST DEPT LIPID TECHNOL MYSORE 570013 KARNATAKA INDIA].

Chiroti is an Indian traditional product prepared from wheat semolina (soji) or refined wheat flour (maida) or a combination of the two. The rheological characteristics of the doughs prepared with soji, maida or blend of these two, which are suitable for chiroti preparation, were studied. The proportions of water and fat required during dough preparation were suitably adjusted depending on the type of raw material. The dough with maida required 56.6% water and 10% fat as against 53.3% and 6.6% for the blend. Soji took only 50% water and 2% fat The study showed that the dough with optimum gluten development having consistencies of 560, 540 and 580 BU for soji, maida and the blend, respectively, were suitable for chiroti preparation. Lecithin at 0.5% level had beneficial effect and functioned as a dough fat replacer, sparing about 20% of the layering fat without affecting the quality of the product. [References: 12].

2362 Claye, SS.; Idouraine, A.; Weber, CW. (1996) **IN VITRO MINERAL BINDING CAPACITY OF FIVE FIBER SOURCES AND THEIR INSOLUBLE COMPONENTS FOR COPPER AND ZINC.** *Plant Foods for Human Nutrition. 49(4):257-269.* English. [UNIV ARIZONA DEPT NUTR SCI TUCSON, AZ 85721 USA].

Five fiber-rich food sources, wheat bran (WB), rice bran (RB), oat fiber (OF), apple fiber (AF), and tomato fiber (TF) and their isolated insoluble fiber fractions were evaluated in vitro for their binding capacity for zinc (Zn) and copper (Cu). Endogenous Zn concentrations of the fibers varied from 11.0 mu g/g for OF to 136.0 mu g/g for WB, whereas Cu concentrations ranged from 1.0 mu g/g for OF to 14.0 mu g/g for WB. In all the fibers, total Cu bound was significantly higher than Zn. Total Cu bound ranged from 3687 mu g/g for OF to 8019 mu g/g and 8073 mu g/g for WB and AF, whereas, bound Zn levels varied from 1213 mu g/g for OF to 7121 mu g/g and 7166 mu g/g for WB and RB, respectively. Significantly more Zn and Cu were bound by the fiber fractions than the whole fibers, probably due to the exposure of more binding sites on the polymers during the fractionation process. Generally, the fiber components of all five fibers showed Cu and Zn binding capacities decreasing in the order; hemicellulose A > lignocellulose > lignin > cellulose. A strong correlation was seen between the combined effects of protein, hemicellulose, and lignin contents of the fibers versus total Zn binding capacity and a lesser correlation with Cu. [References: 32].

2363 Deckard, EL.; Joppa, LR.; Hammond, JJ.; Hareland, GA. (1996) **GRAIN PROTEIN DETERMINANTS OF THE LANGDON DURUM-DICOCCOIDES CHROMOSOME SUBSTITUTION LINES.** *Crop Science. 36(6):1513-1516.* English. [N DAKOTA STATE UNIV DEPT PLANT SCI FARGO, ND 58105 USA].

High grain protein content of durum wheat (Triticum turgidum L.) is important for improved cooking and nutritional quality. The development of a set of 'Langdon'-dicoccoides [LDN(DIC)] chromosome substitution lines offers an opportunity to develop new high protein durum cultivars. The objective of this research was to determine under field conditions the biological reason for the changes in grain protein content. The substitution lines studied included two LDN(DIC-2A) lines; one each of the LDN(DIC-4A), LDN(DIC-4B), and LDN(DIC-5B) lines; and three LDN(DIC-6B) lines. The changes in accumulation and partitioning of dry weight (DW) and N as a result of substituting specific DIC chromosomes into LDN durum were consistent across the environments tested. Certain DIC chromosomes altered the accumulation ratio (total plant N/total plant DW), others altered the partitioning ratio (N harvest index/harvest index), and others appeared to alter both ratios to affect grain protein content. The major reason for the lower N contents of the 2A, 4A, and 4B lines was a decreased partitioning ratio, and the major reason for the higher N content of the 5B line was a higher accumulation ratio. The 6B lines were the only lines where the accumulation and partitioning ratios were always equal to or greater than LDN. The three 6B lines varied for the relative importance of changes in the accumulation and partitioning ratios to increase grain N content. [References: 17].

2364 Doehlert, DC.; Zhang, DC.; Mcmullen, MS.; Moore, WR. (1997) **ESTIMATION OF MIXED LINKAGE BETA-GLUCAN CONCENTRATION IN OAT AND BARLEY FROM VISCOSITY OF WHOLE GRAIN FLOUR SLURRY.** *Crop Science. 37(1):235-238.* English. [N DAKOTA STATE UNIV USDA ARS HARD RED SPRING & DURUM WHEAT QUAL LAB HARRIS HALL FARGO, ND 58105 USA].

The presence of beta-glucan from oat (Avena sativa L.) or barley (Hordeum vulgare L.) products in the human diet can lower serum cholesterol. The selection of new oat or barley cultivars with higher beta-glucan concentration in the grain is usually limited by the efficiency of the analytical procedure required to measure this component. The utility of

hour slurry viscosity as an indirect means of estimating flour beta-glucan concentration was investigated. Water at 25 degrees C was added to enzyme-inactivated whole-grain oat flour to form a 23% dry matter mixture, and stirred to form a uniform slurry. Viscosity, as measured with a rotational spindle-type viscometer, increased hyperbolically with time. Viscosity measured 3 h after water addition was exponentially dependent on hour content and was linearly correlated with beta-glucan concentration in the hour. The procedure was useful as a screening method for the estimation of beta-glucan concentration in preliminary breeding lines of oat and barley. The procedure is effective with enzyme-inactivated (steam-treated) whole or dehulled grain, but the presence of endo-beta-glucanases in hulls of oats and barley prevent the application of this procedure with hours of raw whole oats and barleys. [References: 22].

2365 Dubreil, L.; Compoint, JP.; Marion, D. (1997) **INTERACTION OF PUROINDOLINES WITH WHEAT FLOUR POLAR LIPIDS DETERMINES THEIR FOAMING PROPERTIES.** *Journal of Agricultural & Food Chemistry. 45(1):108-116.* English. [INRA LAB BIOCHIM & TECHNOL PROT BP 1627 F-44316 NANTES 03 FRANCE].

The interaction of puroindolines with wheat polar lipids and the stability of the corresponding puroindoline foams were investigated. Whereas puroindoline-a is capable of binding tightly to both wheat phospholipids and glycolipids, puroindoline-b interacts tightly only with negatively charged phospholipids and forms loose lipoprotein complexes with glycolipids. Both ionic, hydrogen, and hydrophobic bonds contribute to the stability of puroindoline-polar lipid complexes, and the integrity of tryptophan-rich domain is essential for the interaction with neutral polar lipids. Compared with egg white proteins, chosen as a model of nonlipid binding and good foaming food proteins, puroindolines exhibit excellent foam stability, especially in the presence of wheat polar lipids. The higher efficiency of puroindoline-a than puroindoline-b to prevent foam destabilization by wheat polar lipids highlights the close relationships between lipid binding and foaming properties of these wheat proteins. These results indicate that puroindolines would be good candidates to play a major role in the formation and stability of bread dough foams. [References: 38].

2366 Dziuba, J.; Minkiewicz, P.; Puszka, K. (University of Agriculture, Olsztyn (Poland). Dept. of Food Biochemistry) (1995) **Wheat gliadins as potential precursors of bioactive peptides. Running title: Bioactive fragments of wheat gliadins.** *Acta Academiae Agriculturae ac Technicae Olstenensis. Technologia Alimentorum (Poland) (no.28) p. 3-16.* 2 fig., 4 tables; 35 ref. Appendix - a list of bioactive peptides inserted into programme database. English. (AGRIS 97-027877).

Amino acid sequences of alpha/beta-gliadins and gamma-gliadins taken from SWISS-PROT database were analysing using the computer programme called PROTEIN, searching for fragments identical with bioactive peptides in protein chains and localizing bonds susceptible to enzymatic proteolysis. The presented method may be useful in determining the localization of potentially bioactive fragments in protein chains.

2367 Edwards, N.M. (Canadian Grain Commission, Winnipeg, MB, Canada.); Biliaderis, C.G.; Dexter, J.E. (1995) **Textural characteristics of wholewheat pasta and pasta containing non-starch polysaccharides.** *Journal of food science (USA) v. 60(6) p. 1321-1324.* references. English. (AGRIS 97-013313).

Pasta enriched with nonstarch polysaccharides, and wholewheat pasta were assessed for cooking quality. Xanthan gum improved pasta firmness when added at 1 and 2, without affecting moisture uptake or degree of swelling when cooked for a constant time. Dynamic rheological testing indicated development of a network structure with addition of gums which contributed to overall pasta firmness. Food grade pea fiber, at 5 and 10, caused moderate reduction in firmness. Wholewheat pasta was similar in firmness to pasta with 10 pea fiber, as measured by Instron. Dynamic rheometry measurements indicated a weak network in wholewheat pasta. Small strain dynamic tests were more sensitive to subtle changes in network structure than were large deformation compression tests.

2368 El Adawy, T.A. (Menofiya Univ., Shibin El Kom (Egypt). Faculty of Agriculture, Dept. of Food Science and Technology) (1995) **Effect of sesame seed proteins supplementation on the nutritional, physical, chemical and sensory properties of wheat flour bread.** *Plant Foods for Human Nutrition (Netherlands) v. 48(4) p. 311-326.* 30 ref. English. (AGRIS 97-027702).

2369 Fischer, J. (Institut Technique des Cereales et des Fourrages, Paris (France)) (1996) **[Baking value of wheat. Varietal association]. Valeur boulangere des bles. La complementarite des varietes.** *Perspectives Agricoles (France) (no 210) p. 91-96.* 11 graph. French. (AGRIS 97-013182).

2370 Golub, C. (1996) **Ancient and not-so-ancient grains find new-age cachet.** *Environmental nutrition (USA) v. 19(8) p. 2.* English. (AGRIS 97-027792).

2371 Ha, MA.; Jardine, WG.; Jarvis, MC. (1997) **SOLID-STATE C-13 NMR OF CELL WALLS IN WHEAT BRAN.** *Journal of Agricultural & Food Chemistry. 45(1):117-119.* English. [UNIV GLASGOW DEPT CHEM GLASGOW G12 8QQ LANARK SCOTLAND].

Cell walls from wheat bran were examined intact by cross-polarization, magic-angle spinning C-13 NMR to determine their polymer composition. The carbohydrate part of the C-13 spectrum was typical of graminaceous cell walls having cellulose and arabinoxylans as their main components. Only a little lignin was observed in the spectrum, but signals from the hydrocarbon chains of cutin were particularly obvious. It is suggested that cutin, rather than lignin, plays an important role in protecting wheat bran from microbial degradation in the rumen and in the human gut and that the hydrophobic properties of the cutin are likely to be responsible for some of its nutritional properties. [References: 20].

2372 Jayarajah, CN.; Tang, HR.; Robertson, JA.; Selvendran, RR. (1997) **DEPHYTINISATION OF WHEAT BRAN AND THE CONSEQUENCES FOR FIBRE MATRIX NON-STARCH POLYSACCHARIDES.** *Food Chemistry. 58(1-2):5-12.* English. [AFRC INST FOOD RES NORWICH LAB DEPT FOOD MOL BIOCHEM NORWICH RES PK COLNEY NORWICH NR4 7UA NORFOLK ENGLAND].

Wheat bran is a rich source of dietary fibre. Modified milling technologies can yield fibre-enriched bran fractions but the processing also leads to a concentration of phytate, which has a perceived detrimental effect on mineral metabolism. Endogenous phytase activity in wheat grain can be used to reduce phytate levels, and methods to optimise phytase activity have been investigated using aleurone-enriched and pericarp-enriched bran fractions. It was found that dephytinisation of wheat bran could be achieved at a relatively low moisture content for each fraction. The extent of dephytinisation could be controlled either through control of moisture content or through time of incubation. By using yeast, the rate of dephytinisation at 35 degrees C was similar to that achieved by endogenous phytase alone at 55 degrees C. The endogenous phytase activity resulted in the destruction of phytate without accumulation of inositol phosphate intermediates, as monitored using P-31-NMR spectroscopy. Also, at low moisture levels there was no apparent modification of fibre components through polysaccharidase activities which may be present in the bran. Therefore bran fractions can be readily dephytinised at low moisture contents and without modification of the fibre components. Copyright (C) 1996 Elsevier Science Ltd. [References: 27].

2373 Johansson, C.G. (1996) **Determination of total nitrogen in barley and malt by combustion method. Collaborative trial [European Brewery Convention].** *Cerevisia. Belgian Journal of Brewing and Biotechnology (Belgium) v. 21(2) p. 5-8.* 3 tables; 4 ref. English. (AGRIS 97-013202).

2374 Josephides, C.M. (Agricultural Res. Inst., Nicosia (Cyprus)) (1996) **Enzymatic activity of amylase on durum wheat grain produced under Cyprus conditions.** *Technical Bulletin (Cyprus); no. 178 8 p.* 2 tables; 1 illus. 13 ref. English. (AGRIS 97-027631).

The falling number of whole-grain flour from the durum wheat varieties Kyperounda, Aronas, Mesaoria, Karpasia and Macedonia grown in two seasons at seven environments in Cyprus ranged between 500 and 775. This is typical of grain grown under dry and hot conditions and indicates a very low amylolytic activity.

2375 Kitahara, K.; Tanaka, T.; Suganuma, T.; Nagahama, T. (1997) **RELEASE OF BOUND LIPIDS IN CEREAL STARCHES UPON HYDROLYSIS BY GLUCOAMYLASE.** *Cereal Chemistry. 74(1):1-6.* English. [KAGOSHIMA UNIV FAC AGR DEPT BIOCHEM SCI & TECHNOL 21-24 KORIMOTO 1 CHOME KAGOSHIMA 890 JAPAN].

The raw starch granules from corn, rice, and wheat were hydrolyzed by practically pure glucoamylase (Rhizopus niveus). The bound lipids remaining in the residual starches were investigated, of which the major components of the lipids, free fatty acids (FFA) in corn starch, FFA and phospholipids (PL) in rice starch, and PL in wheat starch were determined. In each case, the bound FFA and PL were decreased to some extent during the initial stage of hydrolysis. During the later stages, the FFA continued to gradually decrease, while the level of PL stabilized. It was interesting that some of the bound lipids were released from the granules upon glucoamylase hydrolysis, differing from the model amylose-lipid complexes. Furthermore, the structures of the residual starches were investigated. The blue value and lambda(max) of the starches were increased by partial hydrolysis of the starch granules using practically pure glucoamylase. Two gel-permeation chromatography analyses revealed that the relative amount of amylose fraction was increased by glucoamylase hydrolysis, and also that the increments were reduced by the defatting of bound lipids. The results suggest that the increase in amylose fraction is attributable to the existence of bound lipids in the granules. [References: 33].

2376 Kosar, K. (Vyzkumny Ustav Pivovarsky a Sladarsky, Brno (Czech Republic)) (1996) **[Quality parameters of barley and malt]. Kvalitativni parametry jecmene a sladu.** *Kvasny Prumysl (Czech Republic) v. 42(6) p. 201-206.* Czech. (AGRIS 97-027797).

2377 Kovacs, MIP.; Poste, LM.; Butler, G.; Woods, SM.; Leisle, D.; Noll, JS.; Dahlke, G. (1997) **DURUM WHEAT QUALITY - COMPARISON OF CHEMICAL AND RHEOLOGICAL SCREENING TESTS WITH SENSORY ANALYSIS.** *Journal of Cereal Science. 25(1):65-75.* English. [AGR & AGRI FOOD CANADA CEREAL RES CTR 195 DAFOE RD WINNIPEG MB R3T 2M9 CANADA].

Various chemical and physical screening tests to predict pasta cooking quality in a durum wheat breeding program were evaluated using sensory methods. Twelve durum wheat varieties were field grown in three consecutive years, milled into semolina and then processed into spaghetti using low temperature drying. Correlations between protein content and sensory scores were not consistent among the 3 years, and protein content did not correlate with any of the tests used to predict pasta cooking quality. Cooked pasta disc viscoelasticity measurements were reliable predictors of sensory quality. Sedimentation values (SV) and cooked gluten viscoelasticity (CGV) were significantly correlated with chewiness in 2 of the 3 years. Mixing total energy (MTE) and mixing peak height (MPH) values obtained using a Mixograph were the best predictors for chewiness (CH) and firmness (FI). Dione of the tests correlated with adhesiveness to teeth (AD), which suggests that it is an unrelated parameter. Because the Mixograph test is simple, requires relatively small sample size and the results obtained are highly correlated with sensory data, it is the most useful test to predict the end use qualify of durum wheat in a breeding program. (C) 1997 Academic Press Limited [References: 32].

2378 Lindborg, KM.; Tragardh, C.; Eliasson, AC.; Dejmek, P. (1997) **TIME-RESOLVED SHEAR VISCOSITY OF WHEAT FLOUR DOUGHS - EFFECT OF MIXING, SHEAR RATE, AND RESTING ON THE VISCOSITY OF DOUGHS OF DIFFERENT FLOURS.** *Cereal Chemistry. 74(1):49-55.* English. [NESTLE R&D CTR BJUV AB BOX 520 S-26725 BJUV SWEDEN].

The shear viscosity of three doughs of different wheat cultivars mixed to a farinograph level of 500 BU was measured at low shear rates as a function of the shear deformation using a cone-and-plate viscometer. Cyanoacrylate adhesive was used to attach the dough samples to the instrument surfaces to eliminate wall slip. Flours used were Dragon, Kosack, and a fodder wheat. A distinct difference was observed between the viscosities of the different flour cultivars. The strongest dough (Dragon), with the highest protein content and a good resistance in the farinograph, had the highest maximum viscosity. The doughs showed distinct strain hardening, more pronounced for the strong doughs. Maximum viscosity was obtained at a strain of approximate to 4, almost independent of the shear rate, but at higher values for stronger doughs (5 for Dragon, 4 for Kosack, and 3.5 for fodder wheat). The maximum was most pronounced for well-mixed doughs after resting. The viscosity and its variation with strain may be used as a measure of quality; a higher viscosity and a maximum occurring at high strains indicating good quality (related to the farinogram). The viscosity gradually decreased at higher strains. Apparent viscosity increases with strain and reaches a maximum value at a common strain, which suggests the presence of entangled molecules. The increase of maximum viscosity with increase in mixing also supports this theory. Resting the dough increases the maximum viscosity, which suggests the formation of new cross-links in the nonequilibrium entangled network during resting. [References: 25].

2379 Marcin, A.; Fencik, R.; Belickova, E.; Siklenka, P. (1996) **DETECTION OF WHEAT PROTEIN IN SAUSAGES BY DOT-EIA TECHNIQUE.** *Journal of Food Science & Technology-Mysore. 33(5):421-424.* English. [INST EXPT VET MED KOSICE 04001 SLOVAKIA].

A simple immunological technique (DOT-EIA) for the wheat protein detection in the heat processed meat products and sausages has been developed. It involves extraction of wheat protein with TRIS-NaCl buffer from the commercial samples, such as sausages and meat products (containing wheat flour) as well as subjecting the extract to an immunological test DOT-EIA. The quantitative evaluation of the test was by the spectrophotometric determination of the violet colour on the surfaces of the nitrocellulose (NC) strips, after the immunological staining of the samples and comparison with the spots of the calibration standards. The screening of the samples by DOT-EIA procedure proved to be an efficient method for wheat flour determination in the cooked meat products at 0.2% level of the wheat protein. [References: 16].

2380 Matsuzaki, M.; Toyoda, M. (1996) **CHANGES IN MAXIMUM VISCOSITY OF WHEAT FLOUR AND THE RELATIONSHIP TO CLIMATIC CONDITIONS DURING RIPENING [Japanese].** *Japanese Journal of Crop Science. 65(4):569-574.* Japanese. [HOKKAIDO NATL AGR EXPT STN UPLAND AGR RES CTR MEMURO 082 JAPAN].

In order to study the relationship between climatic conditions and maximum viscosity (MV) in wheal flour, changes in MV and alpha-amylase activity by calendar day were investigated. Two winter and two spring wheat cultivars were harvested at 3-day intervals in 1992 and 1993. Spring cultivars flowered about two weeks later than winter cultivars, but MV of these cultivars decreased to below 300 B. U. at almost the same day in each year: MV decreased to below 300 B. U. from August 11 to 17 in 1992, and from July 21 to 27 in 1993. alpha-Amylase activity increased over 10 Abs/g during the same periods. In 1992, about 60 mm precipitation was recorded from August 8 to 10, and MV probably decreased due to this precipitation. However, the precipitation from July 18 to 26 in 1993 was 3 mm, and MV probably decreased to below 300 B. U. due to other climatic conditions. During the period when MV decreased in 1993, there were low temperatures and little sunshine. These conditions probably reduced MV by inhibiting grain desiccation. In 1993, MV was maintained at a high level in precipitation cut-off treatment. This suggested that a little rain or dew at night, which were not recorded as precipitation, affected MV. The following tendencies were observed with the decrease of MV in 1993:the maximum alpha-amylase activity was low, MV and alpha-amylase activity depended on cultivars, and other flour traits did not worsen. The climatic conditions when MV decreased to below 300 B. U, in 1993, were similar to that in 1988. From the results, it was suggested that the decrease in MV through lack of rainfall is not an exceptional phenomenon in the Tokachi district, and MV may decrease with lack of rainfall. [References: 1].

2381 Morell, MK.; Blennow, A.; Kosarhashemi, B.; Samuel, MS. (1997) **DIFFERENTIAL EXPRESSION AND PROPERTIES OF STARCH BRANCHING ENZYME ISOFORMS IN DEVELOPING WHEAT ENDOSPERM.** *Plant Physiology. 113(1):201-208.* English. [COOPERAT RES CTR PLANT SCI POB 475 CANBERRA ACT 2601 AUSTRALIA].

Three forms of starch branching enzyme (BE) from developing hexaploid wheat(Triticum aestivum) endosperm have been partially purified and characterized. Immunological cross-reactivities indicate that two forms (WBE-I-AD, 88 kD, and WBE-I-B, 87 kD) are related to the maize BE I class and that WBE-II (88 kD) is related to maize BE II. Comparison of the N-terminal sequences from WBE-I-AD and WEE-II with maize and rice BEs confirms these relationships. Evidence is presented from the analysis of nullisomic-tetrasomic wheat lines demonstrating that WEE-I-B is located on chromosome 7B and that the WBE-I-AD fraction contains polypeptides that are encoded on chromosomes 7A and 7D. The wheat endosperm BE classes are differentially expressed during endosperm development. WBE-II is expressed at a constant level throughout mid and late endosperm development. In contrast, WBE-I-AD and WBE-I-B are preferentially expressed in late endosperm development. Differences are also observed

in the kinetic characteristics of the enzymes. The WBE-I isoforms have a 2- to 5-fold higher affinity for amylose than does WBE-II, and the WEE-I isoforms are activated up to 5-fold by phosphorylated intermediates and inorganic phosphate, whereas WBE-II is activated only 50%. The potential implications of this activation of BE I for starch biosynthesis are discussed. [References: 27].

2382 Nilsson, M.; Saulnier, L.; Andersson, R.; Aman, P. (1996) **WATER UNEXTRACTABLE POLYSACCHARIDES FROM THREE MILLING FRACTIONS OF RYE GRAIN.** *Carbohydrate Polymers. 30(4):229-237.* English. [SWEDISH UNIV AGR SCI DEPT FOOD SCI S-75007 UPPSALA SWEDEN].

Water unextractable material from bran, an intermediate milling fraction and sieved flour of rye grain were sequentially extracted at room temperature with saturated barium hydroxide, water, 4 M potassium hydroxide and water followed by extraction with 2 M potassium hydroxide in a boiling water bath, giving repeatable recoveries of extracts and polysaccharide residue compositions in collected fractions. Total recoveries of polysaccharide residues in extracts and residue from the different water unextractable materials were 78-88%. Extracts in which 90-93% of the carbohydrates were arabinose and xylose residues were obtained by extraction with saturated barium hydroxide. Subsequent extraction with water yielded a fraction in which 64-68% of the carbohydrates were glucose residues. The extraction with hot alkali resulted in extracts in which 85-89% of the carbohydrates were arabinose and xylose residues. The ara/xyl ratio in the collected fractions ranged from 0.1-1.3, with the lowest ratios in fractions that precipitated after neutralisation of the 4 M potassium hydroxide extract and the highest ratios in the unextractable residues. Structural characterisation with H-1-NMR spectroscopy revealed varying substitution patterns for arabinoxylans in the different extracts and that glucose residues in the extracts essentially originated from mixed-linked beta-glucan. The proportion of disubstituted xylose residues was lower in barium hydroxide extracts compared to the other main extracts. A highly branched heteroxylan was extracted with hot alkali. The polysaccharides found in the corresponding extracts for all the starting materials had generally similar structural features, but the yield differed considerably. Copyright (C) 1996 Elsevier Science Ltd [References: 43].

2383 Oh, H.J.; Lee, S.R. (Ewha Woman's University, Seoul (Korea Republic). Department of Food and Nutrition) (1996) **Physiological function in vitro of beta-glucan isolated from barley.** *Korean Journal of Food Science and Technology (Korea Republic) v. 28(4) p. 689-695.* 2 illus.; 4 tables; 23 ref. Korean. (AGRIS 97-013197).

2384 Ozboy, O.; Koksel, H. (1997) **UNEXPECTED STRENGTHENING EFFECTS OF A COARSE WHEAT BRAN ON DOUGH RHEOLOGICAL PROPERTIES AND BAKING QUALITY.** *Journal of Cereal Science. 25(1):77-82.* English. [HACETTEPE UNIV DEPT FOOD ENGN FAC ENGN TR-06532 ANKARA TURKEY].

Grain from the wheat varieties Bezostaya and Gerek were milled in a Buhler laboratory mill to obtain straight-run flour, fine bran and coarse bran. When the fine brans from both wheals were added to the respective parent flours al levels of 5%, 10% and 15% a weakening effect was noted in farinograms and extensograms, and loaf volumes were reduced. The coarse bran From Bezostaya wheat added to Bezostaya flour showed similar effects. However, coarse bran from Gerek wheat added to either flour, showed unexpected strengthening effects and had a lessened deleterious effect on loaf volume. (C) 1997 Academic Press Limited [References: 10].

2385 Park, WJ.; Shelton, DR.; Peterson, CJ.; Martin, TJ.; Kachman, SD.; Wehling, RL. (1997) **VARIATION IN POLYPHENOL OXIDASE ACTIVITY AND QUALITY CHARACTERISTICS AMONG HARD WHITE WHEAT AND HARD RED WINTER WHEAT SAMPLES.** *Cereal Chemistry. 74(1):7-11.* English. [UNIV NEBRASKA DEPT AGRON USDA ARS LINCOLN, NE 68583 USA].

Polyphenol oxidase (PPO) has been related to an undesirable brown discoloration of wheat-based end products. Consumer acceptance and product quality are generally decreased by the darkening phenomena. Two sets of wheat samples (Triticum aestivum L.) were investigated for variation in grain and flour PPO levels. Samples included 40 advanced experimental hard white winter wheat lines grown at two Kansas locations and 10 hard red winter wheat genotypes grown at three Nebraska locations. The variability in grain and flour PPO activities was influenced by growing location and population for the hard white wheat samples. There also was a significant influence of population by growing location interactions on PPO activity in both grain and flour. Genotype and growing location both contributed to variability in flour PPO activity among the hard red wheat samples. The variation in flour PPO activities among growing locations appeared larger than variation produced by genotypes tested for the hard red wheat samples. Quality parameters, such as wheat physical properties, flour protein and ash contents, grain color, and milling yield significantly correlated with grain and flour PPO activities. Among red wheat samples, flour PPO activity was related to 100 kernel weight, first reduction flour yield, and flour ash content. Grain PPO activity was related to variation in grain color observed among hard white samples. The relationship of quality characteristics with grain and flour PPO activities varied among white and red wheat samples. [References: 24].

2386 Rayas, LM.; Hernandez, RJ.; Ng, PKW. (1997) **DEVELOPMENT AND CHARACTERIZATION OF BIODEGRADABLE/EDIBLE WHEAT PROTEIN FILMS.** *Journal of Food Science. 62(1):160 ff.* English. [MICHIGAN STATE UNIV SCH PACKAGING E LANSING, MI 48824 USA].

Biodegradable and edible films were prepared from three types of wheat flours: commercial bread, hard red winter, and soft white. Films were produced at two pH values (4 and 11) and tested for oxygen permeability as related to temperature. Films were also produced with a cross-linked agent and tested for tensile strengths. Oxygen permeability was 5.9 x 10(-20) to 18.5 x 10(-20) m(3)O(2) m m(-2) s(-1) Pa-1 similar to values for commercial nylon. The oxygen permeability activation energy varied from 9.1 to 14.5 kcal mol(-1), depending on type of flour and pH did not affect oxygen permeability. Presence of the cross-linking agent increased the strength of films and elongation at break ranged from 490% to 640%, while tensile stress at break ranged from 25.8 x 10(-3) kg m(-2) to 44.1 x 10(-3) kg m(-2), lower than commercial nylon. [References: 25].

2387 Richard Forget, F. (INRA, Avignon, France.); Gauillard, F.; Hugues, M.; Jean Marc, T.; Boivin, P.; Nicolas, J. (1995) **Inhibition of horse bean and germinated barley lipoxygenases by some phenolic compounds.** *Journal of food science (USA) v. 60(6) p. 1325-1329.* references. English. (AGRIS 97-013203).

Phenolic compounds have been repeatedly implicated as potent antioxidants. Efficiency has been frequently estimated by radical scavenging activity and few reports have considered lipoxygenase (LOX) inhibition. Horse bean LOX was inhibited by a range of phenolic acids, gallates and flavonoids. All compounds tested were uncompetitive inhibitors with the exception of flavonol aglycons which were non competitive type. In each class of compounds, inhibition constants were strongly affected by structures. Inhibition patterns of (-)-epicatechin on germinated barley LOXs were detailed: (-)-epicatechin acted as an uncompetitive inhibitor while (-)-epicatechin reduced hydroperoxide formation by its radical scavenging activity and thus limited enzyme activation.

2388 Rugraff, YL.; Desbois, P.; Lebotlan, DJ. (1996) **QUANTITATIVE ANALYSIS OF WHEAT STARCH WATER SUSPENSIONS BY PULSED NMR SPECTROSCOPY MEASUREMENTS.** *Carbohydrate Research. 295:185-194.* English. [UNIV NANTES FAC SCI URA CNRS 472 LAB ANAL ISOTOP & ELECTROCHIM METAB F-44072 NANTES FRANCE].

A rapid and non-destructive method, based on pulsed NMR spectroscopy, has been developed for the study of wheat starch-water interaction. It involves a Gaussian fitting of the FID signals from liquid and solid phases obtained by pulsed NMR spectroscopy, resulting in an exact and repeatable quantification of these different phases. Moreover, the standard addition method in the range of a water/starch ratio greater than 0.55 allows the use of water as an internal reference. This reference signal is in good agreement with the total amount of hydrogen atoms in the sample, regardless of the solid/liquid ratio. This allows, from wheat starch suspensions in deuterium oxide, a determination of the starch proportion which has a 'liquid' behaviour (7.5%) and of the quantity of exchangeable hydroxyl groups (2.6:3) in the wheat starch granule. (C) 1996 Elsevier Science Ltd. [References: 30].

2389 Skrabanja, V.; Kreft, I. (Ljubljana Univ. (Slovenia). Biotechnical Fac., Agronomy Dept.); Draslar, K. (Ljubljana Univ. (Slovenia). Biotechnical

Fac., Biology Dept.); Jost, M. (Agriculture Inst., Krizevci (Croatia)) (1996) **Differences in starch digestibility between wheat genotypes.** *Zbornik Biotehniske fakultete Univerze v Ljubljani (Slovenia). Kmetijstvo (no.67) p. 55-57.* 1 table; 4 ref. English. (AGRIS 97-013351).

Flour from the wheat cv. Divana has significantly less ($P < 0.001$) rapidly digestible starch (RDS), more slowly digestible starch (SDS), and less resistant starch (RS) in comparison to the standard cv. Zitarka. There were no visible damaged starch grains found in either variety using SEM of broken kernels. It is possible that by mechanical treatment, small damages leading to differences in the rate of digestibility might appear in the cell matrix. The high level of slowly digestible starch in Divana may suggest that mechanically induced damages appear inside the starch grains. Such internal cracks or other similar damage could be not observed by SEM. Internal damage may allow more complete digestion of starch grains in a given time (120 min), after water and enzymes penetrate through the rigid cell matrix of Divana.

2390 Sun, RC.; Lawther, JM.; Banks, WB. (1996) **EFFECTS OF EXTRACTION TIME AND DIFFERENT ALKALIS ON THE COMPOSITION OF ALKALI-SOLUBLE WHEAT STRAW LIGNINS.** *Journal of Agricultural & Food Chemistry. 44(12):3965-3970.* English. [UNIV WALES BIOCOMPOSITES CTR BANGOR LL57 2UW GWYNEDD WALES].

Wheat straw was extracted with 1.5% KOH at 20 degrees C for 6 h, 1.5% LiOH at 20 degrees C for 6 h, and 1.5% NaOH at 20 degrees C for 0.5, 2, 3, 4, 6, 12, 24, 48, 72, 96, and 144 h, respectively. The alkali-soluble lignin fractions were isolated by two-step precipitation, and the chemical compositions in each of the lignin fractions are reported. The physicochemical properties and structural features of these lignin fractions were characterized by GPC, UV, IR, and C-13-NMR spectroscopy and alkaline nitrobenzene oxidation. The most striking characteristics of these lignin fractions are the almost absence of neutral sugars (0.7-0.9%) and their low average molecular weights (1000-1560 Da). The results also showed, that these lignin fractions contained roughly equal amounts of guaiacyl and syringyl units with relatively fewer p-hydroxyphenyl units and appeared to be very closely associated to hydroxycinnamic acids. [References: 25].

2391 Varughese, G. (Improvement Center (CIMMYT), El Batan, Mexico.); Pfeiffer, W.H.; Pena, R.J. (1996) **Triticale: a successful alternative crop. I.** *Cereal foods world (USA) v. 41(6) p. 474-482.* references. English. (AGRIS 97-027868).

2392 Wang, N.A. (University of Manitoba, Winnipeg, Manitoba, Canada.); Kierek Jaszczuk, D.; Marquardt, R.R.; Frohlich, A.A.; Abramson, D. (1996) **Use of a heterologous bridge coating antigen for the immunoassay of 3-acetyldeoxynivalenol in barley.** *Journal of food protection (USA) v. 59(5) p. 525-533.* references. English. (AGRIS 97-013198).

The study describes procedures that were used to develop a highly sensitive enzyme-linked immunosorbent assay (ELISA) for the quantitation of a trichothecene mycotoxin, 3-acetyldeoxynivalenol (3-AcDON), in barley. Polyclonal antibodies were produced in rabbits immunized with a conjugate of 3-AcDON and human serum albumin linked by an ester linkage (hemisuccinate bridge). High anti-3-AcDON titers were obtained after multiple immunizations. However, only a negligible degree of inhibition was obtained with 3-AcDON in a competitive ELISA when the coating conjugate contained the same ester linkage group (hemiglutarate bridge) as the immunogen. The use of a conjugate containing a heterologous ether linkage (O-methylcarboxyl bridge) compared to that of the immunogen yielded an inhibition curve for 3-AcDON that was highly sensitive ($IC50 = 0.21$ ng/ml) with essentially no interference from the bridging group. This conjugate was synthesized using iodoacetate and 1, 1'-carbonyldiimidazole chemistries. The assay showed low cross-reactivity with other trichothecenes including several analogs of deoxynivalenol (DON) with the exception of acetylated DON. The ELISA developed on the basis of this new conjugate was able to detect low concentrations of 3-AcDON (16 ppb) in spiked barley without any cleanup treatments.

2393 Zeng, M.; Morris, CF.; Batey, IL.; Wrigley, CW. (1997) **SOURCES OF VARIATION FOR STARCH GELATINIZATION, PASTING, AND GELATION PROPERTIES IN WHEAT.** *Cereal Chemistry. 74(1):63-71.* English. [WASHINGTON STATE UNIV USDA ARS WESTERN WHEAT QUAL LAB E 202 FOOD SCI & HUMAN NUTR FAC E PULLMAN, WA 99164 USA].

The starch of wheat (Triticum aestivum L.) flour affects food product quality due to the temperature-dependent interactions of starch with water during gelatinization, pasting, and gelation. The objective of this study was to determine the fundamental basis of variation in gelatinization, pasting, and gelation of prime starch derived from seven different wheat cultivars: Kanto 107, which is a partial waxy mutant line, and six near-isogenic lines (NILs) differing in hardness. Complete pasting curves with extended 16-min hold at 93 degrees C were obtained using the Rapid Visco Analyser (RVA). Apparent amylose content ranged from 17.5 to 23.5%; total amylose content ranged from 22.8 to 28.2%. Starches exhibited significant variation in onset of gelatinization. However, none of the parameters measured consistently correlated with onset or other RVA curve parameters that preceded peak paste viscosity. Peak paste viscosity varied from 190 to 323 RVA units (RVU). Higher peak, greater breakdown, lower final viscosity, negative setback, and less total setback were associated with lower apparent and total amylose contents. Each 1% reduction in apparent or total amylose content corresponded to an increase in peak viscosity of about 22 and 25 RVU, respectively, at 12% starch concentration. Of the seven U.S. cultivars, the lower amylose cultivars Penawawa and Klasic were missing the granule-bound starch synthase (GBSS; ADPglucose starch glycosyl transferase, EC 2.4.4.21) protein associated with the Waxy gene locus on chromosome 4A (Wx-B1 locus). Kanto 107 was confirmed as missing both the 7A and 4A waxy proteins (Wx-A1 and Wx-B1 loci). The hardness NIL also were shown to be null at the 4A locus. Apparent and total amylose contents of prime starch generally corresponded well to the number of GBSS proteins; although the hardness NIL tended to have somewhat higher amylose contents than did the other GBSS 4A nulls. We concluded that reduced quantity of starch amylose due to decreased GBSS profoundly affects starch gelatinization, pasting, and gelation properties. [References: 47].

Q52 FEED PROCESSING AND PRESERVATION

2394 Guadalix, ME.; Almendros, G.; Martinez, AT.; Camarero, S.; Barrasa, JM.; Pelayo, M. (1996) **COMPARATIVE ANALYSIS OF WHEAT STRAW PAPERBOARDS PREPARED AFTER BIOMECHANICAL AND SEMICHEMICAL PULPING.** *Bioresource Technology. 57(3):217-227.* English. [CSIC CTR CIENCIAS MEDIOAMBIENTALES SERRANO 115 DPDO E-28006 MADRID SPAIN].

A series of industrial and laboratory parameters has been determined in paper handsheets prepared from wheat straw after conventional semichemical pulping and after biomechanical pulping including solid-state fermentations with Pleurotus ostreatus or P. floridanus. The effects of two different refining degrees, as well as of different doses of wastepaper added to straw pulps, were examined using factorial designs to assess the effect of the biological pretreatments. In general, the most noticeable effects of biomechanical pulping were not found in the relative concentration of the major chemical constituents, but in the surface properties of the lignocellulose matrix, which were reflected in the infrared spectra and in parameters such as water repellency, or in the fiber arrangement patterns revealed in thin sections of the handsheets. Multiple regression models and factor analyses suggested that classical industry parameters (iSCT, iCMT, Gurley porosity and burst index) can be expressed as single or polynomial functions of laboratory parameters, mainly hydrolyzable hemicellulose, water drop penetration time, water-holding capacity, bulk density and the 1720/1510 cm(-1) intensity ratio in the infrared spectra. In general, the first three parameters were the best to distinguish biomechanical from semichemical paper. The Klason lignin content had no significant bearing on the correlation models involving the other industry or laboratory parameters. Copyright (C) 1996 Elsevier Science Ltd. [References: 18].

2395 Lee, S.C.; Moon, Y.H.; Kim, B.K.; Chung, Y.H. (Rural Development Administration, Suwon (Korea Republic). Livestock Experiment Station) (1994) **The effect of processings on digestive tract degradation of corn and barley grains in dairy cow-(2)-Ruminal and intestinal degradation of physically processed corn and barley grains by mobile nylon bag technique.** *Korean Journal of Animal Nutrition and Feedstuffs (Korea Republic) v. 18(2) p. 114-121.* 6 tables; 21 ref. Korean. (AGRIS 97-027903).

2396 Shin, J.S.; Cha, Y.H.; Lee, H.H.; Kim, J.G.; Jin, H.J.; Jeong, K.Y. (Rural Development Administration, Suwon (Korea Republic). National

Livestock Research Institute) (1996) **Effects of quality of alfalfa silage by different wheat bran mixing levels.** *Journal of the Korean Society of Grassland Science (Korea Republic) v. 16(3) p. 225-229.* 3 tables; 17 ref. Korean. (AGRIS 97-027917).

Q54 FEED COMPOSITION

2397 Ahring, BK.; Jensen, K.; Nielsen, P.; Bjerre, AB.; Schmidt, AS. (1996) **PRETREATMENT OF WHEAT STRAW AND CONVERSION OF XYLOSE AND XYLAN TO ETHANOL BY THERMOPHILIC ANAEROBIC BACTERIA.** *Bioresource Technology. 58(2):107-113.* English. [TECH UNIV DENMARK INST ENVIRONM SCI & ENGN ANAEROB MICROBIOL BIOTECHNOL RES GRP BLDG 115 DK-2800 LYNGBY DENMARK].

Wheat straw was pretreated by wet oxidation (oxygen pressure, alkaline conditions, elevated temperature) or hydrothermal processing (without oxygen) in order to solubilize the hemicellulose, facilitating bio-conversion. The effect of oxygen pressure and sodium carbonate addition on hemicellulose solubilization was investigated. The two process parameters had little effect on the solubilization of hemicellulose. However alkaline conditions affected the furfural formation whereas oxygen had no effect. After pretreatment, the filtrate was used as a fermentation medium for thermophilic anaerobic bacterin. Of five different thermophilic bacteria used in this study only two strains produced ethanol with xylan as substrate, one of them being the strain A3 isolated from an Icelandic hot-spring. Probably other degradation products formed in the presence of oxygen might act as inhibitors. Adaptation of the microorganism to the wet oxidized filtrate was also examined. Copyright (C) 1997 Elsevier Science Ltd. [References: 30].

2398 Casado, P. (Instituto Tecnico de Cereales y Forrajes, Boigneville (Francia)) (1996) **[Phosphorus in wheats availability for broiler chicken and pig: variation factors]. Disponibilidad del fosforo del trigo para el pollo de carne y el cerdo: factores de variacion.** *Produccion Animal (Espana) (no.109) p. 54-71.* 13 fig., 5 cuadros; 22 ref. Spanish. (AGRIS 97-013418).

2399 Charmley, E.; Winter, KA.; Mcrae, KB.; Fillmore, SAE. (1996) **EFFECT OF INOCULATION ON SILAGE QUALITY AND PERFORMANCE OF STEERS FED GRASS AND CEREAL SILAGES EITHER ALONE OR IN COMBINATION.** *Canadian Journal of Animal Science. 76(4):571-577.* English. [AGR & AGRI FOOD CANADA RES FARM NEPEAN NS B0L 1C0 CANADA].

Two first-cut silages were prepared from orchardgrass/white clover cut at the end of June and ensiled with or without a silage inoculant containing 1 x 10(10) CFU g(-1) Lactobacillus casei, L. plantarum, and Streptococcus lactis at an application rate of 1 x 10(5) CFU g(-1) crop. A further two CFU g silages were prepared from whole-crop wheat cut in the third week of August and ensiled with or without the same silage inoculant at the same application rate. The objectives of the study were to evaluate the effectiveness of a silage inoculant on silage fermentation, silage quality and animal response. Although inoculation increased lactic acid bacteria numbers in grass at ensiling, there were few observed differences in fermentation characteristics of the silages. Silages were used in a 16-wk feeding trial with 48 steers (initial BW 267 kg). Control and inoculated silages were fed either as 100% grass silage, 50% grass and 50% wheal silage mixture (dry matter basis), or as 100% wheat silage. All steers received a barley/soybean meal supplement at 2 kg d(-1) (as-fed basis). Overall, DM intake was similar in control and inoculated silages, but there was an interaction (kg d(-1), P = 0.051; g kg(-1) BW, P = 0.037) between crop and inoculant use indicating that intake was increased by inoculant use in grass silages only. Body weight gain was improved by 10% when inoculant was used (P = 0.006). This resulted in improved feed efficiency in wheat silage treated with inoculant (interaction, P = 0.023). Body weight gain decreased linearly as the proportion of wheat silage in the diet increased (P < 0.001), irrespective of inoculant use. Apparent digestibility of DM and components determined in sheep was higher for grass than wheat silage (P < 0.05), but there was no effect of inoculation on digestibility of either crop type. In this study, the application of inoculant to grass silage improved intake, while its application to wheat silage improved efficiency of feed utilization. [References: 34].

2400 Espindola, M.S. (California Univ., Davis (USA). Dept. of Animal Science) (1996) **[Effect of wheat processing and fat inclusion in rations for dairy cows on nutrients digestibility]. Efecto del procesado de trigo y del metodo de incorporacion de grasa en raciones para vacas en lactacion sobre la digestibilidad de los nutrientes.** *Produccion Animal (Espana) (no.114) p. 20-42.* 2 fig., 10 cuadros. Spanish. (AGRIS 97-013419).

2401 Jalc, D. (Slovak Academy of Sciences, Kosice (Slovaquie). Institute of Animal Physiology); Nerud, F.; Erbanova, P.; Siroka, P. (1996) **[Effect of white-rot basidiomycetes-treated wheat straw on rumen fermentation in artificial rumen]. Effet du traitement de la paille de ble par des basidiomycetes sur la fermentation en rumen artificiel.** *Reproduction Nutrition Development (France) v. 36(3) p. 263-270.* 18 ref. English. (AGRIS 97-013423).

2402 Lawther, JM.; Sun, RC.; Banks, WB. (1996) **FRACTIONAL CHARACTERIZATION OF ALKALI-LABILE LIGNIN AND ALKALI-INSOLUBLE LIGNIN FROM WHEAT STRAW.** *Industrial Crops & Products. 5(4):291-300.* English. [UNIV COLL N WALES BIOCOMPOSITITES CTR BANGOR LL57 2UW GWYNEDD WALES].

Wheat straw was treated with sodium hydroxide at different temperatures (0, 20, 40, 60, 80 degrees C) and various concentrations (0.5, 1.5, 3.0, 5.0, 10.0%) for 6 h, respectively. Soluble lignins and free-phenolic monomers in each of the alkaline treatment hydrolysates were isolated. The tightly bound phenolic acids and aldehydes were determined by nitrobenzene oxidation of alkali-insoluble lignin in the treated straw residues. The predominant components of alkali-labile free-phenolic monomers were found to be ferulic and p-coumaric acids, which together comprised about 80% of the total. Ferulic acid was released faster than p-coumaric acid, while p-coumaric acid appeared to be more effect on dissolution of lignin than ferulic acid during the alkaline treatments. About 90% of p-coumaric acid in wheat straw was present in the ester-linked form to lignin, while more than 60% of ferulic acid was ether-linked to lignin. The results of alkaline nitrobenzene oxidation showed that a slightly high guaiacyl content in the original wheat straw and relatively high syringyl content in alkali treated wheat straw. [References: 18].

2403 McNab, J.M. (Roslin Institute (Edinburgh), Roslin, Midlothian EH25 9PS (United Kingdom)) (1996) **Factors affecting the energy value of wheat for poultry.** *World's Poultry Science Journal (United Kingdom) v. 52(1) p. 69-73.* 19 ref. English. (AGRIS 97-027984).

2404 Miller, RK.; Rockwell, LC.; Lunt, DK.; Carstens, GE. (1996) **DETERMINATION OF THE FLAVOR ATTRIBUTES OF COOKED BEEF FROM CROSS-BRED ANGUS STEERS FED CORN- OR BARLEY-BASED DIETS.** *Meat Science. 44(4):235-243.* English. [TEXAS A&M UNIV DEPT ANIM SCI COLLEGE STN, TX 77843 USA].

Eighteen commercial Angus cross-bred feedlot steers of similar hip height and live weight were randomly assigned to one of three dietary treatment groups, corn-, corn/barley, or barley-based diets (n = 6 per treatment). Steers were fed for 102-103 days on their respective diets prior to slaughter. Live animal performance traits, carcass characteristics, total lipid and descriptive flavor and descriptive palatability attributes of beef strip loin steaks were determined. End live weight (P = 0.88) did not differ between dietary treatments. Beef carcasses from steers fed corn-, barley-, and corn/barley-based diets did not differ in hot carcass weight (P = 0.18), ribeye area (P = 0.21), kidney, pelvic and heart fat (KPH) (P = 0.35), and yield grade (P = 0.14). However, adjusted preliminary yield grade was higher (P = 0.03) for carcasses from steers fed corn/barley-based diets than carcasses from steers fed barley as the dietary energy source. These data suggest that carcasses from steers fed barley-based diets were lower in external fat, Quality grade characteristics were not different in beef carcasses from steers fed either corn-, barley-, or a corn /barley-based diet. Cook time (P = 0.37), cooking loss (P = 0.83), descriptive meat palatability attributes (P > 0.27), Warner-Bratzler shear force (P = 0.25), and descriptive sensory flavor attributes (P greater than or equal to 0.17) did not differ for steaks from steers fed the three diets prior to slaughter. The Japanese have claimed that feeding cattle barley-based high energy, diets result in beef with different flavor than when cattle are fed high-energy corn-based diets. These results indicated that the eating quality, tenderness and flavor attributes of beef steaks were not influenced by the dietary grain source fed to young steers in this study prior to slaughter. Copyright (C) 1996 Elsevier Science [References: 17].

2405 Molinacano, JL.; Francesch, M.; Perezvendrell, AM.; Ramo, T.; Voltas, J.; Brufau, J. (1997) **GENETIC AND ENVIRONMENTAL VARIATION**

IN MALTING AND FEED QUALITY OF BARLEY. *Journal of Cereal Science. 25(1):37-47.* English. [IRTA CTR UDL UEIDA SPAIN].

Five barley cultivars (Hordeum vulgare L.) covering a wide range in adaptation pattern, row type, growth habit and malting quality were grown in two harvest years al six agro-ecologically contrasting locations across Spain in order to study the occurrence of genotype x environment (GE) interaction for a set of malting and chicken Feeding quality parameters. There was no GE interaction for the nutritional and malting characters studied, except in the case of barley protein content. The nutritional characteristics and malt extract yield showed high broad-sense heritabilities. There were significant correlations between most of the malting and Feeding characters studied. In particular, extract yield and apparent metabolisable energy, the main malting and feeding characters, showed a high significant correlation. The best malting cultivars were the best feed cultivars over years and locations. Similarly, the poorest feeding cultivars were also the worst for malting, thus there is no contradiction between malting and feeding quality for either breeding or end use. (C) 1997 Academic Press Limited [References: 34].

2406 Nasi, M.; Partanen, K.; Laurinen, P. (1996) **EFFECTS OF EXPANDING ON THE NUTRITIVE VALUE OF WHEAT BRAN IN PIG DIETS.** *Agricultural & Food Science in Finland. 5(4):413-419.* English. [UNIV HELSINKI DEPT ANIM SCI POB 28 FIN-00014 HELSINKI FINLAND].

Nutrient digestibility and protein utilization responses in pigs to the expanding process of wheat bran were evaluated. The digestibility and nitrogen balance study was conducted with nine finishing barrows (live weight of 75-93 kg) using a two-period reversal design with a 2 x 2 factorial arrangement of treatments. Wheat bran, untreated or expanded with a Kahl expander at a temperature of 105-110 degrees C, was included at two levels of 150 or 300 g kg(-1) in barley-based diet supplemented with minerals and vitamins and fortified with lysine. The level of wheat bran in the diet had a diminishing effect on organic matter (OM), neutral detergent fibre (NDF), and hemicellulose (HC) digestibilities of the diet and tended to decrease those of crude protein (CP) and ash. Expanding of the wheat bran affected a non-significant improvement on ether extract (EE), NDF, acid detergent fibre (ADF) and HC digestibilities of the diet. Nutrient digestibilities of wheat bran and expanded wheat bran computed by regression were 0.64, 0.67 for OM; 0.70, 0.70 for CP; 0.47, 0.63 for EE; 0.35, 0.40 for NDF and 0.01, 0.16 for ADF, respectively. Feed values of untreated and expanded wheat bran were 11.45 and 12.08 respectively. The expanding process had no effect on nitrogen retention or protein utilization parameters measured. Processing of wheat bran with an expander had only a slight improving effect on the nutritive value of bran in pig diets. [References: 26].

2407 Pettersson, Aa. (SLU, Uppsala (Sweden). Inst. foer Husdjurens Utfodring och Vaard) (1996) **Ileal and total tract digestibility of barley and oats in pigs and predictions of nutritive vale.** SLU, Uppsala (Sweden). *Acta Universitatis Agriculturae Sueciae. Agraria (Sweden); no. 15 40 p.* SLU. Bibliography: p. 30-40. A dissertation bound with a collection of 5 reprints. English. (AGRIS 97-027996).

Barley and oats are important feedstuffs in Sweden. Considerable variation in chemical composition and nutritive value of cereals due to cultivar, climatic and agronomic conditions has been demonstrated. The aim of this thesis was to study the effects of the chemical composition of barley and oats on the ileal and total tract digestibility in pigs and rats and to provide means to predict the nutritive value for pigs. Among barleys, naked versus covered cultivars resulted in superior nutrient digestibility and energy values. Similar results were found for oat batches differing in fibre content, at the ileal as well as the total tract level. The nutritive values of barley and oats were strongly correlated with the dietary contents of fibrous constituents such as crude fibre, total fibre, NDF and ADF. The fibrous components were superior predictors compared with the starch content. The ratio of amylose:amylopectin in barley starch influenced nutrient digestibility. Thus, ileal digestibilities of organic matter, energy, NFE, starch and beta-glucans of high-amylose barley were significantly lower than in high-amylopectin and regular starch barleys. By testing the pig diets on rats, highly significant interrelationships were found for energy digestibility between animal species. By including Nebacitin in barley-based diets fed to rats, nutrient total tract digestibilities were lowered as compared with unsupplemented diets and corresponded to the ileal digestibilities observed in pigs. The interrelationship between digestibility of energy in the rat and the in vitro ileal and total tract DM digestibility, indicates that the in vitro technique used had a predicting potential for oats. The close correlation of rat results and total tract digestibility of energy in pigs should allow an extrapolation to pigs.

2408 Seyoum Bediye; Zinash Sileshi (IAR, Addis Abeba (Ethiopia)) (1995) **Influence of variety and location on feeding value of Barley.** 3. National Conference of the Ethiopian Society of Animal Production. Addis Abeba (Ethiopia). 27-29 Apr 1995. *Third National Conference of the Ethiopian Society of Animal Production. Ethiopian Society of Animal Production, Addis Abeba (Ethiopia) p. 312-315.* ESAP. 3 tables; 9 ref. English. (AGRIS 97-013432).

Six varieties of barley straw grown at two locations were tested for their differences in proportions of botanical fractions. Feeding values of whole straw samples and botanical fractions were evaluated for their quality using chemical analysis and in vitro digestibility. The local varieties had relatively higher proportion of internode than the improved varieties at both locations. Wide differences resulting from location were noted on NDF content of leaf fraction than the other botanical fractions. Varieties high.in leaf and low in internode proportions had high digestibility. Differences among varieties in digestibility were 4-5 percent at both locations.

2409 Tomova, D.; Surdzhijska, S.; Vladimirova, L. (Institut po Z"rneni Khrani i Furazhna Promishlenost, Kostinbrod (Bulgaria)) (1996) **[Partial and fuul replacement of maize with wheat in the combined feeds for laying hens]. Chastichno i p"lno zamestvane na tsarevirsata s pshenitsa v kombiniranite furazhi za nosachki.** Selskostopanska Akademiya, Sofia (Bulgaria). *Zhivotnov"dni Nauki (Bulgaria). Animal Science v. 33(3) p. 32-35.* 4 tables; 8 ref. Bulgarian. (AGRIS 97-027975).

Q55 FEED ADDITIVES

2410 Bedford, M.R.; Morgan, A.J. (Finnfeeds International Ltd, Market House, High Street, Marlborough, Wiltshire SN8 1AA (United Kingdom)) (1996) **The use of enzymes in poultry diets.** *World's Poultry Science Journal (United Kingdom) v. 52(1) p. 61-68.* 23 ref. English. (AGRIS 97-028017).

Q70 PROCESSING OF AGRICULTURAL WASTES

2411 Oehmichen, J.; Groeblinghoff, F.F.; Reinders, A.; Doerendahl, A. (Washington Univ., Seattle (USA). Dept. of Botany) (1995) **[Study on the use of biologic compost as fertilizer in agriculture]. Untersuchung ueber die Verwendung von Bio-Kompost als Kreislaufduenger im Landbau. Ergebnisse von Feldversuchen mit Winterweizen, Wintergerste, Winterroggen, Winterraps und Zuckerrueben.** *Muell und Abfall (Germany) v. 27(2) p. 74-78, 80-82.* 3 graphs, 6 tables; German. (AGRIS 97-028133).

Es faellt immer mehr Bio-Kompost an, der mit Erfolg im Garten- und Landschaftsbau eingesetzt wird. Landwirte allerdings haben Vorbehalte gegenueber Bio-Kompost, da sie erhoehte anorganische und organische Schadstoffe sowie Kosten befuerchten. Um ihre Bereitschaft zu verbessern, Bio-Kompost zu verwenden, wurde in einer mehrjaehrigen praxisbezogenen Forschungsreihe die Verwendung von Bio-Kompost im Landbau untersucht. Dabei wurden Erntemengen nach Quantitaet und Qualitaet erfasst. Daneben wurden bodenchemische, bodenphysikalische und bodenbiologische Untersuchungen durchgefuehrt. Der Artikel beschreibt die Versuchsplanung und -durchfuehrung. Die Versuchsergebnisse werden hinsichtlich der Naehrstoffwirkung, der Mehrertraege und den hiermit in Beziehung stehenden Wert des Komposts sowie Schwermetallgehalt ausgewertet.

S20 PHYSIOLOGY OF HUMAN NUTRITION

2412 Ikegami, S.; Tomita, M.; Honda, S.; Yamaguchi, M.; Mizukawa, R.; Suzuki, Y.; Higuchi, M.; Kobayashi, S. (1996) **EFFECT OF BOILED BARLEY-RICE-FEEDING IN HYPERCHOLESTEROLEMIC AND NORMOLIPEMIC SUBJECTS.** *Plant Foods for Human Nutrition. 49(4):317-328.* English. [NATL INST HLTH & NUTR SHINJUKU KU TOKYO 162 JAPAN].

Barley contains approximately 10% dietary fiber and is easily cooked with rice, the dominant cereal in Japan, to increase the intake of dietary fiber. This research involved three experiments to examine the influence of barley on blood lipids in human subjects. All subjects received a boiled barley-rice (50/50 w/w mix) supplement two times per day in place of rice for 2 or 4 weeks. In the normolipemic subjects, serum lipids were unaffected by the ingestion of barley for 4 weeks. In twenty

hypercholesterolemic men aged 41 +/- 5 years, the ingestion of barley was associated with a significant fall in serum total cholesterol, LDL-cholesterol, phospholipids and LDL and VLDL-lipoproteins. In seven mildly hypercholesterolemic women aged 56 +/- 7 years, a significant improvement of serum lipid profiles was observed. The present study suggests the possibility that the ingestion of barley-rice could lower serum lipids in hypercholesterolemic subjects. [References: 28].

S30 DIET AND DIET-RELATED DISEASES

2413 Guest, J. (1996) **Wheat's your problem?** *Diabetes forecast (USA) v. 49(8) p. 44-50.* English. (AGRIS 97-028425).

2414 Varjonen, E.; Vainio, E.; Kalimo, K.; Juntunen Backman, K.; Savolainen, J. (Department of Dermatology, Helsinki University Central Hospital, Helsinki (Finland)) (1995) **Skin-prick test and RAST responses to cereals in children with atopic dermatitis. Characterization of IgE-binding components in wheat and oats by an immunoblotting method.** *Clinical and Experimental Allergy (United Kingdom) v. 25(11) p. 1100-1107.* 29 ref. English. (AGRIS 97-013986).

T01 POLLUTION

2415 Chlopecka, A. (University of Georgia, Savannah River Ecology Laboratory, Drawer E, Aiken, SC 29802 (USA)) (1995) **The availability of Cd and Zn to cereal crops grown in soil amended with Cd or Zn carbonate.** *Biogeochemistry of trace elements. Adriano, D.C.; Chen ZuengSang; Yang ShangShyng (eds.) p. 475-485.* Science and Technology Letters. 22 ref., Environmental Geochemistry and Health Vol. 16. English. (AGRIS 97-014493).

U10 MATHEMATICAL AND STATISTICAL METHODS

2416 Hackett, C.A.; Newton, A.C. (Biomathematics and Statistics Scotland, Scottish Crop Research Institute, Invergowrie, Dundee DD2 5DA (United Kingdom)) (1995) **Modelling spatial trends in barley field trials using generalised additive models.** *Aspects of Applied Biology (United Kingdom) (no.43) p. 59-66.* 19 ref. Field experiment technique. Cambridge (UK), 11-13 December 1995. English. (AGRIS 97-029159).

2417 Mayr, T.R.; Rounsevell, M.D.A.; Loveland, P.J.; Simota, C.; Cojocaru, G. (Soil Survey and Land Research Centre, School of Agriculture, Food and Environment, Cranfield University, Silsoe, Bedford MK45 4DT (United Kingdom)) (1996) **ACCESS-I: an agroclimatic model for land evaluation applied to central England.** *Aspects of Applied Biology (United Kingdom) (no.45) p. 101-102.* 4 ref. Implications of 'Global environmental change' for crops in Europe, 1-3 April 1996, Churchill College, Cambridge, UK. English. (AGRIS 97-014592).

2418 Rounsevell, M.D.A.; Loveland, P.J.; Mayr, T.R.; Armstrong, A.C.; Rosa, D. de la; Legros, J.P.; Simota, C.; Sobczuk, H. (Soil Survey and Land Research Centre, School of Agriculture, Food and Environment, Cranfield University, Silsoe, Bedford MK45 4DT (United Kingdom)) (1996) **ACCESS: a spatially-distributed, soil water and crop development model for climate change research.** *Aspects of Applied Biology (United Kingdom) (no.45) p. 85-92.* 13 ref. Implications of 'Global environmental change' for crops in Europe, 1-3 April 1996, Churchill College, Cambridge, UK. English. (AGRIS 97-014595).

2419 Nielsen, K.V.; Gosvig, V.; Nielsen, B.S. (1996) **[Development of forecasting procedure for straw yields].** Landbrugets Raadgivningscenter, Copenhagen (Denmark). *Metodeudvikling vedroerende prognose for halmudbyttet 29 p.* LRC. 6 ill., 12 tables; 5 ref. Danish. (AGRIS 97-014662).

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[1/] International Crops Research Institute for the Semi-Arid Tropics, Patancheru, Andhra Pradesh 502324, India

[2/] International Association of Agricultural Information Specialists (IAALD)

[3/] Technical Centre for Agricultural and Rural Cooperation, P.O. B. 380, 6700 AJ Wageningen, Netherlands

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