January—February, 1996

Vol. 2 No. 1

Literature Update on

Wheat, Barley, and Triticale

CIMMYT

ICARDA

Distribution Restricted to Developing Countries Only.

EXCHANGE

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Distribution Restricted to Developing Countries Only.

CIMMYT and ICARDA are two internationally funded, nonprofit scientific research and training organizations headquartered in Mexico and Syria respectively. Together with 16 other nonprofit international agricultural research and training centers, CIMMYT and ICARDA are supported by the Consultative Group on International Agricultural Research (CGIAR), which is sponsored by the Food *and Agriculture* Organization (FAO) of the United Nations, the International Bank for Reconstruction and Development (World Bank), and the United Nations Development Programme (UNDP). The CGIAR consists of some 40 donor countries, international and regional organizations, and private foundations.

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The International Information System for the Agricultural Sciences and Technology (AGRIS), with headquarters at Rome, is coordinated by the Food and Agriculture Organization (FAO) of the United Nations. It is a worldwide cooperative information network of some 135 national, regional and international centers and produces a database growing at the rate of about 120 000 bibliographic records per year.

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ISSN 1405-1672

Several CIMMYT staff made important contributions to this document: Dr. Edith Hesse, Leader, Information Technology Unit (editor); Fernando García, Supervisor of Information Services, 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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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

Sample Entries

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)
4 → **[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.**
6 → 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
9 → 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

Note to Readers

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. 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

1 **ICARDA annual report 1993** (1994) International Center for Agricultural Research in the Dry Areas, Aleppo (Syria). *ICARDA Annual Report (ICARDA) 127 p.* ICARDA. 28 tables; 19 fig., ill., 15 appendixes. ICARDA--039. English. (AGRIS 95-147208).

Activities and research results of ICARDA's commodity programs and international cooperation are reported.

2 **[ICARDA annual report 1993]. 'ika:rda: al-taqri:r/u al-sanawi: 1993** (1994) International Center for Agricultural Research in the Dry Areas, Aleppo (Syria). *'Ika:rda: Al-taqri:r/u Al-sanawi: (ICARDA). ICARDA Annual Report 126 p.* ICARDA. 28 tables; 19 fig., ill., 15 appendixes. ICARDA--042. Arabic. (AGRIS 95-147209).

Activities and research results of ICARDA's commodity programs and international cooperation are reported.

3 **ICARDA annual report 1994** (1995) International Center for Agricultural Research in the Dry Areas, Aleppo (Syria). *ICARDA Annual Report (ICARDA) 127 p.* ICARDA. *22 tables; 27* fig., ill., 16 appendixes. ICARDA--031. English. (AGRIS 95-147210).

Activities and research results of ICARDA's commodity programs and international cooperation are reported.

C20 EXTENSION

4 Nazir, U. (1993) **Comparative effectiveness of the sources of information in the adoption of improved agricultural practices of new wheat varieties.** University of Agriculture, Faisalabad (Pakistan). Dept. of Rural Sociology. UAF. 37 tables, 34 ref. 78 p. English. (AGRIS 95-127094).

5 Zavagli, F. (Federation Regionale de Defense des Cultures Centre, Fleury les Aubrais (France)); Lambert, C.L.; Lochon, S. (1995) **[Fungicide management of the wheat crop. Definitely, but how?]. Raisonner ses interventions *fongicides* sur ble? Oui, mais comment?** *Phytoma La Defense des Vegetaux (France) (no 470) p. 23-24.* French. (AGRIS 95-147475).

C30 DOCUMENTATION AND INFORMATION

6 **ICARDA publications catalog 1992-1993 supplement** (1994) International Center for Agricultural Research in the Dry Areas, Aleppo (Syria). ICARDA. 57 p. ICARDA--054. English. (AGRIS 95-147508).

This *supplement* is the second in a series to the cumulative ICARDA publications catalog 1977-1990. Citations are classified into nine categories and listed by the year of publication.

7 **Literature update on maize** (1995) Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). *Literature Update on Maize (CIMMYT); v. 1(no.1) 63 p.* CIMMYT. English. (AGRIS 95-127195).

8 **Literature update on wheat, barley, and triticale** (1995) Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). *Literature Update on Wheat, Barley and Triticale (CIMMYT); v. 1(no.1) 92 p.* CIMMYT-ICARDA. English. (AGRIS 95-127193).

D50 LEGISLATION

9 Noaman, MM.; Elsayed, AA.; Asaad, FA.; Elsherbini, AM.; Elbawab, AO.; Elmoselhi, MA.; Rizk, RA. (1995) **REGISTRATION OF GIZA 125 BARLEY.** *Crop Science. 35(6):1709.* English. [AGR RES CTR FIELD CROPS RES INST BARLEY RES DEPT POB 12619 GIZA EGYPT].

10 Noaman, MM.; Elsayed, AA.; Asaad, FA.; Elsherbini, AM.; Elbawab, AO.; Elmoselhi, MA.; Rizk, RA. (1995) **REGISTRATION OF GIZA 126 BARLEY.** *Crop Science. 35(6):1710.* English. [AGR RES CTR FIELD CROPS RES INST BARLEY RES DEPT POB 12619 GIZA EGYPT].

11 Rathjen, AJ.; Lewis, J.; The, D.; Palmer, GA.; Jefferies, SP.; Chigwidden, JW.; Stone, CJ.; Wallwork, H. (1995) **REGISTER OF AUSTRALIAN WINTER CEREAL CULTIVARS - TRITICUM AESTIVUM SSP VULGARE (BREAD WHEAT) CV YARRALINKA.** *Australian Journal of Experimental Agriculture. 35(5):675-676.* English. [UNIV ADELAIDE WAITE AGR RES INST GLEN OSMOND SA 5064 AUSTRALIA].

12 Rathjen, AJ.; Moody, DB.; Cartwright, B.; Lewis, J.; The, D.; Palmer, GA.; Jefferies, SP.; Chigwidden, JW.; Stone, CJ.; Wallwork, H.; Kroehn, MJ.; Cornish, GB.; Paull, JG. (1995) **REGISTER OF AUSTRALIAN WINTER CEREAL CULTIVARS - TRITICUM AESTIVUM SSP VULGARE (BREAD WHEAT) CV BT-SCHOMBURGK.** *Australian Journal of Experimental Agriculture. 35(5):673-674.* English. [UNIV ADELAIDE WAITE AGR RES INST GLEN OSMOND SA 5064 AUSTRALIA].

13 Taylor, RL.; Wolfe, RI.; Dofing, SM.; Faris, DG. (1995) **REGISTRATION OF OTAL BARLEY.** *Crop Science. 35(6):1711.* English. [AGR & FORESTRY EXP STN 533 E FIREWOOD PALMER, AK 99645 USA].

14 Vansanford, DA.; Pearce, WL.; Swanson, CS.; Tutt, CR.; Tomes, LJ.; Hershman, DE. (1995) **REGISTRATION OF KY 83C-16-2 WHEAT GERMPLASM.** *Crop Science. 35(6):1719-1720.* English. [UNIV KENTUCKY DEPT PLANT PATHOL LEXINGTON, KY 40546 USA].

E10 AGRICULTURAL ECONOMICS AND POLICIES

15 El Beltagy, A. (ICARDA, Aleppo (Syria)) (1995) **How ICARDA is working with Ethiopia.** International Center for Agricultural Research in the Dry Areas, Aleppo (Syria). ICARDA. 10 p. ICARDA--044. English. (AGRIS 95-147707).

16 Herrmann, R. (Giessen Univ. (Germany). Inst. fuer Agrarpolitik und Marktforschung); Ommeh, H. (1995) **Exchange rate devaluation and the contribution of agriculture to the current account: the case of Kenya.** *Quarterly journal of international agriculture (Germany) v. 34(1) p. 6-31.* 1 ill., 8 tables; 31 ref. English. (AGRIS 95-127356).

The paper discusses the effect of domestic currency devaluation on agriculture's contribution to the current account in a developing contry. The problem is illustrated by the foreign agricultural trade balance of Kenya. As a result it impacts the current account. That depends on several crucial structural facters in the economy, such as the degree of overevaluation of the domestic currency, exchange rate elasticities of export supply and import demand, the share of agriculture in the current account and whether business is made in domestic or foreign currency.

17 Mohamed, S.O.; Ismail, M.K.; Ezz El Din, M.M. (Ministry of Agriculture, Cairo (Egypt). Agricultural Economics Research Inst.) (1993) **An agricultural economic and statistical study of the new varieties of wheat in ARE.** *Annals of Agricultural Science, Moshtohor (Egypt) v. 31(2) p. 667-680.* 12 tables; 11 ref. English. (AGRIS 95-127369).

E11 LAND ECONOMICS AND POLICIES

18 Barton, J. (Western Australian Dept. of Agriculture, Perth. Div. of Agricultural Economics and Marketing) (1992) **Optimal management of dryland salinity in selected catchments in Western Australia [wheat lands]. [Conference paper].** *36. Annual Conference. Australian Agricultural Economics Society; Canberra, A.C.T. (Australia); 10 Feb 1992.* Australian Agricultural Economics Society. 3 graphs, 22 ref. 16 p. English. (AGRIS 95-147925).

19 Heldi, A. (Vyskumny Ustav Zavlahoveho Hospodarstva, Bratislava (Slovak Republic)) (1994) **[Irrigation in agricultural transformation process]. Zavlahy v procese transformacie polnohospodarstva.** Possibilities of Irrigation Efficiency Increasing; Bratislava (Slovak Republic); 7-8 Jun 1994. *Possibilities of increasing irrigation efficiency. Proceedings from international conference. Vyskumny Ustav Zavlahoveho Hospodarstva, Bratislava (Slovak Republic); Vysoka Skola Polnohospodarska, Nitra (Slovak Republic) p. 229-234.* VUZH. 1 ill., 1 table. Slovak. (AGRIS 95-147845).

The problem of status and importance of irrigation under conditions of transforming agriculture are discussed. Present organizational scheme of

irrigation and subsidiary policy in 1994 is analyzed. Exceptional attention is paid to economic aspects of irrigation and to preparation of privatization of irrigation.

20 Meza Peter, L. (1994) **[Economic Aspects of Set-aside in Aragon]. Aspectos economicos de la retirada de tierras en Aragon.** Centre International de Hautes Etudes Agronomiques Mediterraneennes, Zaragoza (Spain). Institut Agronomique Mediterraneen de Saragosse. 13 graphs; 44 tables; 73 ref. 154 p. Spanish. (AGRIS 95-127445).

The set-aside scheme is one of the policies adopted by the Common Agricultural Policy (CAP). Since 1988, it was adopted as a structural stabilizing policy. After the CAP reform in 1992 the EC has selcted this policy as a short-run and voluntary measure, to limit oversupply of agricultural production. In this study an appraisal of the pluriannual set-aside scheme of 1988 is undertaken for Aragon in relation to the Spanish and EC framework. It is also analyzed the efficiency of the set-aside scheme established in Aragon, after the CAP reform in 1992, for wheat and barley cultivated on dry land. Emphasis is given to estimate the slippage and to analyze the production results between rotational and non-rotational schemes in Aragon, with respect to the EC general considerations. Finally, producer income variations are estimated whether they subscribe or not to the new EC set-aside schemes. Results show that the slippage is greater for barley than for wheat. The equilibrium between the set-aside schemes is similar to the EC figure (75 per cent) for wheat and lower for barley. The set-aside schemes are more attractive for producers located on marginal land and technically less efficient farmers.

E14 DEVELOPMENT ECONOMICS AND POLICIES

21 Aw Hassan, A.; Ghanem, E.; Ali, A.A.; Mansour, M. (Agricultural Research Center, Giza (Egypt)); Solh, M.B. (ICARDA, Cairo (Egypt). Nile Valley Regional Program) (1995) **Economic returns from improved wheat technology in upper Egypt.** International Center for Agricultural Research in the Dry Areas, Aleppo (Syria). *ICARDA Social Science Papers (ICARDA); no. 1 37 p.* ICARDA. 9 tables; 7 fig., 13 ref. ICARDA--030. English. (AGRIS 95-148080).

This study is based on data collected from 190 farmers in six districts in Sohag and Qena governorates during 1992/93 and on data provided by the Ministry of Agriculture, Egypt. The report reviews the technological improvement of wheat in Egypt and recent pricing policy reform, analyses the productivity trends, presents the survey results on the adoption of wheat technologies in the heat-stressed environment of Upper Egypt and analyses its impact on profitability under different price scenarios. The impact of technological change on average yield and production value are also discussed. The economic returns of wheat research in the study area are examined and concluding remarks are given.

22 Daniel Shamebo (Institute of Agricultural Research, Addis Abeba (Ethiopia)) (1995) **A review of Technology Transfer for Barley Production in Arsi Region.** 6. Annusl Conference of the Crop Science Society of Ethiopia; Addis Abeba (Ethiopia); 3-4 May 1994. *Annual Conference of the Crop Science Society of Ethiopia. Crop Science Society of Ethiopia, Addis Abeba (Ethiopia) p. 143-148.* CSSE. 6 Tables; 5 ref. English. (AGRIS 95-148051).

Barley technology transfer in Arsi had been commenced as of 1967 by CADU through: demonstration farm, demonstration plots, model farms, and plot demonstrations with the close involvement of farmers. In 1968 the demonstration result from barley varieties indicated that barley was not a promising crop. The results from buy vis a vis commercial fertilizer application in Sagure area showed that yield increased by applying each 0/46 and 46/0 NP2O5 ha-1 was 181 percent, VCR of 2.1. In Asella area the corresponding figures are 128 percent and 1.5. Though soil burned plots gave higher yield, but it was not recommended to use 46/0 P2O5. In 1969: The benefit per hectare obtained from improved barley variety with fertilizer in south Asella was 93 Birr with a yield increase of 1530 kg over the local one without fertilizer. The soil burned subplots gave higher yield as it was in 1968. It was beneficial and profitable to apply 0/46 P2O5 and 23/0 NP2O5. The local barley without fertilizer in 8 locations gave an increasing yield between 1968-1971. Improved varieties used to show significantly higher yield than the local ones when assessed 1973/74. The highest barley yield was obtained from Gobessa (4, 200 kg) in 1977-85.

23 Nachit, M.M.; Baum, M. (ICARDA, Aleppo (Syria)) (1993) **Network for integrated research on durum wheat improvement in the Mediterranean region [Triticum durum].** *RACHIS (ICARDA); Barley and Wheat Newsletter v. 12(1-2) p. 60-63.* 1 fig. English. (AGRIS 95-148024).

E16 PRODUCTION ECONOMICS

24 Bonnemort, C. (Institut Technique des Cereales et des Fourrages, Paris (France)); Jezequel, S.; Docquier, F. (1995) **[Hard wheat crop management]. Preconisations techniques pour le ble dur. A mi-chemin entre l'assurance et l'extensif.** *Perspectives Agricoles (France) (no 204) p. 70-77.* French. (AGRIS 95-127763).

25 El Rasoul, A.A.; Abo El Naga, N.I. (Alexandria Univ. (Egypt). Faculty of Agriculture) (1994) **[The nutritional and economical importance of wheat flour supplementation in Egypt].** *Alexandria Journal of Agricultural Research (Egypt) v. 39(2) p. 1-23.* 4 tables; 28 ref. Arabic. (AGRIS 95-148180).

26 Ibrahim, K.T. (Minia Univ. (Egypt). Faculty of Agriculture) (1992) **[An economic study of some factors affecting the production of beans in Egypt].** *Minia Journal of Agricultural Research and Development (Egypt) v. 14(4) p. 1175-1188.* 10 tables; 8 ref. Arabic. (AGRIS 95-127707).

27 Labson, B.S. (Australian Bureau of Agricultural and Resource Economics, Canberra) (1992) **Modelling distortionary aspects of the US wheat program and policy reform. [Conference paper].** *36. Annual Conference. Australian Agricultural Economics Society; Canberra, A.C.T. (Australia); 10 Feb 1992.* Australian Agricultural Economics Society. 5 tables, 23 ref. append. 24 p. English. (AGRIS 95-148186).

28 Mehier, C. (Institut Technique des Cereales et des Fourrages, Paris (France)); Lemaitre, G.; Maudoux, D.; Paquetet, H.; Lejars, L. (1995) **[Production costs of main large scale field crops]. Couts de production: le cout de la croissance.** *Perspectives Agricoles (France) (no 204) p. 18-21.* French. (AGRIS 95-127762).

29 Mohamed Hasen (Institute of Agricultural Research, Addis Abeba (Ethiopia)); Tanner, D.G.; Amanuel Gorfu (1995) **The Impact of Market Liberalization on the Profitability of Fertilizer and Herbicide for Smallholder Bread Wheat Production in Ethiopia.** 6. Annual Conference of the Crop Science Society of Ethiopia; Addis Abeba (Ethiopia); 3-4 May 1994. *Annual Conference of the Crops Science Society of Ethiopia. Crop Science Society of Ethiopia, Addis Abeba (Ethiopia) p. 127-142.* CSSE. 11 Tables; 16 ref. English. (AGRIS 95-148165).

Zone-specific fertilizer and herbicide recommendations for bread wheat production were re-assessed in 1993, considering the dramatic change in the prices of crop inputs and outputs resulting from market liberalization in Ethiopia since 1991. The effect of market liberalization on recommended nutrient levels and the rate of return to fertilizer ranged from neutral to positive across the zones and target groups included in this study. Removal of the current (16 percent) governmental subsidy on fertilizer did not markedly alter nutrient level recommendations except at the lowest grain prices included in the sensitivity analysis, but it did negatively affect the rate of return on farmer investment in fertilizer. Market liberalization coupled with a discriminatory government import levy on herbicides reduced their profitability vis-a-vis hand weeding. Policy makers should carefully consider documented farm-level constraints to the practical application of hand weeding of smallholder wheat, and the potential synergism that could be realized by combining herbicidal weed control with other components of an improved wheat production package.

30 Shaw, I.; Bui Lan, A.; Linacre, A. (Australian Bureau of Agricultural and Resource Economics, Canberra) (1992) **A model of wheat supply response in Australia's mainland states. [Conference paper].** *36. Annual Conference. Australian Agricultural Economics Society; Canberra, A.C.T. (Australia); 10 Feb 1992.* Australian Agricultural Economics Society. 4 tables, 2 graphs, 17 ref. 20 p. English. (AGRIS 95-148262).

E20 ORGANIZATION, ADMINISTRATION AND MANAGEMENT OF AGRICULTURAL ENTERPRISES OR FARMS

31 Bernardo, D.J.; Krenzer, E.G. Jr.; Tarrant, A.R.; Horn, G.W. (1994) **Economic evaluation of wheat varieties based on grain and forage production.** *Current farm economics (USA) v. 67(2) p. 40-51.* references. English. (AGRIS 95-148351).

32 Hartmans, M.A. (University of Idaho Cooperative Extension Service); Makus, L.D.; Guenthner, J.F. (1993) **Seasonal price index: soft white wheat.** *Current information series (USA); no. 1007 7 p.* English. (AGRIS 95-127864).

33 Kingwell, R. (Western Australian Dept. of Agriculture, South Perth Economic Analysis Branch) (1992) **The tactics of dryland farm management given variance in climate and price [wheat growing in Western Australia]. [Conference paper].** *36. Annual Conference. Australian Agricultural Economics Society; Canberra, A.C.T. (Australia); 10 Feb 1992.* Australian Agricultural Economics Society. *tables, 38* ref., append. 43 p. English. (AGRIS 95-148466).

34 Ripley, J.; Hanna, R. (Western Australian Dept. of Agriculture, Perth. Div. of Agricultural Economics and Marketing); Eckersley, P.P. (Western Australian Dept. of Agriculture, Bunbury) (1992) **Buying a cereal, sheep or cattle farm in Western Australia - notes and budgets for potential buyers of cereal/sheep/cattle farms in Western Australia 1992.** *Miscellaneous Publication - Western Australian Department of Agriculture (Australia); no. 11/92 13 p.* Western Australian Department of Agriculture. replaces Miscellaneous publication 14/91; tables. English. (AGRIS 95-148448).

35 Windham, T.E. (University of Arkansas Cooperative Extension Service); Stuart, C.A. (1993) **Estimating 1994 production costs in Arkanasa: wheat: clay soils.** *Extension technical bulletin (USA); no. 207 8 p.* English. (AGRIS 95-127890).

36 Windham, T.E. (University of Arkansas Cooperative Extension Service); Stuart, C.A. (1994) **Estimating 1994 production costs in Arkansas: wheat: loamy soils.** *Extension technical bulletin (USA); no. 206 5 p.* English. (AGRIS 95-127898).

37 Windham, T.E. (University of Arkansas Cooperative Extension Service); Stuart, C.A.; Mason, M.P. (1993) **Estimating 1994 production costs in Arkansas soybeans: following wheat, loamy soils, flood irrigation.** *Extension technical bulletin (USA); no. 231 6 p.* English. (AGRIS 95-127902).

38 Windham, T.E. (University of Arkansas Cooperative Extension Service); Stuart, C.A.; Mason, M.P. (1993) **Estimating 1994 production costs in Arkansas soybeans: no-till, following wheat, loamy soils, flood irrigation.** *Extension technical bulletin (USA); no. 232 8 p.* English. (AGRIS 95-127905).

E70 TRADE, MARKETING AND DISTRIBUTION

39 Bar, C. (Institut Technique des Cereales et des Fourrages, Paris (France)); Bris, V. (1995) **[Wheat sales contract and quality]. Contrats de vente: la qualite a un prix.** *Perspectives Agricoles (France) (no 203) p. 35-39.* French. (AGRIS 95-128349).

40 Barraclough, J. (Dalgety Farmers, Sydney (Australia)); Jones, R. (New South Wales Agriculture, Orange (Australia)) (1993) **An economic perspective of the rationale for single-desk selling [wheat marketing].** *Economic Policy Report -New South Wales Agriculture Economic Services Unit (Australia); no. 3 18 p.* New South Wales Agriculture. 1 fig. English. (AGRIS 95-148793).

Considerable public debate has recently surrounded the issues relating to the compulsory acquisition powers and sole exporter status of the Australian Wheat Board. Sections of the Australian wheat industry, particularly grain exporting groups, have called for more open competition in the export arena while the single-desk selling status of the AWB has been strongly defended by producer groups and the Board itself. This paper assesses the arguments for retaining single-desk selling in the Australian wheat industry. The economic implications of the policy alternatives are examined from an economic efficiency perspective.

41 Bason, M.L.; Zounis, S.; Ronalds, K.A.; Wrigley, C.W. (Commonwealth Scientific and Industrial Research Organisation, North Ryde (Australia). Div. of Plant Industry) (1993) **Visual distinction between red and white wheat. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 511.* Abstract only. English. (AGRIS 95-128353).

42 Brennan, D. (Western Australia Univ., Nedlands); Wright, B. (California Univ., Berkeley (USA)) (1992) **Futures markets, storage and convenience yield [wheat]. [Conference paper].** *36. Annual Conference. Australian Agricultural Economics Society; Canberra, A.C.T. (Australia); 10 Feb 1992.* Australian Agricultural Economics Society. 9 graphs, 18 ref. 22 p. English. (AGRIS 95-148792).

43 Chokri, R. (1993) **Trade patterns of wheat and barley in the single European market.** Centre International de Hautes Etudes Agronomiques Mediterraneennes, Chania (Greece). Institut Agronomique Mediterraneen. 19 tables, 3 fig. 2 appendices. ref. p. 104-105. 136 p. English. (AGRIS 95-128350).

Trade patterns of soft wheat, hard wheat and barley in the single European market is investigated using Armington trade odel for differentiated products by kind and by country of origin. Change in trade flows, markets shares and prices are forecasted for 1994 and 1996. The impact of 10 and 15 tariff reduction on extra-EC imports is also simulated for 1994. Thus, the implications of member countries' integration for these products are identified.

44 Clark, JS. (1995) **SINGLE DESK SELLING BY THE CANADIAN WHEAT BOARD - DOES IT HAVE AN IMPACT.** *Canadian Journal of Agricultural Economics-Revue Canadienne d Economie Rurale. 43(2):225-236.* English. [NOVA SCOTIA AGR COLL DEPT ECON & BUS MANAGEMENT TRURO NS B2N 5E3 CANADA].

The Canadian Wheat Board justifies its monopoly control over the marketing of barley on the basis of single desk selling. It argues that single desk selling raises the pooled price that farmers receive for their barley over a situation where the Canadian Wheat Board does nor have monopoly control over the marketing of prairie barley. Carter (1993b) argues that the Canadian Wheat Board's pricing strategies are suboptimal and the Canadian Board cannot affect prices farmers receive. This paper tests the implications of the Canadian Wheat Board's conclusions and Carter's conclusions using feedgrain prices. The results indicate that Canadian Wheat Board single desk selling has no impact on prices. These results indicate that Carter's analysis is more consistent with the data than is the Canadian Wheat Board's analysis. [References: 21].

45 Ismail, A.M. (Zagazig Univ. (Egypt). Faculty of Agriculture) (1992) **[A study of marketing aspects for wheat flour and its products in Saudi Arabia].** *Zagazig Journal of Agricultural Research (Egypt) v. 19(6) p. 2735-2747.* 7 tables; 8 ref. Arabic. (AGRIS 95-148932).

46 Johnson, DD.; Wilson, WW. (1995) **COMPETITION AND POLICY CONFLICTS IN CANADA US BARLEY TRADE.** *Journal of Agricultural & Resource Economics. 20(1):64-81.* English. [N DAKOTA STATE UNIV DEPT AGR ECON FARGO, ND 58105 USA].

Changes in policy, institutional and competitive environments have led to increased trade and a rise in trade tensions in the Canada-U.S. barley market. These tensions stem from policies and marketing institutions that have evolved independently in these two countries. Results from a detailed spatial equilibrium model of the Canada-U.S. barley market are presented in this article. Simulations are used to quantify effects of U.S, import restrictions; removal of Canadian rail subsidies, different Export Enhancement Program (EEP) subsidy levels, restoration of Conservation Reserve Program (CRP) acres to U.S. production, and retention of Canadian Wheat Board control over Canadian barley sales-all of which affect trade flows in the barley sector. [References: 26].

47 Krause, MA.; Lee, JH.; Koo, WW. (1995) **PROGRAM AND NON-PROGRAM WHEAT ACREAGE RESPONSES TO PRICES AND RISK.** *Journal of Agricultural & Resource Economics. 20(1):96-107.* English. [N DAKOTA STATE UNIV DEPT AGR ECON FARGO, ND 58105 USA].

Wheat acreage responses to expected wheat price and price risk are reversed for program- and nonprogram-planted acreage in the northern plains, central plains, southern plains, and U.S. Expected wheat price has a strong negative effect on program-complying wheat acreage. Government support prices have a positive effect on program-complying and program-planted acreage. Price risk has a positive effect on program-complying wheat acreage and a negative effect on nonprogram-planted acreage. Estimated price elasticities are higher than in studies where risk was ignored. [References: 15].

48 Martin, G. (Institut Technique des Cereales et des Fourrages, Paris (France)) (1995) **[French wheat market: expected quality]. Le marche des bles francais.** *Perspectives Agricoles (France) (no 203) p. 3-6.* 6 tableaux. French. (AGRIS 95-128348).

49 Neugebauer, W. (1994) **[Ecological farming - cereals and meat marketing via super markets]. Oeko-Landbau - Getreide und Fleisch fuer den Supermarkt.** *Bayerisches Landwirtschaftliches Wochenblatt (Germany) v. 184(43) p. 23-24.* 2 ill. German. (AGRIS 95-128501).

50 Riggins, S.K. (Kentucky Cooperative Extension Service, Princeton, KY.); Trimble, R.L.; Shurley, W.D. (1992) **Marketing and profitability considerations.** *University of Kentucky. Cooperative Extension Service (USA) (no. 114) p. 41-46.* In the series analytic: Canola production and management / edited by S. Arnold. English. (AGRIS 95-148942).

51 Schoney, RA. (1995) **THE IMPACT OF PRICE STABILIZING POLICIES ON THE RISK EFFICIENT CROP/FALLOW DECISIONS OF WHEAT FARMERS IN THE BROWN SOIL ZONE OF SASKATCHEWAN.** *Canadian Journal of Agricultural Economics-Revue Canadienne d Economie Rurale. 43(2):259-270.* English. [UNIV SASKATCHEWAN SASKATOON SK CANADA].

The micro-linkages between the crop/fallow decision and price-induced risk are examined for wheat producers located on the brown soils of Saskatchewan. Three generic price stabilization policies are defined. Based on a bio-economic simulation model, the risk-efficient FLEXCROP decision rules are selected, and their corresponding cropping patterns are assessed for each generic price stabilization policy. Assuming no subsidy component within the mandatory price stabilization program: risk lovers reduce cropped acreages by 0% to 4%, depending upon both the risk-aversion level and the stabilizing program and risk-averse producers increase cropped acreage from 10% to 35% over no price stabilization. [References: 18].

52 Uri, N.D.; Hyberg, B.; Mercier, S.; Lyford, C. (US Department of Agriculture, Economic Research Service, Washington, D.C. (USA)) (1994) **The market valuation of the FGIS grain quality characteristics.** *Applied Economics (United Kingdom) v. 26(7) p. 701-712.* 55 ref. English. (AGRIS 95-148791).

E71 INTERNATIONAL TRADE

53 Adreani, P.G. (1994) **[Agricultural and agroindustrial competitiveness at the level of Mercosur. Sectorial report: flour wheat]. Diagnostico de competitividad agropecuaria y agroindustrial a nivel del Mercosur. Informe sctorial: trigo harina.** Banco Interamericano de Desarrollo, Buenos Aires (Argentina). Grupo del Mercado Comun del Sur. Programa de Apoyo Tecnico para la implementacion y puesta en marcha del Mercosur. 201 p. Spanish. (AGRIS 95-149025).

54 Johnson, D.D. (North Dakota Farm Research); Wilson, W.W. (1994) **Border disputes in North American barley trade: impacts of major agricultural policies.** *North Dakota farm research (USA) v. 50(3) p. 31-34.* references. English. (AGRIS 95-128553).

55 Taha, A.M.I. (Zagazig Univ. (Egypt). Faculty of Agriculture) (1993) **[An analytical study for the determinants of wheat imports to Egypt].** *Zagazig Journal of Agricultural Research (Egypt) v. 20(4) p. 1411-1421.* 21 ref. English. (AGRIS 95-128555).

56 Tulpule, V.; Kottege, J.; Tie, G. (Australian Bureau of Agricultural and Resource Economics, Canberra) (1992) **Soviet grain import demand - the past and into the 1990s. [Conference paper].** *36. Annual Conference. Australian Agricultural Economics Society; Canberra, A.C.T. (Australia); 10 Feb 1992.* Australian Agricultural Economics Society. 1 table, 7 fig., 26 ref. 25 p. English. (AGRIS 95-149027).

57 Vanzetti, D. (Australian Bureau of Agricultural and Resource Economics, Canberra) (1992) **Wheat export cartels [effect of restrictive trade practices]. [Conference paper].** *36. Annual Conference. Australian Agricultural Economics Society; Canberra, A.C.T. (Australia); 10 Feb 1992.* The Society. 10 tables, 12 ref. 18 p. English. (AGRIS 95-149026).

E72 DOMESTIC TRADE

58 Taha, A.M.I. (Zagazig Univ. (Egypt). Faculty of Agriculture) (1993) **[An assessment study of the compulsory procurement policy for wheat and rice in Egyptian agriculture].** *Zagazig Journal of Agricultural Research (Egypt) v. 20(4) p. 1399-1410.* 1 table; 13 ref. Arabic. (AGRIS 95-128624).

F01 CROP HUSBANDRY

59 **[<5. Abstracts and consequences. 5.4. Computer aided simulation- and decision models for optimization of production system winter wheat according to economic and ecological criteria>]. 5. Zusammenfassung und Schlussfolgerungen. 5.4. Rechnergestuetzte Simulations- und Entscheidungsmodelle zur Optimierung des Produktionssystems Winterweizen nach oekonomischen und oekologischen Kriterien** (1994) Deutsche Forschungsgemeinschaft, Bonn (Germany). *Integrated plant production. Research report. Final research report on a priority program "development of an integrated system of crop production with regard to economic and ecological aspects of plant protection in wheat crops". Heitefuss, R. (ed.); Holtschulte, B.; Niemann, M. Deutsche Forschungsgemeinschaft, Bonn (Germany) v. 2 p. 289-291.* VCH. German. (AGRIS 95-149468).

60 **Annual report for CIMMYT/ICARDA regional bread wheat nurseries 1992-93 [Triticum aestivum]** (1995) International Center for Agricultural Research in the Dry Areas, Aleppo (Syria). ICARDA. Tables. 107 p. ICARDA--008. English. (AGRIS 95-149462).

The data collected from 37 countries on bread wheat nursery sets of regional yield trials, observation nurseries, segregating populations, crossing blocks, and heat tolerance observation nursery assembled and distributed by ICARDA in early September 1992 for 1992/93 season are reported. The bread wheat nurseries were prepared by the joint CIMMYT/ICARDA breeding activities at ICARDA. The results of the regional bread wheat yield trials are presented at two levels: the overall performance and performance at each location. The results of the bread wheat observation nurseries are presented in three forms: performance summary for all reported traits across the maximum number of locations, the best entries for selected variables at each location, and general performance of the best entries for the selected variables. Information on the bread wheat segregating populations, entry selected or from which single plants were selected, is reported. Performance summary for all reported traits across the maximum number of locations is provided.

61 **Annual report for CIMMYT/ICARDA regional bread wheat yield trials 1992-93 [Triticum aestivum]** (1995) International Center for Agricultural Research in the Dry Areas, Aleppo (Syria). ICARDA. Tables. 72 p. ICARDA--009. English. (AGRIS 95-149463).

The data collected from 51 countries on bread wheat nursery sets of regional yield trials, observation nurseries, segregating populations, crossing blocks, and heat tolerance observation nursery assembled and distributed by ICARDA in early September 1992 for 1992/93 season are reported. The bread wheat nurseries were prepared by the joint CIMMYT/ICARDA breeding activities at ICARDA. The results of the regional bread wheat yield trials are presented at two levels: the overall performance and performance at each location. The overall performance includes the means of all variables and stability parameters of the regression technique. A performance summary for

grain yield which gives equal weight to each location based on number of times among the top 5 yielders and number of times significantly higher yielding than the checks is also given.

62 **Annual report for CIMMYT/ICARDA regional durum wheat nurseries 1992-93** (1995) International Center for Agricultural Research in the Dry Areas, Aleppo (Syria). ICARDA. Tables. 137 p. ICARDA–014. English. (AGRIS 95-149464).

The data collected from 38 countries on 251 durum wheat nursery sets of regional yield trials, observation nurseries, segregating populations, crossing blocks, and heat tolerance observation nursery assembled and distributed by ICARDA in early September 1992 for 1992/93 season are reported. The durum wheat nurseries were prepared by the joint CIMMYT/ICARDA breeding activities at ICARDA. The results of the regional durum wheat yield trials are presented at two levels: the overall performance and performance at each location. The results of the durum wheat observation nurseries are presented in three forms: performance summary for all reported traits across the maximum number of locations, the best entries for selected variables at each location, and general performance of the best entries for the *selected variables*. Information on 43 sets of durum wheat drought and heat tolerance observation nursery 92-93 and on 25 of drought and cold tolerance observation nursery 92-93 is reported. Performance summary for all reported traits across the maximum number of locations is provided.

63 **Annual report for CIMMYT/ICARDA regional durum wheat yield trials 1992-93** (1995) International Center for Agricultural Research in the Dry Areas, Aleppo (Syria). ICARDA. Tables. 82 p. ICARDA–015. English. (AGRIS 95-149296).

64 **Annual report for the international barley nurseries 1992-93** (1995) International Center for Agricultural Research in the Dry Areas, Aleppo (Syria). ICARDA. Tables. 173 p. ICARDA–006. English. (AGRIS 95-149378).

The data collected *from* 44 countries on 431 barley nursery sets of yield trials, observation trials, segregating populations, and crossing blocks in low rainfall cool, mild, and moderate areas, respectively, assembled and distributed by ICARDA in early September 1992 for the 1992/93 season are reported. The results of barley yield trials are presented at three levels: performance summary for all variables across the maximum number of locations, the best entries for selected variables at each location, and general performance of the best entries for selected variables. Information on barley segregating populations, entry selected or from which single plants were selected, is presented. Performance summary for all variables across the maximum *number* of locations is provided. The results of the barley observation nurseries are presented in the following three forms: performance summary for all variables across the maximum number of locations, the best entries for selected variables at each location, and general performance of the best entries for selected variables. Information on barley segregating populations, entry selected or from which single plants were selected, is reported. Performance summary for all variables across the maximum number of locations is provided.

65 **Annual report for the international barley yield trials 1992-93 [Hordeum vulgare]** (1995) International Center for Agricultural Research in the Dry Areas, Aleppo (Syria). ICARDA. Tables. 125 p. ICARDA–007. English. (AGRIS 95-149377).

The data collected from 44 countries on 431 barley nursery sets of yield trials in low rainfall cool, mild, and moderate areas, respectively, assembled and distributed by ICARDA in early September 1992 for the 1992/93 season are reported. The results of barley yield trials are presented at three levels: overall performance, regional performance, and performance at each location. The results of the barley observation nurseries are presented in the following three forms: performance summary for all variables across the maximum number of locations, the best entries for selected variables at each location, and general performance of the best entries for selected variables. Information on barley segregating populations, entry selected or from which single plants were selected, *is* reported. Performance summary for all variables across the maximum number of locations is provided.

66 **Mashreq/Maghreb project for the development of integrated crop/livestock production in West Asia and North Africa: 1994/95 workplan** (1994) International Center for Agricultural Research in the Dry Areas, Aleppo (Syria). ICARDA. 68 p. English. (AGRIS 95-149379).

The work plans of the project in the 1994/95 season are presented.

67 **Nile valley regional program on cool season food legumes and wheat: 1993/94 annual report, Sudan** (1995) Agricultural Research Corporation, Wad Medani (Sudan); International Center for Agricultural Research in the Dry Areas, Aleppo (Syria). ICARDA. 128 tables; 13 fig. 186 p. ICARDA/NVRP-DOC–037. English. (AGRIS 95-149716).

This publication presents the NVRP 1992/93 annual report for food legumes and wheat improvement and the executed activities for staff education, training and scientific visits in 1994. The report is an abridged documentation of two twin annual reports on the results of the wheat and food legumes research presented in the NVRP Annual national Coordination Meeting held in Wad Medani, Sudan between 28 Aug and 1 Sept, 1994. The papers cover different aspects of research activities but with more emphasis on on-farm research, demonstration plots and socio-economic studies.

68 **Nile valley regional program on cool-season food legumes and barley: 1994/95 workplan and budget, Ethiopia** (1994) International Center for Agricultural Research in the Dry Areas, Aleppo (Syria). ICARDA. 142 p. ICARDA/NVRP-DOC–032. English. (AGRIS 95-149713).

This publication presents the NVRP 1994/95 workplan and budget for food legumes and barley improvement in Ethiopia including the proposed programs for staff education and training for barley. Each research project provides in detail the project title, objectives, materials and methods, location, name of scientist in-charge, and names of cooperating scientists.

69 **Nile valley regional program on cool-season food legumes and cereals: 1992/93 annual report, Egypt** (1994) International Center for Agricultural Research in the Dry Areas, Aleppo (Syria). ICARDA. 157 p. ICARDA/NVRP-DOC–030. English. (AGRIS 95-149710).

This publication presents the NVRP 1992/93 annual report for food legumes, barley, bread wheat, durum wheat, and oat improvement in Egypt including the proposed programs for staff education and training.

70 **Nile valley regional program on cool-season food legumes and cereals: 1993/94 workplan and budget, Egypt** (1994) Agricultural Research Center, Giza (Egypt); International Center for Agricultural research in the Dry Areas, Aleppo (Syria). ICARDA. Tables. 143 p. ICARDA/NVRP-DOC–028. English. (AGRIS 95-149722).

This publication presents the NVRP 1994/95 workplan and budget for food legumes and barley, bread wheat, and durum wheat improvement in Egypt including the proposed programs for staff education and training. Each research project provides in detail the project title, objectives, materials and methods, location, name of scientist in-charge, and names of cooperating scientists.

71 **Nile valley regional program on cool-season food legumes and wheat: 1994/95 workplan and budget, Sudan** (1994) International Center for Agricultural Research in the Dry Areas, Aleppo (Syria). ICARDA. 63 p. ICARDA/NVRP-DOC–034. English. (AGRIS 95-149715).

This publication presents the NVRP 1994/95 workplan and budget for food legumes and bread wheat and durum wheat improvement in the Sudan including the proposed programs for staff education and training. Each research project provides in detail the project title, objectives, materials and methods, location, name of scientist in-charge, and names of cooperating scientists.

72 **Nile valley regional program: 1993/94 barley annual report [Egypt]** (1995) *Seventh Annual Coordination Meeting: Cairo (Egypt); 10-14 Sep 1995.* Agricultural Research Center, Giza (Egypt); International Center for Agricultural Research in the Dry Areas, Aleppo (Syria). ICARDA. Tables; fig. 131 p. English. (AGRIS 95-149369).

This publication presents the NVRP 1994/95 annual report for barley improvement and the executed activities for staff education, training and scientific visits in 1994. The report presents the results of the barley research presented in the NVRP Seventh Annual National Coordination Meeting held in Cairo, Egypt between 10-14 Sept, 1995. The papers cover different aspects

of research activities but with more emphasis on on-farm research including farmer- and researcher-managed trials and back-up research for the development of barley genotypes for drought tolerance under rain fed farming.

73 **Pasture, forage and livestock program, annual report for 1993** (1994) International Center for Agricultural Research in the Dry Areas, Aleppo (Syria). ICARDA. Tables; fig. 195 p. ICARDA--050. English. (AGRIS 95-149905).

The activities and results of research on small ruminant systems and production, sown pasture and forage, marginal lands and rangelands, natural resources inventory, and training and technology transfer in 1993 are presented.

74 **[Report on FIFAMANOR activities 22-23 August 1994. Hotel Diamant Antsirabe]. Compte-rendu des Journees de Reflexions sur les activites de FIFAMANOR 22-23 aout 1994, Hotel Diamant Antsirabe** (1994) FIFAMANOR, Fiompiana sy Fambolena Malagasy Norveziana, Antsirabe (Madagascar). FIFAMANOR. 39 p. French. (AGRIS 95-149481).

75 Abo El Kheir, M.S.A. (National Research Centre, Cairo (Egypt). Botany Dept.) (1993) **Effect of gibberellic acid and pix on growth and yield of wheat plants grown under different levels of soil moisture.** *Annals of Agricultural Science, Moshtohor (Egypt) v. 31(4) p. 1777-1786.* 2 tables; 28 ref. English. (AGRIS 95-129016).

76 Al Seaidi, O.M. (Univ. of Mosul (Iraq). Coll. of Agric. and Forestery) (1993) **[The limiting factors of wheat crop production in rainfall area-Ninewah 1970-1989]. Muh"adida:t 'a:nta:j" al-qamah" fi: al-maua:t*q al-dai:mi:ah fi: mah"a:fazat naynawa lil-sanawa:t 1970 -1989 dirasah qai:a:syah.** *Mij"alat zira:3at al-ra:fidi:n (Iraq); Mesopotamia Journal of Agriculture v. 25(no.3) p. 5-12.* 2 tables; 9 ref. Arabic. (AGRIS 95-128808).

The aim of this study was to determine the effectiveness of two variables, rainfall and fertilizers on production of wheat in Ninewah province. Also to deduce an econometric prediction model to crop before harvesting season. The research was classified into three categories according to the average of rains (1-Rainfall area. 2-Semi rainfall area. 3-Dry area).

77 Angus, J.F.; Peoples, M.B.; Gault, R.R.; Koetz, E.A. (Commonwealth Scientific and Industrial Research Organisation, Canberra. Div. of Plant Industry); Scammell, G.T. (Victorian Dept. of Agriculture, Rutherglen (Australia). Rutherglen Research Inst.) (1994) **Increasing the N contribution of pastures to crops [Nitrogen]. [Workshop paper].** The Role of Pastures in Cropping Systems of Southern NSW; Wagga Wagga, N.S.W. (Australia); 1 Mar 1994. *The role of pastures in cropping systems of southern NSW [New South Wales]. Orchard, P.; Hines, K. (New South Wales Agriculture, Wagga Wagga (Australia)) (ed.) p. 41-46.* New South Wales Agriculture. 2 fig., 1 table, 7 ref. English. (AGRIS 95-149697).

78 Baumer, M. (1995) **[Homogenous large sized parts - an opposite to the plant cultivation fit for environment]. Homogene Grosspartien von Braugerste - ein Gegensatz zum umweltgerechten Pflanzenbau?** *Brauwelt (Germany) v. 135(14) p. 666-670, 683-685.* 14 ill., 1 table. German. (AGRIS 95-128907).

79 Baumer, M. (Bayerische Landesanstalt fuer Bodenkultur und Pflanzenbau Freising Muenchen, Freising (Germany)) (1994) **[Winter barley - resistance against leaf diseases most important]. Pflanzenbau - Resistenz gegen Blattflecken und fruehe Reife entscheidend.** *Bayerisches Landwirtschaftliches Wochenblatt (Germany) v. 184(34) p. 40-44.* 2 ill., 2 graphs, 4 tables. German. (AGRIS 95-128910).

80 Belcheva, L. (Institut po Z"rneni Khrani i Furazhna Promishlenost, Kostinbrod (Bulgaria)) (1994) **[Technological characterization of the common winter wheat, variety Pobeda]. Tekhnologichna kharakteristika na obiknovena zimna pshenitsa, sort Pobeda.** Selskostopanska Akademiya, Sofia (Bulgaria). *Rasteniev"dni Nauki (Bulgaria); Plant Science v. 31(5-6) p. 7-9.* 4 tables; 8 ref. Bulgarian. (AGRIS 95-149466).

81 Bozovic, D. (Faculty of Agriculture, Pristina (Yugoslavia)) (1994) **Morphological, physiological and production traits of some promising winter wheat lines and cultivars in north Metohia [Serbia (Yugoslavia)] conditions.** Faculty of Agriculture, Belgrade (Yugoslavia). *Review of Research Work at the Faculty of Agriculture (Yugoslavia) v. 39(2) p. 69-78.* 6 tables; 14 ref. English. (AGRIS 95-128880).

Ten winter wheat genotypes have been studied for two years. Their morphological, physiological and production traits were studied, as well as the influence of sowing term, nitrogen fertilization and sowing density on these traits. The following traits were analysed: plant height, spike length, shooting-earing period duration, winter hardiness, lodging resistance, disease resistance, number of productive spikes per square m, number of grains per spike, grain production per spike, 1000-grain mass, hectoliter mass and grain yield. Effects of sowing time and nitrogen rate on almost all studied traits were observed. The highest grain yield had the following genotypes: Zemunka, Pe 2/5-5 and Pe 4/4.

82 Bragachini, M.; Bonetto, L. (1994) **[Wheat: harvest, drying and storage]. Trigo: cosecha, secado y almacenaje.** Instituto Argentino de Tecnologia Agropecuaria, Buenos Aires (Argentina). INTA-PROPECO. Estacion Experimental Agropecuaria Manfredi. *Cuaderno de Actualizacion Tecnica (Argentina); no. 13 48 p.* Spanish. (AGRIS 95-149457).

83 Brown, B.D. (Parma Research and Extension Center); Robertson, L.D.; Karow, R.; Kronstad, W.; Guy, S.; Souza, E.J.; Zemetra, R.S.; Kruk, M. (1993) **Malcolm: soft white winter wheat.** *Current information series (USA); no. 1005 2 p.* English. (AGRIS 95-129021).

84 Cai Datong; Wang Yibing (Nanjing Agricultural Univ. (China). Dept. of Soil and Agrochemistry) (1994) **The effect of sowing date and nitrogen application under different ecosystem on the yield and quality of the wheat variety.** *Plant Nutrition and Fertilizer Science (China) (no. 1) p. 74-83.* 3 tables; 3 ill., 7 ref. Chinese. (AGRIS 95-129007).

85 Cai, Y. (Institute of Agricultural Modernization, Hubei (China)); Tahir, M.; Yau, S.K. (ICARDA, Aleppo (Syria)) (1993) **Relationship of growth vigor, leaf color and other agronomic characters with grain yield in winter and facultative barley in a low-rainfall environment [Hordeum vulgare].** *RACHIS (ICARDA); Barley and Wheat Newsletter v. 12(1-2) p. 20-23.* 2 tables; 7 ref. English. (AGRIS 95-149381).

Genetic variation in growth vigor, leaf color and other agronomic characters, and their relationship with grain yield were studied in 243 winter/facultative barley (Hordeum vulgare L. ssp. vulgare) lines at Tel Hadya (long-term average annual rainfall of 328 mm) in northern Syria. Visual scores were taken on growth vigor and leaf color at four growth stages. Differences between entries were significant ($P<0.01$) for all traits measured. Heritabilities for growth vigor (40.0-47.5) and leaf color (38.5-48.1) were between those for days to heading and maturity, and grain yield. Growth vigor, but not leaf color, was positively correlated with plant height and grain yield ($r = 0.50$ to 0.69), except at the earliest growth stage in winter type. The study indicated that growth vigor would be a more valuable selection trait than leaf color for high yield in winter and facultative barley under semi-arid conditions in northern Syria.

86 Canpolat, N.; Bolte, J.P. (1993) **Object-oriented implementation of the CERES-Wheat model.** *American Society of Agricultural Engineers. Meeting (USA); no. 934052 18 p.* references. Paper presented at the "1993 International Summer Meeting sponsored by The American Society of Agricultural Engineers and The Canadian Society of Agricultural Engineering," June 20-23, 1993, Spokane, Washington. English. (AGRIS 95-128878).

87 Celma, I. (State Stende Selection and Experiment Station, Stende (Latvia)) (1995) **[Sowing perennial grasses - the main condition of forage production]. Daudzgadigas zales - lopbaribai un augsnes auglibai.** *Latvijas Lauksaimnieks (Latvia) (no.4) p. 10-11.* Latvian. (AGRIS 95-129620).

The research carried out on the capacity of perennial grasses to produce high quality inexpensive forage and improve soil fertility is described. The role of leguminous plants for soil fertility, the choice of proper species and varieties, seed rate and nitrogen fertilizer ration are particularly emphasized. As the result of the research recommendations are given on the growing technology of perennial grasses.

88 Chen Xianglong (Jiangsu Academy of Agricultural Sciences, Nanjing (China). Inst. of Industrial Crops) (1995) **The effects of nitrogen and plant density on the transplanted cotton following wheat harvesting and the dynamic process of its organ formation.** *Acta Gossypii Sinica (China) v. 7(1) p. 43-45.* 7 tables; 3 ill., 6 ref. Chinese. (AGRIS 95-129137).

89 Christen, O. (Kiel Univ. (Germany). Inst. fuer Pflanzenbau und Pflanzenzuechtung); Sieling, K. (1994) **[Effects of different preceding crops and crop rotations on yield of winter rape]. Einfluss unterschiedlicher Vorfruechte und Fruchtfolgen auf den Ertrag von Winterraps.** 38. Jahrestagung der Gesellschaft fuer Pflanzenbauwissenschaften; Halle/Saale (Germany); 29 Sep - 1 Oct 1994. *Mitteilungen der Gesellschaft fuer Pflanzenbauwissenschaften (Germany) v. 7 p. 285-288.* 1 table; 5 ref. German. (AGRIS 95-129081).

90 Ciolacu, F.; Carsofschi, I. (Statiunea Centrala de Cercetari pentru Cultura Plantelor pe Nisipuri, Dabuleni (Romania)) (1994) **[Behaviour of some barley varieties and lines under sandy soil resources available in southern Oltenia]. Comportarea *unor* soiuri si linii de secara in conditiile solurilor nisipoase amenajate din sudul Olteniei.** *Lucrari stiintifice. Statiunea Centrala de Cercetari pentru Cultura Plantelor pe Nisipuri Dabuleni (Romania) v. 8 p. 9-17.* 5 tables; 2 graphs; 7 ref. Romanian. (AGRIS 95-128989).

During 1989-1992 investigations in barley crops under irrigation on sandy soils were made regarding the control of some varieties and lines in comparative and competitive cultures. The experiments performed with several barley varieties and lines show that it is necessary to cultivate varieties with strong tillering capacity to make them well adapted to the climate conditions of the sandy zone. In ecological conditions specific to the southern Oltenia sandy soils, the line SV-344-86, with the yielding capacity of 3425 kg/ha, surpasses the varieties cultivated nowadays as to the yields of grains, resistance to lodging, fall of grain, hardiness and resistance to diseases (rust and powdery mildew). The variety Gloria showed also good yielding (3418 kg/ha), but its production gain resulted in comparison with the control- Aurie de Dankow, which yielded 3400 kg/ha, was situated within the limits of error.

91 Coelli, T.J. (New England Univ., Armidale (Australia). Econometrics Dept.) (1992) **Forecasting wheat production using Shire level data [Western Australia]. [Conference paper].** *36. Annual Conference. Australian Agricultural Economics Society; Canberra, A.C.T. (Australia); 10 Feb 1992.* Australian Agricultural Economics Society. 12 tables, 30 ref. 63 p. English. (AGRIS 95-149333).

92 Delmoral, LFG.; Boujenna, A.; Yanez, JA.; Ramos, JM. (1995) **FORAGE PRODUCTION, GRAIN YIELD, AND PROTEIN CONTENT IN DUAL-PURPOSE TRITICALE GROWN FOR BOTH GRAIN AND FORAGE.** *Agronomy Journal. 87(5):902-908.* English. [UNIV GRANADA FAC CIENCIAS DEPT BIOL VEGETAL E-18071 GRANADA SPAIN].

The use of cereal crops for both forage and grain production is practiced in many parts of the world. Quantity and quality of forage and grain with this dual use is strongly influenced by seeding date, cutting frequency and growth stage. The effect of two seeding dates and three cutting frequencies on forage production, grain yield, forage and grain protein content, and several associated characteristics of triticale (xTriticosecale Witt.) was determined in 1990 and 1991 at three field locations in southern Spain. Seeding date was less influential on forage and grain production than cutting treatments. Forage harvest significantly reduced grain yield 19.1 to 54.7% with one cutting and 46.6 to 76.2% with two cuttings. Plant height was reduced 5.6 to 18.8% with one cutting and 16.4 to 43.3% with two cuttings. Grain protein yield was reduced 18.6 to 53.7% with one cutting and 47.9 to 72.8% with two cuttings. Grain protein content increased 5.6 to 23.3% with one cutting and 8.0 to 32.0% with two cuttings at the rainfed sites, but not under irrigated conditions. Forage protein content was negatively related to forage yield both in rainfed ($r = -0.824$) and irrigated ($r = -0.952$) environments, probably due to a dilution effect. An inverse linear relationship was found between grain yield and protein content ($r = -0.901$) in the four rainfed experiments, probably from differences in accumulation of starch. Under irrigated conditions and high soil fertility, cuttings did nut affect the final percentage of protein in the grain, although grain yield decreased. An inverse relationship was found between the rainfall measured during the triticale growing season and the mean protein content in the grain ($r = -0.911$) under rainfed conditions. [References: 26].

93 Deneken, G.; Boesen, B. (1995) **[Varieties of cereals, pulse crops and oil seed crops 1995 [Brassica napus ssp. oleifera]]. Sorter af korn, baelgsaed og olieplanter 1995.** Statens Planteavlsforsoeg, Lyngby (Denmark). *Groen Viden. Landbrug (Denmark); no. 153 56 p.* SP. 74 tables. Danish. (AGRIS 95-129014).

94 Djokic, A. (Faculty of Agriculture, Belgrade (Yugoslavia)); Pesic, V.; Mladenov, N.; Mladenovic, G. (1994) **The results of the investigations on winter wheat cultivars and lines under agroecological conditions of Zajecar [Serbia (Yugoslavia)].** *Review of Research Work at the Faculty of Agriculture (Yugoslavia) v. 39(2) p. 79-86.* 4 tables; 5 ref. English. (AGRIS 95-128881).

The investigations were carried out with 14 winter wheat cultivars and 7 future wheat lines in agroecological conditions of Zajecar environment in Timocka Krajina (Serbia, Yugoslavia). The trials have been focused on disease resistance and productivity. The average 3-year yield and hectoliter grain weight for all the cultivars and lines analyzed have been higher than 7.0 t/ha and 80.0 kg, respectively. With respect to yield and disease resistance under the environmental conditions of Timocka Krajina the following cultivars may be recommended: Beogradjanka, Zadruga, Kraljevica, Jugoslavija and Indjija as well as the lines In 140/1 and In 42/2.

95 Dong Hezhong (Shandong Provincial Office of Cotton Production, Jinan (China)) (1994) **Optimum combination of several major agricultural techniques for summer cotton planting.** *Acta Gossypii Sinica (China) v. 6(4) p. 229-231.* 4 tables; 3 ref. Chinese. (AGRIS 95-129135).

96 Doyle, A.D. (New South Wales Agriculture, Tamworth (Australia)) (1992) **Report on barley study tour to Europe and North America.** New South Wales Agriculture. 22 p. English. (AGRIS 95-149374).

Gives an overview of the various topics of interest and value covered on the study tour, including barley breeding programmes, pest and disease control, quality standards, marketing, the status of Australian barley production on the world market and soil testing procedures for fertilizer application.

97 Dusek, D.A. (USDA, ARS, Conservation and Production Research Laboratory, Bushland, TX.); Musick, J.T. (1992) **Deficit irrigation of winter wheat: Southern Plains.** *American Society of Agricultural Engineers. Meeting (USA); no. 92-2600/92-2610 20 p.* references. Paper presented at the "1992 International Winter Meeting sponsored by the American Society of Agricultural Engineers, " December 15-18, 1992, Nashville, Tennessee. Issue numbers not consecutive. English. (AGRIS 95-128879).

98 Eddin, J.I. (Agrarian University, Kishinev (Republic of Moldova)) (1995) **[The influence of predecessors, sowing time and norms of seeding on the cropping capacity and grain quality of winter wheat]. Vliyanie predshestvennikov, srokov poseva i norm vyseva na urojainost' i kachestvo zerna ozimoi pshenitsy.** Agrarian University. 30 p. Russian. (AGRIS 95-149311).

The author determined the most efficient from the biological and economical points of view, variants of technological elements of growing intensive varieties of winter wheat for seeds and its qualities. Recommendations for a rational placement of intensive varieties after predecessor crops are elaborated, optimal time for sowing and seeding rate were stated, according to biological peculiarities of the variety and soil moisture content, which assures a higher grain yield of good quality per area seeded at minimal expense. On the ground of a 3-year-research period author considers advisable to recommend for production the following: 1. to consider as the best predecessors for the new winter wheat varieties, regionalized in Moldova for seeds, esparsette, and autumn sowing on bare fallow. 2. The optimal time for sowing winter wheat is late September (20-30 Sep) taking into account ability of new regionalized varieties to better support delayed sowing time. 3. When winter wheat is placed on bare fallow, varieties Odesskaia 117, Albatros Odesskii and Skifeanka should be sown at a sowing rate of 4.0-5.0 min, after esparsette, 5.0-6.0 min after pea for seeds and winter crops, and after silage maize 6.0-7.0 min germinated seeds per hectare.

99 El Gamasy, I.M. (Ministry of Agriculture, Cairo (Egypt). Agricultural Economics Research Inst.) (1992) **[Developing of wheat yield forecasting procedure in Egypt].** *Zagazig Journal of Agricultural Research (Egypt) v. 19(6) p. 2765-2773.* 6 tables; 5 ref. Arabic. (AGRIS 95-149340).

100 El Menoufi, M.M.; Bassouni, A.H. (Ministry of Agriculture, Cairo (Egypt). Field Crops Research Inst.); Harb, O.M.S. (1994) **Transplanting wheat compared to direct seeding at el-Arish area [Egypt].** *Journal of Agricultural Science, Mansoura Univ. (Egypt) v. 19(8) p. 2449-2455.* 3 tables; 7 ref. English. (AGRIS 95-129017).

101 El Menoufi, M.M.; Mitkees, R.A. (Ministry of Agriculture, Cairo (Egypt). Field Crops Research Inst.); Abdu, F.M. (1993) **Transplanting of wheat under late sowing date.** *Assiut Journal of Agricultural Sciences (Egypt) v. 24(4) p. 107-112.* 2 tables; 11 ref., English. (AGRIS 95-129015).

102 Ellegaard, H.C. (1992) **[6: Report from the Department of Variety Examinations]. 6: Meddelelser fra Sortsaegthedsafdelingen.** *Plantedirektoratets Beretning. Froe, Saedekorn, Sortsafproevning, Genteknologi og Bier (Denmark) (no.1) p. 58-68.* 10 tables; summary p. 119. Danish. (AGRIS 95-129599).

103 Evans, J. (New South Wales Agriculture, Wagga Wagga (Australia)) (1994) **Managing nitrogen flows between crops and pasture: some principles. [Workshop paper].** The Role of Pastures in Cropping Systems of Southern NSW; Wagga Wagga, N.S.W. (Australia); 1 Mar 1994. *The role of pastures in cropping systems of southern NSW [New South Wale·' Orchard, P.; Hines, K. (New South Wales Agriculture, Wagga Wagga (Austra...a)) (ed.) p. 47-53.* New South Wales Agriculture. 1 fig. English. (AGRIS 95-149699).

104 Evans, J. (New South Wales Agriculture, Wagga Wagga (Australia)); Chalk, P.M. (Melbourne Univ., Melbourne (Australia). Dept. of Soil Science and Forestry) (1993) **The field pea-wheat rotation: variety and management effects on soil nitrogen balance and wheat production.** New South Wales Agriculture. 5 fig., 11 tables. 29 p. English. (AGRIS 95-149743).

Gives detailed results of field trials using different wheat and/or pea varieties in rotations with various sowing and stubble management techniques and different nitrogen application rates. It was found that by increasing the amount of nitrogen available for wheat growth, crop legumes can help achieve potential wheat yields and reverse the chronic decline in wheat protein. On average crop legumes were worth 78 kg of urea N/ha to the first succeeding wheat crop. Variations in the levels of soil N have been achieved by varying sowing times of peas and using different stubble management techniques.

105 Falconi P, J.; Romero L, R. (Universidad Nacional Agraria La Molina, Lima (Peru). Facultad de Agronomia) (1993) **[Effect of three levels of vegetable coverage applied after the sowing to two densities on the humidity, soil temperature and productivity of winter wheat in Puno]. Efecto de tres niveles de cobertura vegetal aplicado despues de la siembra a dos densidades sobre la humedad, temperatura del suelo y productividad de trigo de invierno en Puno.** *[Summary of investigations supported by FUNDEAGRO [Foundation for the Development of Agriculture] 1988-1992]. Resumen de investigaciones apoyadas por FUNDEAGRO [Fundacion para el Desarrollo del Agro] 1988-1992. Quevedo Iturri, F.; Arroyo Vergara, R. (eds.). Proyecto Transformacion de la Tecnologia Agropecuaria (TTA), Lima (Peru). Fondo para el Aumento de Oportunidades de Investigacion; Fundacion para el Desarrollo del Agro, Lima (Peru) v. 1: p. 167-168.* Spanish. (AGRIS 95-129000).

106 Faria, R.T. de (Instituto Agronomico do Parana, Londrina PR, Brazil); Madramootoo, C.A. (1993) **Risk analysis of drought and irrigation requirements for wheat in Parana, Brazil.** *American Society of Agricultural Engineers. Meeting (USA); no. 932588 26 p.* references. Paper presented at the "1993 International Winter Meeting of the American Society of Agricultural Engineers," December 14-17, 1993, Chicago, Illinois. English. (AGRIS 95-149224).

107 Faw, W.F. (Louisiana Cooperative Extension Service); Alison, M.W.; Ashley, J.; Boquet, D.; Brown, L.P.; Coco, A.B.; Colyer, P.D.; Funderburg, E.R.; Hallmark, B. (1992) **1992 recommended wheat and oak varieties and management practices.** *Pub. (Louisiana Cooperative Extension Service) (USA); no. 2370, rev. 28 p.* English. (AGRIS 95-128957).

108. Felton, W.L.; Marcellos, H.; Morris, S.G. (New South Wales Agriculture, Tamworth (Australia)) (1992) **No-tillage wheat production in northern New South Wales.** New South Wales Agriculture. 6 tables. 14 p. English. (AGRIS 95-149335).

Contains brief reviews of a regional programme in northern New South Wales, commenced in 1981 to evaluate the influence of tillage practices on crop production at five sites representing the major soil types in the wheat belt. Different soil types produced different results in terms of improved wheat production, but no-tillage systems have definite beneficial effects on soil structure and soil erosion.

109 Fischer, A. (Bayerische Landesanstalt fuer Betriebswirtschaft und Agrarstruktur, Muenchen (Germany)) (1995) **[More brewer's barley, less sunflowers?]. Mehr Braugerste, weniger Sonnenblumen?** *Top agrar (Germany) (no.2) p. 36-39.* 1 ill., 3 tables. German. (AGRIS 95-129421).

110 Goebel, J. (Hohenheim Univ., Stuttgart (Germany). Inst. fuer Pflanzenbau und Gruenland. Fachgebiet Spezieller Pflanzenbau) (1994) **[Yield formation of winter rape and winter barley undersown in faba bean stands]. Ertragsbildung von Winterraps und Wintergerste erstellt als Untersaat nach Ackerbohnen.** 38. Jahrestagung der Gesellschaft fuer Pflanzenbauwissenschaften; Halle/Saale (Germany); 29 Sep - 01 Oct 1994. *Mitteilungen der Gesellschaft fuer Pflanzenbauwissenschaften (Germany) v. 7 p. 45-46.* 1 table; 2 ref. German. (AGRIS 95-128908).

111 Gogoi, AK.; Kalita, H. (1995) **EFFECT OF SEEDING METHOD AND HERBICIDE ON WEEDS, AND GROWTH AND YIELD OF WHEAT (TRITICUM AESTIVUM).** *Indian Journal of Agronomy. 40(2):209-211.* English. [ASSAM AGR UNIV DEPT AGRON JORHAT 785013 ASSAM INDIA].

A field experiment was conducted during the winter seasons of 1988-89 and 1989-90 at Jorhat, to evaluate effectual method of seeding and herbicide for controlling weeds and increasing yield of wheat (Triticum aestivum L. emend. Fiori & Paol). Line-sowing and cross-sowing showed equal advantage over broadcast method for higher grain yield. Isoproturon 0.75 kg/ha and 2, 4-D 0.8 kg/ha were equally effective in controlling weeds and improving the growth and yield components as well as grain yield of wheat, which were comparable with hand-weeding system.

112 Gorban, G.S.; Kostromitin, V.M. (1993) **[Winter triticale]. Ozime tritikale.** *[Winter cereal crops]. Zhivotkova, L.O.; Byryukova, S.B. (eds.); Babayanets, L.T. p. 254-287.* Urozhai. Ukrainian. (AGRIS 95-149342).

The history of triticale, its biology, creation of gexaploidies of triticale, triticales breeding, seed using, triticales variates are discussed.

113 Guan Guilan; Yang Yusuo; Wang Weiping (Academia Sinica, Urumqi (China). Inst. of Biology, Pedology and Desert) (1994) **Development of promoting growth microorganism preparations and its efficacy of application.** *Xinjiang Agricultural Sciences (China) (no. 6) p. 273-275.* 5 tables. Chinese. (AGRIS 95-128916).

114 Hansen, G.K.; Svendsen, H. (1995) **[Yields and nitrogen leaching: System analyses of nitrogen balances by the DAISY-model for a cropping system with and without application of pig slurry, at varying soil types and climates in relation to the Danish accompanying measures of EU for reduced nitrogen applications]. Udbytter og kvaelstofudvaskning: Systemanalyser med DAISY-modellen af N-balancer i saedskifte med og uden tilførsel af svinegylle ved varierende jordtyper og klima i relation til EU's ledsageforanstaltning for reduceret kvaelstoftilførsel.** Statens Planteavlsforsoeg, Vejle (Denmark). Afdeling for Arealanvendelse. SP. 27 ill., 43 tables; 9 ref. 77 p. Danish. (AGRIS 95-149371).

115 Helm, J.L. (North Dakota State University, Fargo, ND.) (1993) **1993 North Dakota barley, oat, rye and flax variety performance descriptions.** *NDSU Extension Service : [publication] (USA); no. A-1049 8 p.* English. (AGRIS 95-128914).

116 Helm, J.L. (North Dakota State University, Fargo, ND.) (1993) **1993 North Dakota durum wheat variety performance descriptions.** *NDSU Extension Service : [publication] (USA); no. A-1067 7 p.* English. (AGRIS 95-129004).

117 Hevia H, Felicitas (Concepcion Univ., Chillan (Chile). Dept. de Ciencias Basicas); Tollenaar G, Huib; Mosre R, Yamil; Serri G, Humberto; Wilckens E, Rosemarie (1994) **[Behaviour of ten wheat cultivars sown at eight different dates 1. Grain and flour yield]. Comportamiento de diez cultivares de trigo sembrados en ocho fechas diferentes. 1. rendimiento de grano y harina.** *Agro-Ciencia (Chile) v. 10(1) p. 9-15.* 29 ref. Spanish. (AGRIS 95-149458).

118 Hevia H, Felicitas (Concepcion Univ., Chillan (Chile). Dept. de Ciencias Basicas); Tollenaar G, Huib; Mosre R, Yamil; Villegas F, Ricardo; Wilckens E, Rosemarie (1994) **[Behaviour of ten wheat cultivars sown at eight different dates 2. Baking quality]. Comportamiento de diez cultivares de trigo sembrados en ocho fechas diferentes. 2. Calidad panadera.** *Agro-Ciencia (Chile) v. 10(1) p. 17-26.* 40 ref. Spanish. (AGRIS 95-149459).

119 Huebner, G. *(1995)* **[A cash crops with future in the long run: malting barley]. Eine Marktfrucht mit Zukunft auf Dauer: Braugerste.** *Brauwelt (Germany) v. 135(12-13) p. 619-621.* 1 table. German. (AGRIS 95-128906).

120 Iglesias, L.A.; Perez, N. (Instituto Nacional de Ciencias Agricolas, Pinar del Rio (Cuba). Estacion Experimental del Arroz "Los Palacios") (1995) **[Wheat crop in tropical environments and its possible sowing in Cuba]. El cultivo del trigo en condiciones tropicales y posibilidades para su siembra en Cuba.** *Cultivos Tropicales (Cuba) v. 16(1) p. 52-63.* 59 ref. Spanish. (AGRIS 95-149460).

121 Jara Valenzuela, J. (1993) **[Wheat cultivation in the mountain of Peru]. Cultivo de trigo en la sierra del Peru.** Instituto Nacional de Investigacion Agraria, Lima (Peru). Direccion General de Investigacion Agraria; Proyecto Transformacion de la Tecnologia Agropecuaria (TTA), Lima (Peru). *Serie Manual - Instituto Nacional de Investigacion Agraria (Peru); no. 12 69 p.* INIA. Fig. cuadros; 33 ref. Spanish. (AGRIS 95-128998).

122 Jaradat, A.A. (ICARDA, Aleppo (Syria)); Haddad, N.I. (ICARDA, Amman (Jordan)) (1994) **Analysis and interpretation of Mashreq project findings (1990-1992): special report. Mashreq Project: increased productivity of barley, pasture and sheep (RAB/89/026).** United Nations Development Programme, Amman (Jordan); Arab Fund for Economic and Social Development (Kuwait); International Center for Agricultural Research in the Dry Areas, Aleppo (Syria). ICARDA. Tables; fig. 133 p. Mashreq Document--018. English. (AGRIS 95-149376).

This report presents, analyzes and discusses the results of the activities conducted in Iraq, Jordan and Syria during the 1989-1992 growing seasons. The report includes the results of the plant production activities only, because sufficient results were not available on animal production activities when the report was prepared. Also included is a summary of an economic assessment study on Mashreq Project technologies.

123 Jezequel, S. (Institut Technique des Cereales et des Fourrages, Paris (France)) (1995) **[Hard wheat in Provence region (France): optimization of crop managment]. Ble dur en Provence: comment optimiser les conduites de culture.** *Perspectives Agricoles (France) (no 204) p. 65-69.* French. (AGRIS 95-128997).

124 Karabinova, M.; Prochazkova, M. (1995) **THE EFFECT OF VARIETIES, WAYS OF SEEDING AND YEAR ON WINTER WHEAT YIELD FORMATION [Slovak].** *Rostlinna Vyroba. 41(11):499-504.* Slovak. [VYSOKA SKOLA POLNOHOSPODARSKA A HLINKU 2 NITRA 94976 SLOVAKIA].

Results of two-year trials (1991 to 1993) conducted with five winter wheat varieties in which we investigated the effect of different ways of seeding (muldboard, band and disc) and weather conditions of the year on formation and reduction of tillers and final grain yield showed statistically insignificant effect of ways of seeding and statistically highly significant effect of varieties and conditions of the year on maximum number of tillers, number of productive tillers and resulting grain yield. Most significant positive increase of maximum number of set up tillers on an average for the experimental period and variety was due to disc seeding in which increase amounted to 1.29 tillers per plant, i.e, increase of 25.9% compared with the lowest number of set up tillers - in muldboard seeding. Regarding productive tillering, the band seeding seemed to be an optimum way of seeding in which increment was 0.40 tillers per plant, i.e. 18.7% (in which limitation of reduction in the number of tillers by 7.1% was recorded) compared with the lowest number of productive tillers. Investigated varieties gave maximum grain yields in band seeding with average yield of 6.72 t.ha(-1), differences in grain yields between different ways of seeding were insignificant (statistically insignificant). Livia was the variety with highest intensity of tillering in trials conducted (6.28 tillers per plant) but at the same time it had highest reduction of number of tillers (68.19%), in which maximum grain yield of 7.00 t.ha(-1) was recorded, what is higher by 9.7% compared with minimum grain yield (6.38 t.ha(-1)).

125 Khan, RU.; Rashid, A. (1995) **WHEAT PRODUCTION AS INFLUENCED BY PLANTING TIME UNDER RAINFED CONDITION OF ELMARJ-LIBYA.** *Pakistan Journal of Botany. 27(1):169-173.* English. [ARID ZONE RES SUBSTN DERA ISMAIL KHAN PAKISTAN].

Field experiments on seeding dates were conducted during 1990-91 and 1991-92 to determine the optimum time for sowing of wheat crop under rainfed condition. Early as well as late sowing of wheat reduced the yield. The optimum time of planting of Durum wheat variety Mexicale was found to be 4 to 21 December to obtain maximum grain production.

126 Kim, J.G.; Han, J.D.; Jin, H.J.; Lee, H.H. (Rural Development Administration, Suwon (Korea Republic). National Livestock Research Institute); Han, M.S.; Kim, G.Y. (Rural Development Administration, Suwon (Korea Republic). Agricultural Science and Technology Institute) (1995) **Study on the whole crop pellet making of barley cultivated on paddy land after rice.** *Journal of The Korean Society of Grassland Science (Korea Republic) v. 15(2) p. 146-150.* 5 tables; 16 ref. Korean. (AGRIS 95-128912).

127 Kjeldsen, A. (1992) **[7: Report from the Department of Certification of Cereal Seed]. 7: Meddelelser fra Afdelingen for Certificering af Saedekorn.** *Plantedirektoratets Beretning. Froe, Saedekorn, Sortsafproevning, Genteknologi og Bier (Denmark) (no.1) p. 69-82.* 5 tables; summary p. 119. Danish. (AGRIS 95-128918).

128 Kjer, Ilse (1993) **[Quality of hop and barley by organic farming and the influence on intermediate and final products of beer-production]. Die Qualitaet von Hopfen und Gerste aus oekologischem Anbau und deren Einfluss auf die Zwischen- und Endprodukte der Bierherstellung.** Hessen Univ., Kassel (Germany). Fachgebiet oekologische Umweltsicherung - Fachbereich Landwirtschaft der Gesamthochschule. 26 tables, 37 graphs. Bibliography p. 126-140. 193 p. German. (AGRIS 95-149936).

129 Koch, H.J. (Goettingen Univ. (Germany). Inst. fuer Zuckerruebenforschung); Baeumer, K. (1994) **[Effects of straw mulching on yield formation of winter barley]. Einfluss von Strohmulch auf die Ertragsbildung von Wintergerste.** 38. Jahrestagung der Gesellschaft fuer Pflanzenbauwissenschaften; Halle/Saale (Germany); 29 Sep - 01 Oct 1994. *Mitteilungen der Gesellschaft fuer Pflanzenbauwissenschaften (Germany) v. 7 p. 55-58.* 5 graphs; 4 ref. German. (AGRIS 95-128909).

130 Kuhlmann, F. (Giessen Univ. (Germany). Inst. fuer Landwirtschaftliche Betriebslehre); Glenz, H. (1994) **[<4. Computer aided simulation and decision models for optimization of production system winter wheat following economic and ecological criteria> 4.3. Computerized decision models for winter wheat production]. 4. Rechnergestuetzte Simulations- und Entscheidungsmodelle zur Optimierung des Produktionssystems Winterweizen nach oekonomischen und oekologischen Kriterien. 4.3. Computergestuetzte Entscheidungsmodelle fuer die Winterweizenproduktion.** *Integrated plant production. Research report. Final research report on a priority program "development of an integrated system of crop production with regard to economic and ecological aspects of plant protection in wheat crops". Heitefuss, R. (ed.); Holtschulte, B.; Niemann, M. Deutsche Forschungsgemeinschaft, Bonn (Germany) v. 2 p. 251-277.* VCH. 7 ill., 13 tables; 19 ref. German. (AGRIS 95-149467).

With the objectives to prevent excessive resource strain on the one hand, and to possibly maintain the profitability of wheat cropping on the other hand, several computer models have been developed as decision aids for long-term crop rotation planning, as well as for short-term production control of the wheat crop. The knowledge bases of these models contain production functions and production rules which have been identified by results of documented experiments and/or by nondocumented domain knowledge of crop experts. According to the decision areas they are aimed at, the programs can be subdivided into strategical and tactical decision aids. In the paper, three of the models are described in more detail. The model ROTACALC supports strategical decisions regarding the configuration of crop rotations which contain wheat besides other crops. Field specific conditions are taken into account. The model FERTRIC supports tactical decisions concerning the optimal amount, number of applications, and timing of the nitrogen fertilization during the production period under field specific conditions. The model METRO supports tactical decisions for fungus control in wheat, giving advice about timing of measures and spraying materials. The proposals are based on field specific conditions, especially the actual disease situation. The model can be used repeatedly during the relevant stages of the wheat growth period. In addition, the paper reports the results of biannual experiments, conducted to test the practicability of the tactical programs, and to gain some insight into the comparative advantage of the model's proposals as compared to the conventional decision rules, commonly used by farmers.

131 Linshevsky, A.A.; Scheremet, O.M. (1993) **[Winter barley]. Ozimiy iachmin.** *[Winter cereal crops]. Zhivotkova, L.O.; Byryukova, S.B. (eds.); Babayanets, L.T. p. 220-253.* Urozhai. Ukrainian. (AGRIS 95-149383).

Barley breeding, its variants, genetics, agronomic charachters, its use in bakery industry are described.

132 Liska, E.; Pospisil, R.; Tyr, S. (Vysoka Skola Polnohospodarska, Nitra (Slovak Republic). Katedra Polnohospodarskych Sustav) (1994) **[Agroclimatic conditions for spring barley growing in Slovakia]. Agroklimaticke podmienky pre jarny jacmen na Slovensku.** *Polnohospodarstvo (Slovak Republic) v. 40(11) p. 814-824.* 3 ill., 3 tables; 9 ref. Slovak. (AGRIS 95-128913).

The quality of temperature and humidity conditions for spring barley grown in the most productive areas in Slovakia was studied during the period 1971-1991. The total heat characterized by the sum of temperatures from the seeding period to maturity was directly dependent on the altitude in the range between 1129-1650 deg C. Temperature security declines with increasing altitude. Humidity conditions are characterized by the irrigation coefficient. The driest regions is the lowland Podunajska Nizina (southern Slovakia) where water deficit during the spring barley vegetation period ranges between 70-90 mm. Using the isothermic method, Slovakia can be divided into 6 regions according to temperature requirements, and into 1-3 sub-regions according to humidity requirements of spring barley.

133 Marcellos, H. (New South Wales Agriculture, Tamworth (Australia)) (1992) **Winter grain legumes for the northern wheat zone of NSW [rotations; New South Wales].** New South Wales Agriculture. 1 fig., 2 tables. 5 p. English. (AGRIS 95-149696).

Discusses the results of a project aimed at evaluating the genotypes of lupins, faba beans, field peas, lentils and fenugreek in the northern wheat belt, investigating their agronomic requirements and evaluating the capacity of grain legumes to increase grain yield and protein in wheat crops.

134 Mersinkov, N.; Zapryanov, S. (Institut po Echemika, Kamobat (Bulgaria)) (1994) **[State and problems of barley breeding in Bulgaria]. S"stoyanie i problemi pri selektsiyata na echemika.** Selskostopanska Akademiya, Sofia (Bulgaria). *Rasteniev"dni Nauki (Bulgaria); Plant Science v. 31(3-4) p. 67-71.* 2 tables; 38 ref. Bulgarian. (AGRIS 95-128904).

135 Micanovic, D.; Lomovic, S.; Ciric, D. (Institut za istrazivanja u poljoprivredi "Srbija", Kragujevac (Yugoslavia). Centar za strna zita "Kragujevac") (1994) **[Effect of seeding date on some wheat leaf parameters]. Uticaj vremena setve na neke osobine lista psenice.** *Savremena poljoprivreda (Yugoslavia) v. 42(6) p. 55-60.* 4 tables; 15 ref. Serbian. (AGRIS 95-128883).

Effect of seeding date on some leaf parameters (leaf area per plant, leaf area index, specific weight of leaf) were investigated. Four seeding dates and two wheat genotypes were examined in the field experiment. Trial was designed as randomized block design with four replications. Soil type was smonitza in degradation (vertisol). All parameters were investigated in the jointing and in the full flowering. Leaf area index (LAI) and leaf area per plant were decreasing with later seedling date in both plant stages. Opposite of them, values of specific weight of leaf were significantly increasing with later seeding date.

136 Murray, G.M. (New South Wales Agriculture, Wagga Wagga (Australia)) (1994) **Disease aspects of crop pasture rotations. [Workshop paper].** The Role of Pastures in Cropping Systems of Southern NSW; Wagga Wagga, N.S.W. (Australia); 1 Mar 1994. *The role of pastures in cropping systems of southern NSW [New South Wales]. Orchard, P.; Hines, K. (New South Wales Agriculture, Wagga Wagga (Australia)) (ed.) p. 60-66.* New South Wales Agriculture. 4 fig. English. (AGRIS 95-149337).

137 Musick, J.T. (USDA, ARS, Conservation and Production Research Laboratory, Bushland, TX.) (1992) **Projected crop response to climate change: Southern Plains.** *American Society of Agricultural Engineers. Meeting (USA); no. 92-2600/92-2610 23 p.* references. Paper presented at the "1992 International Winter Meeting sponsored by the American Society of Agricultural Engineers," December 15-18, 1992, Nashville, Tennessee. Issue numbers not consecutive. English. (AGRIS 95-129144).

138 Nilsson, P. (Sveriges Lantbruksuniv., Uppsala (Sweden). Inst. foer Vaextfoeraedling) (1992) **[Spelt wheat - a crop for the future?]. Speltvete - en groeda foer framtiden?. Seminariekurs mark/vaext 1992.** Sveriges Lantbruksuniv. 27 ref. 10 p. Swedish. (AGRIS 95-149473).

139 Panajotov, I. (Institut po Pshenitsata i Sl'nchogleda "Dobrudzha", General Toshevo (Bulgaria)); Boyadzhieva, D.; Todorov, I.; Stankov, I.; Dechev, D.; Tsvetkov, S. (1994) **[Present situation and problems of wheat breeding in Bulgaria]. S"stoyanie i problemi pri selektsiyata na pshenitsata v B"lgariya.** Selskostopanska Akademiya, Sofia (Bulgaria). *Rasteniev"dni Nauki (Bulgaria); Plant Science v. 31(3-4) p. 48-57.* 10 tables; 24 ref. Bulgarian. (AGRIS 95-128874).

140 Parzefall, J. (1994) **[Triticale cultivation is profitable]. Pflanzenbau - Vieles spricht fuer Triticale.** *Bayerisches Landwirtschaftliches Wochenblatt (Germany) v. 184(35) p. 30-32.* 2 tables. German. (AGRIS 95-128869).

141 Pawlowski, F.; Wozniak, A. (Akademia Rolnicza, Lublin (Poland). Katedra Ogolnej Uprawy Roli i Roslin) (1994) **[Yielding of winter triticale depending on share in crop rotation]. Plonowanie pszenzyta ozimego wzaleznosci od jego udzialu w plodozmianie i sposobu pielegnowania.** *Fragmenta Agronomica (Poland) v. 11(3) p. 40-45.* 3 tables; 9 ref. Polish. (AGRIS 95-149367).

The long term experiment was conducted in 1988-92 on soil of very good rye complex. In the experiment grain yield of winter triticale and yield of components were investigated in four crop rotations (25, 50, 75, 100 percent of winter triticale) and cultivation system. It was found that monoculture of winter triticale reduced yield of grain about 20.3 percent in comparison with Norfolk rotation. The intensive cultivation increased yield of grains about 6.6 percent in comparison with basic cultivation.

142 Porter, PM.; Khalilian, A. (1995) **WHEAT RESPONSE TO ROW SPACING IN RELAY INTERCROPPING SYSTEMS.** *Agronomy Journal. 87(5):999-1003.* English. [UNIV MINNESOTA DEPT AGRON & PLANT GENET SW EXP STN BOX 428 LAMBERTON, MN 56152 USA].

Relay intercropping of soybean [Glycine max (L.) Merr.] or cotton [Gossypium hirsutum L.] into standing wheat [Triticum aestivum L.] allows for earlier planting of the summer crop than with sequential doublecrop systems. Relay intercropping has been evaluated using modifications of standard planting and harvesting equipment as well as specifically designed equipment. In most relay intercropping systems, wheat is drilled in the fall in a row pattern that provides traffic-tire lanes as guides for planting the summer crop. Also, row spacing for wheat in relay intercropping is usually wider than for conventionally planted wheat. This held study, conducted during 1991-1992 and 1992-1993 near Blackville, SC, on a Varina loamy sand

(clayey, kaolinitic, thermic Plinthic Paleudults), compared the yield and yield component response of soft red winter wheat produced with two different intercropping production schemes to the yield and yield component response of conventionally planted wheat. Yields of wheat planted in skip-row schemes designed to allow for relay intercropping of either soybean or cotton were not significantly different from yield of conventionally planted wheat under the given experimental conditions. For conventionally planted wheat, wheel traffic on certain rows reduced yields by as much as 50% compared with nontraffic rows. In the schemes designed to allow for relay intercropping, wheat grown with wider-spaced rows (0.31-0.61 m) compensated with respect to yield on an area basis compared with wheat grown with conventionally spaced rows (0.15-0.20 m). [References: 16].

143 Qasim, M. (1993) **Effect of strip planting techniques on the yield and yield components of wheat (Triticum aestivum L.).** University of Agriculture, Faisalabad (Pakistan). Dept. of Agronomy. UAF. 11 ills., 20 tables, 43 ref. 85 p. English. (AGRIS 95-129020).

144 Ramos, JM.; Delamorena, I.; Delmoral, LFG. (1995) **BARLEY RESPONSE TO NITROGEN RATE AND TIMING IN A MEDITERRANEAN ENVIRONMENT.** *Journal of Agricultural Science. 125(Part 2):175-182.* English. [UNIV GRANADA FAC CIENCIAS DEPT BIOL VEGETAL E-18001 GRANADA SPAIN].

Nitrogen is an important factor determining grain yield of barley (Hordeum vulgare L.). Optimal rates and application timing can vary according to the environmental conditions under which the crop is grown. For 8 years (1979-86) barley yield, tillering, and leaf-area response to N application rates and timing were studied in southern Spain. The results showed that, under our experimental conditions, the most advantageous N rate for grain yield was 60 kg/ha, either split equally between sowing and tillering, or else with the greater proportion applied at tillering. Nitrogen applied at sowing increased number of tillers per plant, and N applied at tillering favoured tiller survival for later spike formation. In addition, N applied at tillering increased the number of leaves per plant, leaf area per plant, and the leaf area index, the maximum value of which occurred at anthesis. [References: 36].

145 Roncevic, P.; Dencic, S.; Malesevic, M. (Poljoprivredni fakultet, Novi Sad (Yugoslavia). Institut za ratarstvo i povrtarstvo) (1995) **[Production and significance of spring and facultative wheat cultivars]. Stvaranje i znacaj jarih i fakultativnih sorti psenice.** 29. seminar agronoma; Vrnjacka Banja (Yugoslavia); 30 Jan - 4 Feb 1995. *Zbornik radova - Poljoprivredni fakultet u Novom Sadu, Institut za ratarstvo i povrtarstvo (Yugoslavia) (no. 23) p. 131-142.* 6 tables; 7 ref. Serbian. (AGRIS 95-128884).

The best results of spring sowing are obtained with the cultivar Venera and the line NSJP-256 (Kraljica) which are most close to the desirable type of spring variety according to several characters. The cultivar Nevesinjka was created with spring wheat cultivars. The best yield of this cultivar can be obtained when it is sown in October. As it has a desirable degree of resistance to low temperatures and as it has the characters of medium late spring cultivar, this cultivar belongs to winter-spring, i.e. facultative type. The sowing of winter cultivars (tolerant to sowing period) and winter-spring cultivars in late autumn, as well as sowing of spring cultivars can provide the fulfillment of sowing plan.

146 Rooney, J.M.; Leigh, R.A. (Biochemistry and Physiology Department, AFRC Institute of Arable Crops Research, Rothamsted Experimental Station, Harpenden, Herts AL5 2JQ (United Kingdom)) (1993) **Dry matter and nitrogen partitioning to the grain of winter wheat (Triticum aestivum L.) cultivars grown on Broadbalk since 1843.** Physiology of varieties; Nottingham (United Kingdom); 6-8 Apr 1993. *Aspects of Applied Biology (United Kingdom) (no.34) p. 219-227.* 20 ref. English. (AGRIS 95-149475).

147 Roy, I.; Dey Sarker, A.K.; Razzaque, M.A. (Bangladesh Agricultural Research Council, Farmgate, Dhaka 1215 (Bangladesh)) (1993) **Wheat response to different tillage methods under irrigated and rainfed conditions of Bangladesh.** *Philippine Journal of Crop Science (Philippines) v. 18(1) p. 45-49.* English. (AGRIS 95-129019).

The study investigated the effect of reduction of tillage practices on grain yield and yield characters of wheat grown after rice. Field experiments with Kanchan variety of wheat were conducted over the 1989-90 and 1990-91 wheat growing seasons. Three tillage treatments-minimum (opening furrow), reduced (one ploughing and one laddering) and conventional (five ploughings and five ladderings) - were compared under irrigated and rainfed conditions. Tillage effects on grain yield averaged over irrigated and rainfed conditions were similar. Plant emergence and spike/sq.m. were significantly less in minimum tillage treatments whereas other yield components showed compensatory effect. Grain yield and most yield components showed better performance in reduced tillage treatment.

148 Rudnicki, F.; Kotwica, K.; Oledzka Zyla, H. (Akademia Techniczno Rolnicza, Bydgoszcz (Poland). Katedra Ogolnej Uprawy Roli i Roslin) (1993) **[Effect of nitrogen fertilization and growth retardants on winter Triticale yields]. Wplyw nawozenia azotem i retardantow wzrostu na plonowanie pszenzyta ozimego.** *Roczniki Nauk Rolniczych. Seria A - Produkcja Roslinna (Poland); Polish Agricultural Annual. Series A - Plant Production v. 110(1-2) p. 129-138.* 4 tables; 13 ref. Polish. (AGRIS 95-128870).

The effect of nitrogen fertilization (80 and 120 kg N/ha) as well as growth retardants (CCC and ethephon) and their doses on the Triticale yields was investigated in the 3-year field experiment. In the years with very different meteorological conditions in growing season a distinct dependence of the factors under study on the weather course was observed. A positive effect of nitrogen fertilization and growth retardants was particularly visible in the year with high atmospheric precipitation level. The CCC and ethephon effect showed no significant differences in the Triticale growth. The growth retardant doses exceeding 2 kg of the active element per hectare appeared to be unpurposeful.

149 Ruza, A. (Latvia University of Agriculture, Jelgava (Latvia). Faculty of Agriculture) (1995) **[Winter crops sowing - when and how we do it]. Kad un ka sesim ziemajus.** *Latvijas Lauksaimnieks (Latvia) (no.8) p. 3-4.* Latvian. (AGRIS 95-149349).

150 Ruzha, A.; Dominiece, I. (Latvia University of Agriculture, Jelgava (Latvia)) (1995) **[Nitrogen fertilizers and the yield of spring wheat]. Soreiz par slapekla meslojumu un vasaras kviesu razu.** *Latvijas Lauksaimnieks (Latvia) (no.4) p. 8-9.* 2 tables. Latvian. (AGRIS 95-128861).

The growing of spring wheat in Latvia in the period from 1930's to nowadays is discussed. The research on the role of nitrogen fertilizers in raising spring wheat productivity and improving the grain quality was studied in experiments at the LUA teaching and research farm in 1991-1994. The experiments are described, the resulting data are shown in tables.

151 Saadalla, M.M. (Assiut Univ. (Egypt). Faculty of Agriculture) (1994) **Quantification of drought tolerance in spring wheat.** *Alexandria Journal of Agricultural Research (Egypt) v. 39(1) p. 177-195.* 4 tables; 15 ref. English.. (AGRIS 95-128875).

152 Saberi Khabaz, H. (1994) **Determination of appropriate seeding rate for promising barley varieties.** Seed and Plant Improvement Institute, Karaj (Iran Islamic Republic). *Seed and Plant, Journal of Agricultural Research (Iran Islamic Republic) v. 19(1, 2) p. 10-14.* 6 tables. Persian. (AGRIS 95-128915).

In order to determine the appropriate seeding rate for three promising barley varieties named C.63, Reyhane-s, and Arass, and also to study their interaction, an experiment using Split-split plot Design was carried out under rainfed condition at Araghee Mahaleh Research Station for three growing season (1988-91). Results showed that there exists a highly significant difference between varieties, while the seeding rates and interaction of variety x seeding rates were not significant. The same results were reported by Simmons et al., in 1982, studying six barley genotypes over two growing season. Growing season had significant effect on varieties but had no effect on other treatments. As a whole Reyhane-s, with seeding rate of 250/m2, was detected as the best combination. Study of yield components revealed that the increment effect of seed rate on grain yield is adjusted by a decrease in number of seeds/spike, (r=-.85). This result emphasizes the finding of Holliday et al., in 1971, that they also observed a negative correlation between seed rate and number of seeds/spike.

153 Sallam, H.A. (Ministry of Agriculture, Cairo (Egypt). Desert Research Centre) (1992) **Zinc seed-hardening of some wheat cultivars in relation to growth behavior and some biochemical constituents under saline**

conditions. *Annals of Agricultural Science, Moshtohor (Egypt) v. 30(3) p. 1249-1258.* 2 tables; 21 ref. English. (AGRIS 95-149470).

154 Sanjari, A. (1994) **Study of the effect of the yield component on grain yield of wheat cultivars.** Agricultural Research Center, Zanjan (Iran Islamic Republic). *Seed and Plant, Journal of Agricultural Research (Iran Islamic Republic) v. 19(1, 2) p. 15-20.* 5 tables, 15 ref. Persian. (AGRIS 95-128876).

In order to detect yielding varieties of wheat and to determine the effects of yield components on grain yield of this crop, 20 advanced cultivars were studied using a randomized Complete Block Design with four replications for three years starting 1990. During the growing season, all the agronomic cares were taken and serveral important characters such as heading and maturing dates, frost damage, plant height, loading and shattering rates, seed characteristics and harvest index were measured and determined. Simple ANOVA was done on the results of each individual year for some characters including grain and biological yields, plant height and harvest index. The results of the three year for the mentioned characters were analyzed by combined ANOVA. A correlation analysis was also done to determine the role and importance of the yield components and their relations to each other. The results showed that cultivars No.11, with a 5.2 ton/ha of grain and 11.7 ton/ha of biological yield and 45 harvest index was detected as the most cultivar for Zanjan area. It was also found that the grain yield had positive significant correlation with biological yield, 1000 kernel weight and number of seeds per unit area. It showed no significant correlation with plant height and harvest index.

155 Schenke, Holger (1993) **[Cultivation technique of winter wheat in organic farms]. Anbautechnik von Winterweizen im organischen Landbau: Unkrautaufkommen und Ertragsbildung in Abhaengigkeit von mechanischer Unkrautregulierung, Saatgutqualitaet, Standraumzumessung und organischer Duengung.** Rheinische Friedrich-Wilhelm-Univ., Bonn (Germany). Hohe landwirtschaftliche Fakultaet. 51 ill., 39 tables. Bibliography p. 159-174. 176 p. German. (AGRIS 95-149338).

156 Schnellhammer, R. (Hoehere Landbauschule, Rotthalmuenster (Germany)) (1994) **[Careful cultivation of winter barley provides high yields]. Pflanzenbau - Wintergerste belohnt einen sorgfaeltigen Anbau.** *Bayerisches Landwirtschaftliches Wochenblatt (Germany) v. 184(35) p. 24-26.* 1 ill., 7 graphs. German. (AGRIS 95-128911).

157 Shackley, BJ.; Anderson, WK. (1995) **RESPONSES OF WHEAT CULTIVARS TO TIME OF SOWING IN THE SOUTHERN WHEATBELT OF WESTERN AUSTRALIA.** *Australian Journal of Experimental Agriculture. 35(5):579-587.* English. [WESTERN AUSTRALIA DEPT AGR CLIVE ST KATANNING WA 6317 AUSTRALIA].

Experiments were conducted at 4 locations on an east-west transect in the 300-500 mm average annual rainfall zone in the southern wheatbelt of Western Australia, to determine whether promising crossbreds differ from existing wheat cultivars in their response to time of sowing. Nine cultivars and 2 crossbreds were examined at 3 sowing dates each year, ranging from late April to early July 1989, 1990, and 1991. Grain yield, grain quality (protein, hectolitre weight, grain weight, small grain sievings), crop development, and soil and weather variables were measured. The average decrease in grain yield with delay in sowing after early May was 20 kg/ha.day. All existing wheat cultivars and new crossbreds examined produced their highest yields when sown in early May. Yield decline for the crossbreds and cultivars was almost linear after early May; however, the rate of decline could not be entirely predicted from a knowledge of the crossbreds' maturities. Spear, the cultivar with longest maturity, was one of the highest yielding cultivars when sown in early May or June. The yields of the 2 shortest season cultivars, Kulin and Gutha, were only comparable to the yield of Spear when sown in June. Therefore, in the southern wheatbelt of Western Australia, we do not advise retaining a number of cultivars to suit a range of sowing times. The optimum flowering periods over the 3 seasons were 17 September-7 October in the medium rainfall zone of the southern wheatbelt and 3 September-23 September in the low rainfall area at the most easterly location, reflecting the importance of terminal drought. There is still a risk of frost damage to wheat crops in about 1 year in 3 for the periods estimated. Therefore some risk of yield loss from frost damage must be accepted if yields are to be maximised. [References: 21].

158 Shafei, M.; El Siefe, M.; Mohamed, R.N. (Alexandria Univ. (Egypt). Faculty of Agriculture); Shaker, L. (1995) **[The statistical forecasting methods to analyse the yield trends of wheat, maize and rice in Egypt].** *Menoyfiya Journal of Agricultural Research (Egypt) v. 20(1) p. 335-357.* 8 tables; 8 ref. Arabic. (AGRIS 95-128898).

159 Sippel, R. (Technische Univ. Muenchen, Freising (Germany). Lehrstuhl fuer Pflanzenbau und Pflanzenzuechtung); Maidl, F.X.; Fischbeck, G. (1994) **[Effects of crop rotation and soil characteristics on yield formation of cereals, demonstrated in the Tertiary Hilly Country (Bavaria)]. Der Einfluss von Fruchtfolge und Bodenparametern auf die Ertragsbildung von Getreide, dargestellt an einem Landschaftsausschnitt des Tertiaeren Huegellandes.** 38. Jahrestagung der Gesellschaft fuer Pflanzenbauwissenschaften; Halle/Saale (Germany); 29 Sep - 1 Oct 1994. *Mitteilungen der Gesellschaft fuer Pflanzenbauwissenschaften (Germany) v. 7 p. 299-302.* 3 ref. German. (AGRIS 95-129011).

160 Snoo, G.R. de (Centre of Environmental Science, Leiden University, P.O. Box 9518, 2300 RA Leiden (Netherlands)) (1994) **Cost-benefits of unsprayed crop edges in winter wheat, sugar beet and potatoes.** *Field margins: integrating agriculture and conservation. Proceedings of a symposium held at Coventry, UK, 18-20 April 1994. Boatman, N. (ed.) p. 197-202.* British Crop Protection Council (BCPC). 9 ref., BCPC Monograph No. 58. English. (AGRIS 95-149482).

161 Stojanovic, J.; Stojanovic, S.; Ognjanovic, R. (Institut za istrazivanja u poljoprivredi "Srbija", Kragujevac (Yugoslavia). Centar za strna zita) (1994) **[Evaluation of real and potential productivity of some cultivars of wheat]. Ocena stvarne i potencijalne produktivnosti nekih sorata psenice.** *Savremena poljoprivreda (Yugoslavia) v. 42(6) p. 43-47.* 2 tables; 7 ref. Serbian. (AGRIS 95-128882).

Ten wheat varieties and one triticale variety were growing in two vegetation years 1989/90 and 1990/91.The size of all indices investigated was different according to varieties and years. Potential yield of grain from the main stem, which shows the possibilities of plants at sufficient amounts of assimilates in the period of filling of grain, was higher than the yield of grain per plant, except in varieties with higher rate of clustering. The biggest reaction on the corrected nutrition by assimilates was obtained in triticale Kg 20. On average for all varieties the number of grains per plant and potential number of grains per ear varied more according to years than the weight of individual grains.

162 Stolcova, M. (Institut Vychovy a Vzdelavani Ministerstva Zemedelstvi, Prague (Czech Republic)) (1994) **[Growing of triticale]. Zaklady pestovani tritikale.** Institut Vychovy a Vzdelavani Ministerstva Zemedelstvi CR. 3 ill., 9 tables; 9 ref. 39 p. Czech. (AGRIS 95-149322).

163 Svensson, H.; Stadig, H.; Ohlander, L. (1994) **[Preceeding crops to peas]. Foerfrukter till aerter. Redovisning av resultaten foer skoerden, kemiska analyser och besiktningar fraan de enskilda platserna i foersoeksserierna R4-3301 och R4-3302.** *Interna Publikationer - Sveriges Lantbruksuniversitet, Institutionen foer Vaextodlingslaera (Sweden); no. 11 57 p.* Swedish. (AGRIS 95-129429).

164 Thiel, W. (Landwirtschaftskammer Weser Ems, Oldenburg (Germany)); Lueschen, G. (1994) **[Cultivar testing results of winter wheats for the Weser Ems region (Germany)]. Sortenpruefungen Winterweizen - Die Ertraege litten unter Witterungsbedingungen.** *Landwirtschaftsblatt Weser-Ems (Germany) v. 141(35) p. 22-26.* 4 tables. German. (AGRIS 95-129012).

165 Tkac, J. (Vyskumny Ustav Zavlahoveho Hospodarstva, Bratislava (Slovak Republic)) (1994) **[Some knowledge from long-term irrigation of main agricultural crops under heterogenous conditions in the Vychodoslovenska nizina Lowland, Slovakia]. Niektore poznatky z dlhodobeho zavlazovania hlavnych polnohospodarskych plodin v heterogennych podmienkach Vychodoslovenskej niziny, Slovensko.** Possibilities of Irrigation Efficiency Incresing; Bratislava (Slovak Republic); 7-8 Jun 1994. *Possibilities of increasing irrigation efficiency. Proceedings from international conference. Vyskumny Ustav Zavlahoveho Hospodarstva, Bratislava (Slovak Republic); Vysoka Skola Polnohospodarska, Nitra (Slovak Republic)* p. 46-49. VUZH. 8 ref. Slovak. (AGRIS 95-149474).

From the stated survey one may consider that the soil water deficit in corn maize and sugar beet, especially during periods demanding on water, shoud fluctuate in the range of levels between 60-70 % of available water capacity and shoud not fall under the limit of 40 % of available water capacity. In most cases this applies also to other irrigated crops (stubble mixtures and catch crops). Perennial fodder crops and grasses are among the crops most demanding on water. The irrigation season of these crops keeps on during the whole growing season. It turned out that winter wheat on heavy soils responded to irrigation water especially on those fields where subsoil ploughing into the depth of 0.50 m was carried out before the actual soil cultivation (disc harrowing) after harvesting the previous crop. In the case of winter wheat, irrigation depth of 90-100 mm generally must be taken into account, and when necessary, also the application of pre-vegetational irrigation is recommendable.

166 Tumba Zevallos, J. (Instituto Nacional de Investigacion Agraria, Moquegua (Peru). Programa de Investigacion en Cultivos Andinos) (1993) **[Cultivation of inca wheat (Amaranthus caudatus L.)]. Cultivo de la kiwicha (Amaranthus caudatus L.).** Instituto Nacional de Investigacion Agraria, Lima (Peru). Direccion General de Investigacion Agraria; Proyecto Transformacion de la Tecnologia Agropecuaria (TTA), Lima (Peru). *Serie Plegable - Instituto Nacional de Investigacion Agraria (Peru); no. 2 v. 1.* INIA. Aprox. 5 p. Spanish. (AGRIS 95-129025).

167 Vaghasia, P.M.; Patel, P.G. (Gujarat Agricultural University, Navsari (India). Dept. of Agronomy) (1993) **Response of wheat to date of sowing and nitrogen.** *Gujarat Agricultural University Research Journal (India) v. 19(1) p. 131-132.* 1 table; 3 ref. English. (AGRIS 95-149471).

168 Vajeika, A. (Plant breeding Experimental Station, Priekuli (Latvia)); Abolins, M. (Latvia University of Agriculture, Jelgava (Latvia)) (1995) **[Hybrid of rye and wheat - triticale]. Tritikale - rudzu un kviesu krustojums.** *Latvijas Lauksaimnieks (Latvia) (no.8) p. 7-8.* Latvian. (AGRIS 95-149444).

169 Valdivia P, R.; Gomez P, L. (Universidad Nacional Agraria La Molina, Lima (Peru). Facultad de Agronomia) (1993) **[Trial with regard to sowing time and levels of fertilization in six winter wheat genotypes]. Ensayo de epoca de siembra y niveles de fertilizacion en seis genotipos de trigo invernal.** *[Summary of investigations supported by FUNDEAGRO [Foundation for the Development of Agriculture] 1988-1992]. Resumen de investigaciones apoyadas por FUNDEAGRO [Fundacion para el Desarrollo del Agro] 1988-1992. Quevedo Iturri, F.; Arroyo Vergara, R. (eds.). Proyecto Transformacion de la Tecnologia Agropecuaria (TTA), Lima (Peru). Fondo para el Aumento de Oportunidades de Investigacion; Fundacion para el Desarrollo del Agro, Lima (Peru) v. 1: p. 165-166.* Spanish. (AGRIS 95-128999).

170 Vedzyaneew, A.M.; Dzeeva, V.P. (Akadehmiya Navuk Belarusi, Minsk (Belarus). Instytut Ehksperymental'naj Bataniki) (1994) **[Intake, distribution and metabolism of growth regulator "quartazine" in sprouts of two barley varieties different in sensitivity to the preparation]. Paglynanne, razmerkavanne i metabalizm rehgulyatara rostu kvartazinu w prarostkakh dvukh sartow yachmenyu, yakiya adroznivayutstsa pa chullivastsi da prehparata.** *Vestsi Akadehmii Navuk Belarusi. Seryya Biyalagichnykh Navuk (Belarus) (no.4) p. 20-25.* 2 tables, 3 figures, 8 ref. Byelo Russian. (AGRIS 95-149375).

The quartazine uptake, distribution and metabolism in barley sprouts of two varieties were studied. The varieties differed only in the rate of uptake and metabolism. Quartazine decomposition started after 48 hours irrespective of the variety. This process was accompanied by the formation of non-toxic metabolites which were the components of nitrogen and carbohydrate metabolism or were involved in the process.

171 Volpe, A. (1995) **[Low environmental impact, trials on soft wheat]. Basso impatto ambientale, prove sul grano tenero.** *Terra e Vita (Italy) v. 36(7) p. 37-40.* 7 tables; 3 graphs. Italian. (AGRIS 95-129018).

172 Voznyakovskaya, Yu.M.; Kurdyukov, Yu.F.; Popova, Zh.P.; Loshchinina, L.P. (1994) **[Biological assessment of crops preceding the summer wheat as regulators of soil fertility in dry areas of the Volga region [Russian Federation]]. Biologicheskaya otsenka predshestvennikov yarovoj pshenitsy kak regulyatorov pochvennogo plodorodiya zasushlivoj zony Povolzh'ya.** *Pochvovedenie (Russian Federation) (no.1) p. 70-74.* 7 ref. Russian. (AGRIS 95-149472).

Soil microbiological conditions prove to be unfavourable in wheat dominated rotation as its residues are weakly assimilated by microorganisms. The increased proportion in rotations of crops, which produce residues enhancing biological processes and thus increasing soil fertility is desirable.

173 Xu Lihua; Li Daqing; Yang Deyin (Jiangsu Provincial Academy of Agricultural Sciences, Nanjing (China). Inst. of Industrial Crops) (1994) **Chemical control technique of direct sowing short-term cotton following wheat.** *Jiangsu Agricultural Sciences (China) (no.4) p. 20-22.* 5 tables; 2 ill. Chinese. (AGRIS 95-129158).

174 Zhang Xijin; Chen Jingui; Zhou Xie (Nanjing Agricultural Univ. (China). Dept. of Agronomy) (1994) **An analysis of hormone-balance as an effect of PP333: dwarfing and delaying senescence of leaves in wheat seedlings.** *Journal of Nanjing Agricultural University (China) v. 17(3) p. 53-59.* 2 tables; 7 ill., 12 ref. Chinese. (AGRIS 95-129005).

175 Zhivotkova, L.O.; Byryukova, S.B. (eds.); Babayanets, L.T. (1993) **[Winter cereal crops]. Ozymi zernovi kultury.** Urozhai. 288 p. Ukrainian. (AGRIS 95-149368).

The results of a longterm scientific research propgramme in selection, seed breeding, immunity, plant physiology, quality of the crops, as well as the intensive technology of saving resources for winter cereals crop production are discussed.

176 Zimmermann, H. (1995) **[Malting barley 1995 - under which star?]. Braugerste 1995 unter welchem Stern?** *Brauwelt (Germany) v. 135(10-11) p. 527-529.* 4 tables. German. (AGRIS 95-128905).

F02 PLANT PROPAGATION

177 Aziz, A.N. (Quaid i Azam Univ., Islamabad (Pakistan). Dept. of Biological Sciences); Rashid, H. (National Agricultural Research Centre, Islamabad (Pakistan). Tissue Culture Lab.); Sultana, K.; Quraishi, A. (1994) **Heat shock proteins in embryogenic calli of wheat.** *Pakistan Journal of Agricultural Research (Pakistan) v. 15(1) p. 83-88.* 2 plates, 24 ref. English. (AGRIS 95-150140).

178 Bains, NS.; Singh, J.; Gosal, SS. (1995) **PRODUCTION OF WHEAT HAPLOIDS THROUGH EMBRYO RESCUE FROM WHEAT X MAIZE CROSSES.** *Current Science. 69(7):621-623.* English. [PUNJAB AGR UNIV DEPT PLANT BREEDING LUDHIANA 141004 PUNJAB INDIA].

Appropriate hormone treatment using 2, 4-D and gibberellic acid led to a high frequency (34.17%) of embryo formation in crosses of field-grown wheat strains with maize. Twenty-five days after culture on MS medium supplemented with casein (2000 mg/l) and amino acids, 30.95% of the embryos showed plant formation, 44.05% resulted in callus-like structures and the remaining failed to respond. The haploid nature of some of the regenerated plants was confirmed cytologically. Implications for wheat breeding are discussed. [References: 4].

179 Bohorova, NE.; Vanginkel, M.; Rajaram, S.; Hoisington, DA. (1995) **TISSUE CULTURE RESPONSE OF CIMMYT ELITE BREAD WHEAT CULTIVARS AND EVALUATION OF REGENERATED PLANTS.** *Cereal Research Communications. 23(3):243-249.* English. [CIMMYT APDO POSTAL 6-641 MEXICO CITY 06600 DF MEXICO].

Six elite CIMMYT bread wheat genotypes Pavon 76, Seri M82, Opata M85, Mochis T88, Baviacora M93, and the advanced line Attila were evaluated for their response to in vitro tissue culture. Donor plants were grown at El Batan and CIANO experiment stations in Mexico in 1992. Immature embryos, about 1.0 mm in length, were excised and placed scutellum side up on callus initiation media. Basal N6 medium supplemented with dicamba (E1), MS medium containing 2, 4D (E3), or MS medium containing 2, 4D plus different amino acids (E5) was used for callus initiation and maintenance. Plant regeneration and rooting were achieved on basal MS medium with IAA and BAP. Embryogenic calli with regeneration potentials of 10-92% were obtained on E3 and E5 media; each embryo produced 5-50 plants. A total of

800 regenerated plants were transferred to pots in the greenhouse for evaluation and seed production. Of the regenerated plants, 85% were morphologically normal, reached full maturity, and produced seeds. Seeds (R1) of 360 plants regenerated from Mochis T88, Baviacora M93, and Attila were planted in the field. Field observations indicated that embryos cultured on E3 medium resulted in 29% of the progeny producing deviating plants, compared with 21% of those grown on E5 medium. These results will form the basis for future efforts aimed at transforming CIMMYT bread wheat varieties.

180 Bregitzer, P.; Poulson, M.; Jones, BL. (1995) **MALTING QUALITY OF BARLEY LINES DERIVED FROM TISSUE CULTURE.** *Cereal Chemistry. 72(5):433-435.* English. [USDA ARS NATL SMALL GRAINS GERMPLASM RES FACIL POB 307 ABERDEEN, ID 83210 USA].

The occurrence of somaclonal (tissue culture-derived) variation in plants regenerated from tissue culture will influence the efficiency with which techniques such as genetic transformation can be used in the development of new barley cultivars. To assess the effect of somaclonal variation on malting quality, 12 families of tissue culture-derived lines from three barley cultivars were analyzed using standard micromalting techniques. Each family was derived from a single regenerated plant that, in turn, was derived from an immature embryo callus culture. Five to six plants from each family were selected in the R(2) generation based on phenotypic similarity to their uncultured parental controls, and advanced to the R(4) and R(5) generations for replicated field tests. The malting quality of the majority of these lines was altered by passage through tissue culture, and most alterations were undesirable. These results suggest that efforts should be made to delineate in vitro (tissue culture) conditions that are less mutagenic to cultured barley cells. [References: 9].

181 Cho, UH.; Kasha, KJ. (1995) **THE EFFECT OF CALCIUM ON ETHYLENE PRODUCTION AND MICROSPORE-DERIVED EMBRYOGENESIS IN BARLEY (HORDEUM VULGARE L) AND WHEAT (TRITICUM AESTIVUM L) ANTHER CULTURES.** *Journal of Plant Physiology. 146(5-6):677-680.* English. [DONGGUK UNIV DEPT APPL BIOL SEOUL SOUTH KOREA].

The roles of calcium on microspore-derived embryo (embryoid) formation and ethylene production in barley (Hordeum vulgare L. cv. Bruce) and wheat (Triticum aestivum L. cv. Chris) anther cultures were investigated. The inclusion of calcium as CaCl2 in the medium increased embryoid production, at an optimal concentration of 1 mM in barley. The addition of the ionophore A23187 (0.5 mu M) with CaCl2 (1 mM) further improved the embryoid formation in both wheat and barley. Since exogenous calcium and ionophore increased ethylene production measured at culture initiation time, it was suggested that the positive action of free calcium on embryoid formation might be achieved through initial ethylene production and stimulation of tissue senescence. [References: 16].

182 Chung, D.H. (Rural Development Administration, Muan (Korea Republic). Crop Experiment Station, Mokpo Branch); Min, K.S. (Chonnam National University, Kwangju (Korea Republic). College of Agriculture); Chun, J.U. (Sunchon National University, Sunchon (Korea Republic). College of Agriculture) (1994) **Authentication of barley haploids in H. vulgare through pollination with H. bulbosum.** *Korean Journal of Breeding (Korea Republic) v. 26(3) p. 254-259.* 4 illus.; 2 tables; 22 ref. Korean. (AGRIS 95-129841).

183 Cistue, L.; Ziauddin, A.; Simion, E.; Kasha, KJ. (1995) **EFFECTS OF CULTURE CONDITIONS ON ISOLATED MICROSPORE RESPONSE OF BARLEY CULTIVAR IGRI.** *Plant Cell Tissue & Organ Culture. 42(2):163-169.* English. [CSIC ESTAC EXPTL AULA DEI DEPT GENET & PROD VEGETAL APARTADO 202 ZARAGOZA SPAIN].

Pretreatment of anthers in mannitol prior to isolation of microspores by glass rod homogenization was effective for in vitro induction of embryogenesis in barley cv. Igri. A procedure for separation of viable microspores using centrifugation on 20% maltose was developed. The concentration of microspores was important and greatly increased the number of developing structures. Initial culture of microspores on FHG medium containing 62 g 1(-1) maltose, 4.4 mu M (1 mg 1(-1)) BA and 200 g 1(-1) Ficoll-400 resulted in high frequencies of plant regeneration. Albino plant frequency was correlated to length of time in culture. Stock plant condition appeared to be a major factor influencing induction frequency. From 668 to 1738 green plants per 100 anthers were produced. The number of calli and embryos obtained and the number of green plantlets regenerated were improved by increasing the Ficoll concentration from 100 g 1(-1) to 400 g 1(-1) during the culture period compared to continuous culture on FHG Ficoll 200 g 1(-1). [References: 26].

184 Dellaquila, A.; Dituri, M. (1995) **DETERIORATION OF WHEAT SEEDS UNDER SUBFREEZING TEMPERATURES AND RELATED PROTEIN SYNTHESIS IN GERMINATING EMBRYOS.** *Seed Science & Technology. 23(2):551-561.* English. [CNR INST GERMPLASM I-70126 BARI ITALY].

Wheat seeds (Triticum durum Desf. cv Venusia) were adjusted to moisture contents of 17.7, 20 and 23% and kept at temperatures of 5, 40, -20, -50 and -80 degrees C for 7 days. Seeds aged at 40 degrees C were damaged progressively with increasing moisture content and storage time, but subfreezing temperature treatment caused loss of germination only in seeds containing 23% moisture. Timing of germination onset, abnormal seedling percentage and seed leakage measurements confirmed that differential loss of vigour occurred under different combinations of storage factors. A decrease of 'in vivo' protein synthesis rate in imbibing embryos and quantitative changes of soluble [S-35] methionine labelled proteins, synthesized during the radicle emergence phase, showed that normal protein synthesis patterns were differently impaired. Subfreezing temperatures prevented deterioration effects in embryos of 17.7 and 20% moisture content. However, al a moisture content of 23% marked changes in specific polypeptides occurred as the temperature was lowered from -20 to -80 degrees C. The tolerance of seeds to storage under extreme environmental conditions could be monitored by certain 'germination specific' proteins, whose changes during the radicle emergence phase reflect the damaging of biosynthetic activities.

185 Frederiksen, S.; Bothmer, R. von (1995) **Intergeneric hybridizations with Eremopyrum (Poaceae) [Eremopyrum triticeum, Eremopyrum orientale, Dasypyrum, Psathyrostachus, Taeniatherum, chromosome pairing].** *Nordic Journal of Botany (Denmark) v. 15(1) p. 39-47.* 3 ill., 30 ref. English. (AGRIS 95-129983).

186 Gustafson, VD.; Baenziger, PS.; Wright, MS.; Stroup, WW.; Yen, Y. (1995) **ISOLATED WHEAT MICROSPORE CULTURE.** *Plant Cell Tissue & Organ Culture. 42(2):207-213.* English. [UNIV MINNESOTA DEPT AGRON . PLANT GENET ST PAUL, MN 55108 USA].

The use of doubled haploid plants in a wheat breeding program requires an efficient haploid production system. While the techniques for producing doubled haploids from anther culture are well established, those for isolated microspores are complicated and inefficient. Four methods of isolating microspores from anthers (blending, stirring, macerating, and floating) were compared. Isolated microspores were washed and cultured in liquid medium. The effects of pre-isolation mannitol conditioning, cell density, culture dilution, and sucrose centrifugation on microspore viability were evaluated. Isolation by blending gave the highest initial microspore viability (75%). Mannitol conditioning and purification by sucrose centrifugation had a detrimental effect on initial viability. An initial microspore density of 2 x 10(5) microspores per ml was necessary for continued microspore viability. One hundred and nine haploid or spontaneously doubled haploid plants were regenerated from microspores isolated without mannitol conditioning using the blending method. Based on this research, blender isolation with an initial density of 2 x 10(5) microspores per ml is recommended for isolated microspore culture. [References: 31].

187 He, D.G.; Yang, Y.M.; Scott, K.J. (Queensland Univ., St Lucia (Australia). Dept. of Biochemistry) (1992) **Plant regeneration from suspension cultures and protoplasts of durum wheat. [Conference paper].** Abstracts of the Australian Society of Plant Physiologists (Australia) p. P4. Australian Society of Plant Physiologists. p. P4. English. (AGRIS 95-129850).

188 Karimzadeh, G.; Kovacs, G.; Barnabas, B. (1995) **EFFECTS OF COLD TREATMENT AND DIFFERENT CULTURE MEDIA ON THE ANDROGENIC CAPACITY OF TWO WINTER WHEAT GENOTYPES.** *Cereal Research Communications. 23(3):223-227.* English. [UNIV WALES COLL CARDIFF POB 915 CARDIFF CF1 3TL S GLAM WALES].

Cold treatment and three various solidified culture media were studied for their effects on callus induction, embryoid formation and plant regeneration capacity in anther culture of two winter wheat genotypes Mv 06-83 and Mv 15. Generally, cold treatment inhibited the anther response and callus productivity. It had no effect on or slightly decreased, the androgenic response and ultimate plant regeneration frequencies. Of the two genotypes tested Mv 06-83 had better induction capacity, but in plant regeneration Mv 15 was better. W-14 culture medium appeared to be practical for plant regeneration and gave good anther induction percentage compared to the others tested. Consequently, the effectiveness of the anther culture technique can be improved by utilizing the optimal culture medium in conjunction with classical cross breeding methods combining notably responsive genotypes with cultivars of high green plant regeneration capacity.

189 Khan, N.; Hussain, M.; Khan, G.S.; Ghafoor, A. (Ayub Agricultural Research Inst., Faisalabad (Pakistan). Agriculture Biotechnology Research Inst.) (1994) **Application of tissue culture techniques for wheat improvement.** *Pakistan Journal of Agricultural Research (Pakistan) v. 15(1) p. 167-175.* 4 tables, *28* ref. English. (AGRIS 95-150145).

190 Kim, B.Y. (Taegu University, Kyungsan (Korea Republic). College of Agriculture) (1994) **Early selection and propagation of embryogenic callus using electrophoretic characteristics of barley callus.** *Korean Journal of Breeding (Korea Republic) v. 26(4) p. 319-327.* 3 illus.; 2 tables; 19 ref. English. (AGRIS 95-129842).

191 Krautwig, B.; Lorz, H. (1995) **CEREAL PROTOPLASTS [Review].** *Plant Science. 111(1):1-10.* English. [INST ALLGEMEINE BOT AMP 2 OHNHORSTSTR 18 D-22609 HAMBURG GERMANY].

In cereals for a long time regenerable protoplasts could be isolated from embryogenic suspension lines, initiated from callus cultures of immature zygotic embryos or microspores. Up to now they still represent the main source for totipotent protoplasts and meanwhile it is possible to obtain protoplast-derived transgenic plants. Since suspension cultures are difficult to handle and regeneration capacity is restrained by somaclonal variation, research has focused on methods for protoplast isolation and culture circumventing long in vitro culture periods. Recently, culture systems with a reduced in vitro phase prior protoplast isolation have been developed providing totipotent protoplasts. Successful protoplast regeneration could be demonstrated from selected primary callus cultures of somatic and androgenic cell origin. A further step avoiding a previous callus culture was achieved by the direct isolation of embryogenic protoplasts from microspore cultures and mesophyll protoplasts from leaf tissue of seedlings. With the regeneration of protoplasts of in vivo and in vitro produced zygotes today the spectrum of protoplasts able to regenerate has been extended. Furthermore, these systems allow the regeneration of plants with somatic, androgenetic or zygotic background. In this article we will give an overview on the difficult explant sources and protoplast systems and their application in biotechnology. [References: 87].

192 Kumlehn, J.; Nitzsche, W. (1995) **PLANT REGENERATION FROM ISOLATED OVULES OF ITALIAN RYEGRASS (LOLIUM MULTIFLORUM LAM) - EFFECT OF 2, 4-DICHLOROPHENOXYACETIC ACID AND DIFFERENT CYTOKININS SUPPLEMENTED TO THE OVULE CULTURE MEDIUM.** *Plant Science. 111(1):107-116.* English. [UNIV HAMBURG INST ALLGEMEINE BOT OHNHORSTSTR 18 D-22609 HAMBURG GERMANY].

Plantlet regeneration was obtained from culture of Lolium multiflorum ovules, excised 3 days post pollination. The response of ovules was investigated at various concentrations of 2, 4-dichlorophenoxyacetic acid (2, 4-D) and of several cytokinins supplemented to the ovule culture medium. A concentration of 0.2 mg 1(-1) 2, 4-D stimulated regeneration via direct zygotic and/or secondary somatic embryogenesis, depending on genotype. Kinetin at a range of 0.04-1 mg 1(-1) was shown to be a generally suitable cytokinin in both tested genotypes. However, highest frequencies of plantlet regeneration per number of cultivated ovules were recorded at 0.2 mg 2, 4-D combined with 1 mg zeatin or 0.2 mg benzyladenine per liter medium depending on genotype and resulted in 43.5 and 57.8% plantlet regeneration, respectively, A high frequency regeneration procedure for isolated ovules is desirable for further experiments to overcome postzygotic crossing barriers and for the development of genetic manipulation techniques. [References: 26].

193 Li Xuemei; Liu Rongshan (Sichuan Agricultural Univ., Yaan (China)) (1994) **Effect of endogenous hormones on induction and differentiation of the embryonic calli of wheat young inflorescences.** *Plant Physiology Communications (China) v. 30(4) p. 255-260.* 5 tables; 2 ill., 13 ref. Chinese. (AGRIS 95-129848).

194 Liu Siheng (Fujian Agricultural Univ., Fuzhou (China). Dept. of Agronomy) (1994) **Preliminary study on the isolated culture of wheat young ear.** *Fujian Science and Technology of Rice and Wheat (China) (no. 4) p. 39-42.* 3 tables. Chinese. (AGRIS 95-129837).

195 Luckett, DJ.; Smithard, RA. (1995) **A COMPARISON OF SEVERAL PUBLISHED METHODS FOR BARLEY ANTHER CULTURE.** *Plant Cell Reports. 14(12):763-767.* English. [NSW AGR INST AGR RES PRIVATE MAIL BAG WAGGA WAGGA NSW 2650 AUSTRALIA].

A number of methods have been published for barley (Hordeum vulgare L.) anther culture and have gained acceptance in different laboratories. The breeder's requirement is for a compromise method that gives good, repeatable results for a wide range of genotypes. Yet the routine production of spontaneously doubled haploid green regenerants remains difficult. Despite attempts to formulate a widely-applicable anther culture method, the 4 main published methods, compared here with one modified procedure, are quite distinct for a number of important characteristics. The methods interacted strongly with the 3 genotypes, and response ranged from zero to 28 green regenerants per 100 anthers plated. The current methods still require often substantial modification to suit local situations in order that the technology may be exploited by barley breeders. [References: 24].

196 Luckett, DJ.; Smithard, RA. (1995) **BARLEY ANTHER CULTURE USING MEMBRANE RAFTS.** *Plant Cell Tissue & Organ Culture. 42(3):287-290.* English. [NEW S WALES AGR & FISHERIES AGR RES INST PRIVATE MAIL BAG WAGGA WAGGA NSW 2650 AUSTRALIA].

When compared to agarose solidified media in small petri dishes, membrane rafts used in conjunction with liquid induction media significantly improved anther culture response in the Australian, malting-quality, spring barley cultivar Clipper. In contrast, the German cultivar Gimpel did not show an increased response on rafts. [References: 8].

197 Mohmand, A.S. (National Agricultural Research Centre, Islamabad (Pakistan)) (1994) **Induced variability for some agronomic and morphological characters in wheat.** *Pakistan Journal of Agricultural Research (Pakistan) v. 15(1) p. 100-107.* 5 plates, 3 tables, 19 ref. English. (AGRIS 95-150143).

198 Park, K.G.; Kang, Y.S. (Rural Development Administration, Suwon (Korea Republic). Crop Experiment Station); Choi, J.Y.; Yoon, K.M. (Kangwon National University, Chuncheon (Korea Republic)) (1994) **Morphological indicator for optimal stage of microspore in triticale anther culture.** *Korean Journal of Breeding (Korea Republic) v. 26(3) p. 271-275.* 2 illus.; 4 tables; 12 ref. Korean. (AGRIS 95-129835).

199 Rashid, H. (National Agricultural Research Centre, Islamabad (Pakistan). Tissue Culture Lab.); Hameed, S. (National Agricultural Research Centre, Islamabad (Pakistan). Plant Virology Lab.); Chaudhry, Z.; Tahir, F.; Quraishi, A. (1994) **Quantitative proteins from embryogenic and non-embryogenic wheat calli.** *Pakistan Journal of Agricultural Research (Pakistan) v. 15(1) p. 97-99.* 1 ill., 11 ref. English. (AGRIS 95-150142).

200 Rashid, H.; Quraishi, A. (National Agricultural Research Centre, Islamabad (Pakistan). Tissue Culture Lab.) (1994) **Biodiversity in wheat using tissue culture technologies.** *Pakistan Journal of Agricultural Research (Pakistan) v. 15(1) p. 78-82.* 4 plates, 16 ref. English. (AGRIS 95-150139).

201 Saeed, N.A.; Chowdhry, M.A. (University of Agriculture, Faisalabad (Pakistan). Dept. of Plant Breeding and Genetics); Khan, I.A. (1994) **Induction of callus and organogenesis in bread wheat through anther culture.** *Pakistan Journal of Agricultural Research (Pakistan) v. 15(1) p. 108-114.* 3 tables, 20 ref. English. (AGRIS 95-150144).

202 Schenk, G.K.; Luckett, D.J. (New South Wales Agriculture, Wagga Wagga (Australia). Agricultural Research Inst.) (1992) **Wheat anther culture using F2 donor plants from three-way breeding crosses selected for grain hardness and disease resistance. [Conference paper].** Abstracts of the Australian Society of Plant Physiologists (Australia) p. P5. Australian Society of Plant Physiologists. p. P5. English. (AGRIS 95-129836).

203 Sharma, KD.; Singh, BM.; Chauhan, RS. (1995) **AN IMPROVED MEDIUM FOR IN VITRO GRAIN DEVELOPMENT FROM DETACHED WHEAT SPIKELETS.** *Plant Cell Tissue & Organ Culture. 42(3):227-231.* English. [HPKV CTR BIOTECHNOL PALAMPUR 176062 HIMACHAL PRADES INDIA].

Wheat spikelets detached from the spike at anthesis were cultured on solidified media and successfully produced mature grains. These grains resembled normal grains and contained well-developed, embryos. Lower concentrations of glutamine favored dry weight increase in developing grains. Such grains were indistinguishable from grains from greenhouse-grown plants in germination on moist blotting sheets. The technique of individual spikelet culture can be used to study physiology and development of wheat grains and kernels and to study host-pathogen interactions in wheat floret diseases such as Karnal bunt. [References: 7].

204 Tahir, F.; Rashid, H.; Quraishi, A. (National Agricultural Research Centre, Islamabad (Pakistan). Tissue Culture Lab.) (1994) **Biochemical studies in stressed cultures (sodium chloride) of wheat.** *Pakistan Journal of Agricultural Research (Pakistan) v. 15(1) p. 89-96.* 3 ills., 47 ref. English. (AGRIS 95-150141).

205 Wang Yafu; Cui Kairong; Wang Lihong (Lanzhou Univ., Gansu (China). Dept. of Biology) (1994) **Ultrastructural studies of somatic embryogenesis in wheat.** *Acta Botanica Sinica (China) v. 36(6) p. 418-422.* 23 ill., 16 ref. Chinese. (AGRIS 95-129849).

F03 SEED PRODUCTION

206 **Seed unit annual report for 1994** (1995) International Center for Agricultural Research in the Dry Areas, Aleppo (Syria). ICARDA. 38 tables; 2 fig. 44 p. ICARDA--023. English. (AGRIS 95-150366).

Activities of the Seed Unit to assist national programs in West Asia and North Africa to strengthen their seed capabilities by training regional seed production staff; building up seed production infrastructure in the countries of the region; making available limited quantities of high quality seed of new varieties of cereals, food legumes and forages for national programs; dissemination of information; and carrying out regional seed technology research are reported. Research results of the evaluation of seed vigor in lentil, seed surveys in Syria, Ethiopia, and Jordan are presented. WANA seed directory of names of government and private sector seed production and processing programs and companies in Cyprus is also included.

207 Atta, M.I. (Ministry of Agriculture, Cairo (Egypt). Field Crops. Research Inst.) (1994) **Effect of seed size on yield and some of its components in wheat (Triticum aestivum L.).** *Journal of Agricultural Science, Mansoura Univ. (Egypt) v. 19(8) p. 2519-2532.* 1 ill. 5 tables; 32 ref. English. (AGRIS 95-130078).

208 Hewett, PD.; Suett, DL. (1995) **EVENNESS OF COMMERCIALLY-APPLIED FERRAX SEED TREATMENT ON WINTER BARLEY.** *Seed Science & Technology. 23(2):455-467.* English. [126 THORNTON RD CAMBRIDGE CB3 OND ENGLAND].

Lots of seed barley (Hordeum vulgare L.) commercially treated with 'Ferrax' flowable concentrate were sampled as close to the point of application as practicable from fourteen seed treatment machines of five types and from sacks on pallets. Loss of formulation due to handling was avoided; the general sampling incidence was one from each 500 kg. Eight hundred and fifty samples were analysed by HPLC for ethirimol (label application rate 2000 mg/kg). The combined sampling and analytical variation was found from pairs of 'at machine' samples taken simultaneously; the mean differences were usually below 100 mg/kg with maximum differences mostly around 200 mg/kg. When differences between successive samples during a run were calculated these values were nearly doubled. Despite the variety of machines and sites from which samplings were obtained it was usual for 90% or more of results to be within +/- 10% of the relevant mean. Variation for 'on pallet' samplings was rather wider but the values obtained for mean loadings proved to be very similar. It was concluded that procedures similar to those in the Rules of the International Seed Testing Association might be used to obtain representative samples. It is suggested that a sampling incidence of one from each 1000 kg is suitable for seed lots of small-grain cereals of 5 000-10 000 kg. Fewer than half the samplings gave mean loadings above 1750 mg/kg ethirimol; poor calibration and maintenance seem likely to be the causes of flow loadings as the evenness of application was similar, despite the various machines and sites sampled.

209 Hofmann, P.; Steiner, A.M. (Institute of Plant Breeding, Seed Science and Population Genetics, University of Hohenheim, 70593 Stuttgart (Germany)) (1994) **Seed quality as cause for differences in longevity behaviour after seed pretreatment in wheat (Triticum aestivum L.).** *Seed Science Research (United Kingdom) v. 4(3) p. 323-328.* 38 ref. English. (AGRIS 95-130076).

210 Mask, P.L. (Auburn University, AL.); Ball, D.M.; Moss, B.R. (1994) **Wheat silage production guide.** *Circular ANR (USA); no. 528 4 p.* In the subseries: Agronomy. English. (AGRIS 95-150319).

211 Mihaljev, I. (Institut za ratarstvo i povrtarstvo, Novi Sad (Yugoslavia)); Savic, S.; Damljanovic, S.; Cobanovic, M. (1995) **[Basic and commercial seed production of the Novi Sad wheat and barley cultivars [Yugoslavia]]. Zasnivanje izvornih kategorija i komercijalno semenarstvo novosadskih sorti psenice i jecma [Jugoslavia].** 29. seminar agronoma; Vrnjacka Banja (Yugoslavia); 30 Jan - 4 Feb 1995. *Zbornik radova - Poljoprivredni fakultet u Novom Sadu, Institut za ratarstvo i povrtarstvo (Yugoslavia) (no. 23) p. 191-198.* 1 graph; 5 tables; 5 ref. Serbian. (AGRIS 95-130060).

The basic seed categories of Novi Sad (Yugoslav) wheat and barley cultivars (breeders seed, super elite and elite) are produced at the Institute field and firmly controlled by breeders which created cultivars. The original and first reproduction categories of seed are produced on the chosen agricultural farms and controlled by breeders experts of the regional agricultural services. The seed sales of Novi Sad wheat cultivar and established seed production of winter cultivars of different seed categories, as well as produced quantities of seed of spring cultivars, satisfied the need of wheat and barley production and have good cultivars structure.

212 Wu Jimin; Liu Shijia; Wei Xizhong (Nanjing Agricultural Univ. (China). Dept. of Agronomy) (1994) **A preliminary report on the results of treating wheat different in kernel colors with GA3 and by isoenzymatic analysis with alpha-amylase.** *Journal of Nanjing Agricultural University (China) v. 17(3) p. 142-144.* 2 tables; 1 ill., 4 ref. Chinese. (AGRIS 95-130077).

F04 FERTILIZING

213 Abd El Haleem, A.K.; Saleh, A.L.; El Faham, S.Y. (National Research Centre, Cairo (Egypt). Field Crops Research Dept.) (1993) **Mineral status of wheat grains as affected by phosphorus and potassium fertilization under different water regimes.** *Annals of Agriculture Science, Moshtohor (Egypt) v. 31(3) p. 1347-1356.* 2 ill. 2 tables; 25 ref. English. (AGRIS 95-130386).

214 Achremowicz, B.; Zajac, J. (Akademia Rolnicza, Lublin (Poland). Katedra Technologii Przemyslu Rolno Spozywczego i Przechowalnictwa); Styk, B. (Akademia Rolnicza, Lublin (Poland). Inst. Szczegolowej Uprawy Roslin) (1993) **[Effect of increased nitrogen fertilization level on technological quality of some spring and winter wheat varieties]. Wplyw podwyzszonego nawozenia azotem na wartosc technologiczna niektorych odmian pszenicy jarej i ozimej.** *Roczniki Nauk Rolniczych. Seria A - Produkcja Roslinna (Poland); Polish Agricultural Annual. Series A - Plant Production v. 110(1-2) p. 149-157.* 4 fig., 4 tables; 12 ref. Polish. (AGRIS 95-130399).

Three winter wheat Gama, Panda and Livilla and three spring wheat Henika, Jara and Kadett varieties were tested based on three levels of the nitrogen fertilization: 50, 100 and 150 kg/ha. Basic physical and chemical properties of grains were determined as well as tentative milling and laboratory baking quality were estimated. It has been proved that the apparent glassiness and the protein content in the grains showed an

increasing tendency. The effect of experimental factors on the flour and bread production proved to be statistically insignificant.

215 Asche, E. (Giessen Univ. (Germany). Inst. fuer Pflanzenernaehrung); Steffens, D.; Mengel, K. (1994) **[Manuring effect and soil structure effects through application of biological waste compost on agricultural areas]. Duengewirkung und Bodenstruktureffekte durch den Einsatz von Bioabfallkompost auf landwirtschaftlichen Kulturflaechen.** VDLUFA-Schriftenreihe (Germany); no. 38 p. 321-324. VDLUFA. 3 ill., 2 tables; 4 ref. p. 321-324. German. (AGRIS 95-150731).

216 Atteia, M.F. (Ministry of Agriculture, Alexandria (Egypt). Plant Protection and Isolation Research Station); Nawar, A.I. (1994) **Rust incidence, grain yield and yield components of wheat as influenced by nitrogen and potassium fertilization.** *Menofiya Journal of Agricultural Research (Egypt) v. 19(6 part 1) p. 2973-2990.* 2 ill. 4 tables; 21 ref. English. (AGRIS 95-130387).

217 Atteia, M.F. (Ministry of Agriculture, Alexandria (Egypt). Plant Protection and Isolation Station); Rehab, I.F. (1994) **Effect of nitrogen and zinc fertilization on rust infection, grain yield and yield components of wheat.** *Menofiya Journal of Agricultural Research (Egypt) v. 19(6 part 1) p. 2991-3007.* 2 ill. 4 tables; 21 ref. English. (AGRIS 95-130388).

218 Baierova, V. (Forschungsinstitut fuer Pflanzenproduktion, Praha (Czech Republic)); Baier, J. (1994) **[Plant nutrition problems in extensive agriculture]. Pflanzenernaehrungsprobleme bei der Extensivierung der Landwirtschaft.** VDLUFA-Schriftenreihe (Germany); no. 38 p. 203-206. VDLUFA. 5 ill.; 1 ref. p. 203-206. German. (AGRIS 95-150517).

219 Bay Schmith C, Catalina; Carvajal P, Carolina (1994) **[Effect of nitrogen fertilizer on yield, yield components and protein content of 10 genotypes of malting barley (Hordeum vulgare L.)]. Efecto de la fertilizacion nitrogenada sobre el rendimiento, componentes del rendimiento y contenido de proteina de 10 genotipos de cebada cervecera (Hordeum vulgare L.).** Universidad Catolica de Chile, Santiago (Chile). Fac. de Agronomia. 46 ref. 117 p. Spanish. (AGRIS 95-150529).

220 Baylis, A.D. (ICI Agrochemicals, Jealott's Hill Research Station, Bracknell, Berks. RG12 6EY (United Kingdom)) (1993) **Developmental differences between winter wheat (Triticum aestivum L.) varieties and the timing of nitrogen fertilizers.** Physiology of varieties; Nottingham (United Kingdom); 6-8 Apr 1993. *Aspects of Applied Biology (United Kingdom) (no.34) p. 193-202.* 11 ref. English. (AGRIS 95-150612).

221 Bednarek, W.; Lipinski, W. (University of Agriculture, Lublin (Poland). Dept. of Agricultural Chemistry) (1994) **Influence of mineral fertilization and liming on phosphorus uptake by spring barley from various soil phosphorus forms.** Zeszyty Problemowe Postepow Nauk Rolniczych (Poland); no. 413 p. 41-46. Instytut Agrofizyki. 3 tables; 13 ref. p. 41-46. English. (AGRIS 95-150537).

It was stated that nitrogen fertilization caused significant increase in aluminium phosphate fraction content and decrease in easily soluble phosphatase fractions. The phosphorus fertilization contributed to the increase of all determined forms of phosphorus, on the other hand potassium fertilizing did not influence in a statistically proved mode the concentration of the examined P forms. The phosphorus uptake by the vegetative parts was significantly and positively dependent on the amount of aluminium phosphate fraction amount in soil and iron phosphate fractions easily soluble by grain.

222 Berner, A.; Scherrer, D.; Niggli, U. (1995) **EFFECT OF DIFFERENT ORGANIC MANURES AND GARDEN WASTE COMPOST ON THE NITRATE DYNAMICS IN SOIL, N UPTAKE AND YIELD OF WINTER WHEAT.** *Biological Agriculture & Horticulture. 11(1-4):289-300.* English. [RES INST ORGAN AGR CH-4104 OBERWIL SWITZERLAND].

The different ratios of organic to inorganic nitrogen of organic fertilizers affect the nitrate dynamics in soil as well as the yield of crops. To examine this, winter wheat was cultivated on loess in Therwil near Basel (Switzerland). The plots were amended with stacked, composted and rotted manure, garden waste compost, slurry or mineral fertilizer (mineral control). In additional treatments, a top dressing with slurry was applied. Nitrate concentration in soil water was measured with ceramic cups. The N uptake of winter wheat was determined at three growing stages: tillering, flowering and at harvest. The nitrate dynamics in soil water were not significantly influenced by the different organic manures. Only the top dressing with slurry led to slightly enhanced nitrate concentration in the soil water. After sowing in autumn and the following winter period, the organically fertilized plots showed the same nitrate concentrations in soil water in 110 cm depth as the minerally fertilized control. This indicates a similar potential of nitrogen losses in all treatments. The different organic manures strongly affected the winter wheat plants both in the rate of N uptake during the growing season and in the growth rate. However, a high potential of the plants to compensate in later growing stages led to comparable yields in all organically manured treatments. The increased yield in the top dressed plots compared to the plots without top dressing was about 7%.

223 Bhatti, J. (1993) **Effect of various sources of nitrogen and phosphorus [DAP, urea, nitrophos, ammonium sulphate and ssp] on the growth yield of two wheat genotypes.** University of Agriculture, Faisalabad (Pakistan). Dept. of Agronomy. UAF. 25 tables, 49 ref. 89 p. English. (AGRIS 95-130395).

224 Cervelli, S.; Digiovanni, F.; Perna, C. (1995) **ANTHRACENE INFLUENCE ON ((NH4)-N-15)(2)SO4 FERTILIZATION OF WHEAT SEEDLINGS.** *Water, Air, & Soil Pollution. 82(3-4):635-643.* English. [CNR INST SOIL CHEM VIA CORRIDONI 78 I-56125 PISA ITALY].

The influence of the addition of anthracene (1 mu g anthracene g(-1) soil) in N transformations following ((NH4)-N-15)(2)SO4 fertilization (200 mg N g(-1) soil) was investigated in wheat pots by quadrupole mass-spectrometry. The dry matter yield at harvesting (after 16 days) was not statistically affected (P=0.05) by anthracene addition. The total amount of N from the fertilizer taken up by wheat seedings in 16 days was 29 and 26.8% of the added N in the absence and in the presence of anthracene, respectively, but the difference was not significantly different at level P = 0.05. In order to investigate more deeply the effect of anthracene on the N cycle in the soil-plant system, the first-order rate constants of N mineralization, N immobilization, nitrification and N plant uptake have been determined according to a N-15 + N-14 soil-plant model. The comparison of the constants showed that organic N mineralization, nitrification and plant uptake proceeded at the same rate, while a small different rate (P = 0.05) was shown by N immobilization. In fact, the N immobilization constant increased from 0.14 +/- 0.012 to 0.21 +/- 0.014 day(-1) as a consequence of anthracene addition. [References: 28].

225 Chen Zhende (Qingdao Municipal Inst. of Agricultural Sciences, Shandong (China)); Zou Qi (1994) **Essence of adaptability of wheat to heavy manuring.** *Soils (China) v. 26(6) p. 284-288.* 5 tables; 10 ref. Chinese. (AGRIS 95-130374).

226 Conry, MJ. (1995) **COMPARISON OF EARLY, NORMAL AND LATE SOWING AT THREE RATES OF NITROGEN ON THE YIELD, GRAIN NITROGEN AND SCREENINGS CONTENT OF BLENHEIM SPRING MALTING BARLEY IN IRELAND.** *Journal of Agricultural Science. 125(Part 2):183-188.* English. [OAK PK RES CTR CARLOW IRELAND].

Nine experiments were carried out on three different soil types in the south-east of Ireland over three years (1989, 1992 and 1993) to test the effect of early, normal and late sowing at three rates of fertilizer nitrogen (100, 125, 150 kg/ha) on the yield and grain quality ex-farm of spring malting barley (cv. Blenheim). Early sowing (January or February) was not possible in 1990 and 1991 due to wet weather. Sowing date had a pronounced effect on grain yield and grain N content in all three years. In 1989 and 1992, the earliest-sown barley (January or February) gave significantly greater yields than later-sown crops (March and April) in five of the six experiments. The earliest-sown barley gave the lowest grain N in all six experiments and there was a gradual and significant increase in grain N content as sowing date was delayed. In 1993 the earliest-sown barley (February) gave significantly lower yield and greater grain N than the March-sown crop in all three experiments. The lower yield of the February-sown barley in 1993 was due to the significantly reduced number of grains/ear. The April-sown barley gave significantly lower yield and greater grain N than the earlier-sown crops in eight out of the nine experiments. In 1989 and 1992 only one of the six

experiments, Ferns 1992, gave a significant yield response to increased rate of N (125 kg/ha). But in 1993, 125 kg N/ha significantly increased grain yield in all three experiments and 150 kg N/ha gave a further significant increase in yield in two of the experiments. Increasing increments of fertilizer N significantly increased grain N in all nine experiments. [References: 16].

227 Dhillon, K.S.; Chhibba, I.M.; Dhillon, S.K.; Nayyar, V.K. (Punjab Agricultural University, Ludhiana (India). Department of Soils) (1994) **Utilization of zinc by wheat and maize as influenced by different levels of applied phosphorus in soil.** *Journal of Nuclear Agriculture and Biology (India) v. 23(4) p. 233-237.* 1 table; 2 ill., 10 ref. English. (AGRIS 95-130392).

228 Diepolder, M. (Technische Univ. Muenchen, Freising (Germany). Lehrstuhl fuer Pflanzenbau und Pflanzenzuechtung); Maidl, F.X.; Fischbeck, G. (1994) **[Investigations on derivative guidelines to optimize nitrogen fertiliser application in winter wheats]. Untersuchungen zur Ableitung von Richtlinien fuer die Optimierung der N-Duengung von Winterweizen.** 38. Jahrestagung der Gesellschaft fuer Pflanzenbauwissenschaften; Halle/Saale (Germany); 29 Sep - 01 Oct 1994. *Mitteilungen der Gesellschaft fuer Pflanzenbauwissenschaften (Germany) v. 7 p. 59-62.* 3 tables; 4 ref. German. (AGRIS 95-130376).

229 Domska, D.; Anchim, W.; Bobrzecka, D.; Procyk, Z. (Akademia Rolniczo Techniczna, Olsztyn (Poland). Katedra Chemii Rolnej) (1994) **[Effect of nitrogen and copper fertilization on yield, protein content and amino acids composition of wheat protein]. Wplyw nawozenia azotem i miedzia na plon, zawartosc i sklad aminokwasowy bialka ziarna pszenicy ozimej.** *Fragmenta Agronomica (Poland) v. 11(3) p. 46-54.* 5 tables; 11 ref. Polish. (AGRIS 95-150623).

The high grain and protein yield of wheat fertilized to soil with 125 kg N/ha and 5 kg Cu/ha was recorded. However, this fertilization caused unprofitable changes in protein composition. Foliar fertilization with copper was more profitable than soil fertilization because it increased the effectiveness of lower nitrogen dose (100 kg N/ha) without any substantial changes in protein amino acids composition. In this respect the most efficient was the dose of 0.2 kg Cu/ha applied together with second nitrogen dose (50 kg N/ha) in shooting stage of wheat development.

230 Du Plessis, J.P. (Department of Agriculture, Elsenburg (South Africa). Elsenburg Agricultural Development Inst.); Agenbag, G.A. (1994) **[Reaction of two spring wheat cultivars to nitrogen and sulphur fertilizer in the Swartland [South Africa] I. Vegetative growth, nitrogen and sulphur uptake and concentration in the plant]. Reaksie van twee lentekoringkultivars op stikstof- en swaelbemesting in die Swartland. I. Vegetatiewe groei, opname en konsentrasie van stikstof en swael in die vegetatiewe plant.** *South African Journal of Plant and Soil (South Africa) v. 11(4) p. 163-169.* Afrikaans. (AGRIS 95-130403).

231 Du Plessis, J.P. (Department of Agriculture, Elsenburg (South Africa). Elsenburg Agricultural Development Inst.); Agenbag, G.A. (1994) **[Reaction of two spring wheat cultivars to nitrogen and sulphur fertilizer in the Swartland [South Africa]. II. Yield and baking quality]. Reaksie van twee lentekoringkultivars op stikstof- en swaelbemesting in die Swartland. II. Opbrengs en bakkwaliteit.** *South African Journal of Plant and Soil (South Africa) v. 11(4) p. 189-195.* Afrikaans. (AGRIS 95-130404).

232 Efimov, V.N.; Trusova, L.A.; Diallo, T.B.; Diallo, B. (1994) **[Phosphorus of mineral fertilizers transformations in sod-podzolic soils]. Transformatsiya fosfora mineral'nykh udobrenij v dernovo-podzolistoj pochve.** *Pochvovedenie (Russian Federation) (no.10) p. 86-92.* Russian. (AGRIS 95-150540).

The effect pf phosphorus fertilizers differing by their solubility rate (superphosphate, precipitate, ground phosphate rock) on soluble (0.2n HCl) phosphates and their composition in a sod-podzolic soils proved to be inadequate. With superphosphate or precipitate applied to soil, fertilizers were transformed into soil aluminium phosphates, to a lesser extent, into iron phosphates already in the same year. Ground phosphate rock being introduced, the mineral phosphates pool got increased due to calcium phosphates. In the latter case phosphorus of the fertilizer predominated over that of soil.

233 El Dawwey, G.M. (Minia Univ. (Egypt). Faculty of Agriculture) (1993) **Effectiveness of sewage sludges and basic slag on wheat plants grown in sandy calcareous and loamy soils.** *Assiut Journal of Agricultural Sciences (Egypt) v. 24(4) p. 170-184.* 7 tables; 21 ref. English. (AGRIS 95-130383).

234 El Genbeehy, M.A.; Nawar, A.I. (Alexandria Univ. (Egypt). Faculty of Agriculture) (1994) **Triticale and wheat response to nitrogen fertilization.** *Menofiya Journal of Agricultural Research (Egypt) v. 19(6 part 1) p. 3089-3107.* 3 ills. 5 tables; 20 ref. English. (AGRIS 95-130251).

235 El Hawary, N.A.; Haekal, M.A. (Ministry of Agriculture, Cairo (Egypt). Field Crops Research Inst.); Ahmed, A.R. (1994) **Effect of preceding summer crops and farmyard manure on the production of wheat under sandy soil conditions.** *Journal of Agricultural Sciences, Mansoura Univ. (Egypt) v. 19(6) p. 1897-1906.* 6 tables; 20 ref. English. (AGRIS 95-130429).

236 Elers, B. (Fachhochschule Nuertingen (Germany). Fachbereich Agrarwirtschaft); Sneyd, J. (1994) **[Response of different cultivars of winter wheat on management intensity]. Reaktion verschiedener Winterweizensorten auf unterschiedliche Produktionsintensitaeten.** 38. Jahrestagung der Gesellschaft fuer Pflanzenbauwissenschaften; Halle/Saale (Germany); 29 Sep - 1 Oct 1994. *Mitteilungen der Gesellschaft fuer Pflanzenbauwissenschaften (Germany) v. 7 p. 303-305.* 2 graphs, 2 tables. German. (AGRIS 95-130381).

237 Hassan, H.M.; El Basioni, S.M.; Dahroug, A.A. (Ministry of Agriculture, Cairo (Egypt). Soils and Water Research Inst.) (1992) **Effect of sewage sludge application under different irrigation intervals on wheat production in Fayoum Governorate [Egypt].** *Annals of Agricultural Science, Moshtohor (Egypt) v. 30(4) p. 2105-2115.* 4 tables; 17 ref. English. (AGRIS 95-150620).

238 Ibrahim, A.A.; Abd El Gawad, K.I. (Cairo Univ. (Egypt). Faculty of Agriculture) (1993) **Effect of zinc, copper, boron and their combinations on grain, straw and protein yields of wheat.** *Zagazig Journal of Agricultural Research (Egypt) v. 20(1A) p. 77-87.* 5 tables; 10 ref. English. (AGRIS 95-130384).

239 Ivanic, J.; Vnuk, L. (Vysoka Skola Polnohospodraska, Nitra (Slovak Republic). Katedra Agrochemie a Vyzivy Rastlin); Huntejova, S. (1994) **[Optimalization of nitrogen fertilization rates for winter wheat grown in the potato growing region]. Optimalizacia davok dusika pri produkcnom prihnojovani ozimnej psenice v zemiakarskej vyrobnej oblasti.** *Polnohospodarstvo (Slovak Republic) v. 40(11) p. 803-813.* 8 tables; 7 ref. Slovak. (AGRIS 95-130401).

In a 3-year experiment (1987-1990) an optimalization of nitrogen rates used for fertilization of winter wheat was studied. The field experiments were carried out on the heavy gleyic alluvial soil in the potato growing region. The best parameters of grain production, its quality and highest economical effectiveness of nitrigen fertilization were reached by applying the calculation based on the inorganic nitrogen content in soil, determined at the depth of 0.6 m, considering its 80 % utilization and N-utilization by wheat stand in the phase of 6th leaf.

240 Jenkinson, D.S. (Rothamsted Experimental Station, Harpenden, Herts. (United Kingdom). Inst. of Arable Crops Research); Coleman, K.; Harkness, D.D. (1995) **The influence of fertilizer nitrogen and season on the carbon-13 abundance of wheat straw.** *Plant and Soil (Netherlands) v. 171(2) p. 365-367.* 7 ref. English. (AGRIS 95-130393).

241 Kerolous, R.G.; Negm, M.A.; Salib, M.M. (Ministry of Agriculture, Cairo (Egypt). Soils and Water Research Inst.) (1993) **Efficiency of some ammoniacal fertilizers added to wheat grown on clay and calcareous soils.** *Zagazig Journal of Agricultural Research (Egypt) v. 20(IB) p. 443-450.* 3 tables; 13 ref. English. (AGRIS 95-130389).

242 Kjellerup, V. (1995) **[Nitrogen leaching after application of nitrochalk and cattle slurry in crop rotation on sandy soil [long-term experimentation]]. Kvaelstofudvaskning efter tilfoersel af kalkammonsalpeter og kvaeggylle i saedskifte paa sandjord.** Statens Planteavlsforsoeg, Lyngby (Denmark). *Groen Viden. Landbrug (Denmark); no. 156 6 p.* SP. 4 ill. Danish. (AGRIS 95-130281).

243 Kleiber, E. (Giessen Univ. (Germany). Inst. fuer Pflanzenbau und Pflanzenzuechtung 1); Zoschke, M. (1994) **[Effects of low input systems on yields and baking characteristics of wheat]. Einfluss von Extensivierungsmassnahmen auf Weizenertrag und Backqualitaet.** 38. Jahrestagung der Gesellschaft fuer Pflanzenbauwissenschaften; Halle/Saale (Germany); 29 Sep - 01 Oct 1994. *Mitteilungen der Gesellschaft fuer Pflanzenbauwissenschaften (Germany) v. 7 p. 103-106.* 1 graph, 4 tables; 3 ref. German. (AGRIS 95-130377).

244 Kucharski, J. (Akademia Rolniczo Techniczna, Olsztyn (Poland). Katedra Mikrobiologii Rolnej) (1994) **[Efficiency of PPDA (phenylic ester of diamidophosphoric acid) in the control of urea hydrolysis rate in the soil]. Skutecznosc estru fenylowego kwasu diamidofosforowego w regulowaniu tempa hydrolizy mocznika w glebie.** *Acta Academiae Agriculturae ac Technicae Olstenensis. Agricultura (Poland) (no.57) p. 83-90.* 5 tables; 12 ref. Polish. (AGRIS 95-150531).

It was found that PPDA effectively suppressed the urea hydrolysis in the soil samples incubated at 10 and 20 degrees C. Studied inhibitor did not positively affect yields of spring barley and also did not improve the nitrogen utilization from the urea. The negative effects of PPDA on ammonifiers and actinomycetes proliferation are possible.

245 Larney, FJ.; Janzen, HH.; Olson, BM. (1995) **EFFICACY OF INORGANIC FERTILIZERS IN RESTORING WHEAT YIELDS ON ARTIFICIALLY ERODED SOILS.** *Canadian Journal of Soil Science. 75(3):369-377.* English. [AGR & AGRI FOOD CANADA RES CTR LAND RESOURCE SCI SECT POB 3000 LETHBRIDGE AB T1J 4B1 CANADA].

Chemical fertilizers are often used to amend eroded agricultural land. However, the relationships between level of erosion, nitrogen (N) rate and phosphorus (P) rate in restoring soil productivity are unclear. In 1990, experiments were initiated to examine the effect of three levels of erosion (0, 10 and 20 cm of topsoil removal to simulate non-eroded, moderately eroded and severely eroded soils), four rates of N and three rates of P on the performance of spring wheat (Triticum aestivum L.) for four southern Alberta soils. Residual erosion and fertilizer effects were assessed in a second cropped year. Erosion significantly decreased grain and straw yield at all four sites in the initial year. Removing 10 and 20 cm of topsoil reduced non-fertilized production by 43-66% and 60-85%, respectively, as compared with the undisturbed non-fertilized plots. Except for one site in the initial year, additions of N and P only partly remedied these losses. Responses to N and P were highest at moderate levels of erosion at three sites. There was a greater yield overlap between moderately and severely eroded treatments than between non-eroded and moderately eroded treatments, implying that the restoration of productivity is more difficult once the shallowest layer of topsoil has been removed. [References: 35].

246 Li Xiuzhang (Jiangsu Academy of Agricultural Sciences, Nanjing (China). Inst. of Industrial Crops) (1994) **Effects of the level of nitrogen application on nitrogen metabolism in the plants of transplanted cotton following wheat harvest.** *Acta Gossypii Sinica (China) v. 6(4) p. 223-228.* 5 tables; 1 ill., 11 ref. Chinese. (AGRIS 95-130467).

247 Mengozzi, B. (1995) **[For the autumn-winter cereal crops [nitrogen fertilization]]. Per i cereali autunno vernini [concimazione azotata].** *Terra e Vita (Italy) v. 36(2) p. 41-43.* 1 graph. Italian. (AGRIS 95-130273).

248 Modi, A.T.; Cairns, A.L.P. (Natal Univ., Scottsville (South Africa). Dept. of Agronomy) (1995) **Can molybdenum reduce pre-harvest sprouting in wheat?** *South African Journal Plant and Soil (South Africa) v. 12(3) p. 108-111.* 5 tables. English. (AGRIS 95-150519).

249 Mohamed, M.K.; Shams El Din, G.M. (Zagazig Univ., Moshtohor (Egypt). Faculty of Agriculture) (1992) **Response of some barley cultivars to different rates of nitrogen fertilizer.** *Annals of Agricultural Science, Moshtohor (Egypt) v. 30(4) p. 1665-1676.* 4 ill. 2 tables; 16 ref. English. (AGRIS 95-150536).

250 Mosalem, M.E. (Tanta Univ., Kafr El Sheikh (Egypt). Faculty of Agriulture) (1993) **Response of two wheat cultivars to nitrogen level and seeding rate.** *Joural of Agricultural Research, Tanta Univ. (Egypt) v. 19(4) p. 791-805.* 2 ill. 7 tables; 39 ref. English. (AGRIS 95-130390).

251 Nawrath, M. (Giessen Univ. (Germany). Inst. fuer Pflanzenbau und Pflanzenzuechtung 1); Zoschke, M. (1994) **[Effects of organic fertilizer application in a long-term model experiment]. Die Wirkung unterschiedlicher organischer Duengung in einem langjaehrigen Modellversuch.** 38. Jahrestagung der Gesellschaft fuer Pflanzenbauwissenschaften; Halle/Saale (Germany); 29 Sep - 1 Oct 1994. *Mitteilungen der Gesellschaft fuer Pflanzenbauwissenschaften (Germany) v. 7 p. 249-252.* 5 graphs, 2 tables; 4 ref. German. (AGRIS 95-130532).

252 Olfs, H. W. (Bonn Univ. (Germany). Agrikulturchemisches Inst.); Neu, A.; Werner, W. (1994) **[Effects of different nitrogen fertilization for spring barley on contents of microbial fixed nitrogen in postharvest phase]. Auswirkungen differenzierter N-Duengergaben zu Sommergerste auf die Gehalte an mikrobiell gebundenem Stickstoff in der "Nach-Erntephase".** VDLUFA-Schriftenreihe (Germany); no. 38 p. 589-592. VDLUFA. 3 ill., 3 tables; 8 ref. p. 589-592. German. (AGRIS 95-150532).

253 Olfs, HW. (1995) **DETERMINATION OF THE N FERTILIZER REQUIREMENT OF WINTER WHEAT - SUITABILITY OF DIFFERENT N FRACTIONS AND FERTILIZER ADVISORY SYSTEMS.** *Agribiological Research-Zeitschrift fur Agrarbiologie Agrikulturchemie Okologie. 48(2):127-137.* German. [UNIV BONN INST AGR CHEM MECKENHEIMER ALLEE 176 D-53115 BONN GERMANY].

Field experiments with increasing nitrogen rates (13 locations in 2 years) were carried out to test the suitability of different soil N fractions and fertilizer advisory systems for the improvement of N fertilizer recommendation to winter wheat. Mineral N (N-min) in soil down to 90 cm, extractable organic N (EUF-N-org, CaCl2-N-org) in the topsoil, yield and N uptake by winter wheat were measured and net N mineralization, optimum yield and the amount of N fertilizer required for this yield were calculated. No significant relationship could be found between net N mineralization on unfertilized plots and the soil N-org content in december of the previous year. A quantitative calculation of the amount of N mineralized during the vegetation period was therefor not possible. Determination of the N-min content in early spring showed the best correlations to optimal N fertilizer rate. Improvement of the prognosis of N fertilizer requirement was neither possible by calculating multiple regression functions taking into account N-min together with N-org nor by application of more complex N fertilizer advisory systems. [References: 26].

254 Panse, A. (Technische Univ. Muenchen, Freising (Germany). Lehrstuhl fuer Pflanzenbau und Pflanzenzuechtung. Versuchsgut Roggenstein); Maidl, F.X.; Dennert, J.; Brunner, H.; Fischbeck, G. (1994) **[Yield formation of cereal crop rotations and cereal monocultures as affected by management intensity]. Ertragsbildung von getreidereichen Fruchtfolgen und Getreidemonokulturen bei differenzierter Produktionsintensitaet.** 38. Jahrestagung der Gesellschaft fuer Pflanzenbauwissenschaften; Halle/Saale (Germany); 29 Sep - 1 Oct 1994. *Mitteilungen der Gesellschaft fuer Pflanzenbauwissenschaften (Germany) v. 7 p. 273-276.* 2 graphs, 1 table; 5 ref. German. (AGRIS 95-130380).

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256 Papastylianou, I. (Agricultural Research Institute, Nicosia (Chypre)) (1995) **[The effects of seed rate and nitrogen fertilization yield and yield components of two-row barley]. [Effets de la densite du semis et de la fertilisation azotee sur le rendement et les composantes du rendement de l'orge deux rangs].** *European Journal of Agronomy (France) v. 4(2) p. 237-243.* 22 ref. English. (AGRIS 95-130276).

257 Papastylianou, I. (Agricultural Research Institute, Nicosia (Chypre)) (1995) **[Yield components in relation to grain yield losses of barley fertilized with nitrogen]. [Composantes du rendement en relation avec la perte de recolte en grains chez l'orge fertilisee par de l'azote].** *European Journal of Agronomy (France) v. 4(1) p. 55-63.* 32 ref., 6 tableaux. English. (AGRIS 95-130275).

258 Pascualena, J.; Relloso, J.B.; Ritter, E. (1995) **[Study of poultry droppings compost as fertilizer]. Estudio del compost de gallinaza como fertilizante.** *Sustrai (Espana) (no.37) p. 34-37.* 3 tab., 3 fig. Spanish. (AGRIS 95-150628).

259 Patel, NM.; Sadaria, SG.; Kaneria, BB.; Khanpara, VD. (1995) **EFFECT OF NITROGEN, POTASSIUM AND ZINC ON GROWTH AND YIELD OF WHEAT (TRITICUM AESTIVUM).** *Indian Journal of Agronomy. 40(2):290-292.* English. [GUJARAT AGR UNIV DEPT AGRON JUNAGADH 362001 GUJARAT INDIA].

260 Pettersson, S. (1994) **[Human urine as plant nutrition. Chemical composition and fertilizer effects]. Humanurin som vaextnaeringskaella. Kemisk sammansaettning och goedslingseffekt.** *Examensarbete - Sveriges Lantbruksuniversitet, Institutionen foer Markvetenskap, Avdelningen foer Vaextnaeringslaera (Sweden); no. 93 20 p.* 28 ref. Swedish. (AGRIS 95-130278).

261 Qou Yuande; Yue Peichang; Yuan Weimin (Xinjiang Academy of Agricultural Sciences, Urumqi (China). Inst. of Information) (1994) **Yield increasing efficacy of multiple elements micronutrient liquid fertilizers on wheat.** *Xinjiang Agricultural Sciences (China) (no. 6) p. 268-270.* 4 tables. Chinese. (AGRIS 95-130375).

262 Radwan, S.A.; Bayoumi, N.A. (Monoufiya Univ., Shebin El Kom (Egypt). Faculty of Agriculture); Shehata, A.A.; Shalabey, O.E. (1993) **Effect of nitrogen levels and composting materials on some macro-and micronutrients uptake by wheat plants.** *Zagazig Journal of Agricultural Research (Egypt) v. 20(2B) p. 937-952.* 6 ill. 5 tables; 38 ref. English. (AGRIS 95-150621).

263 Rajput, AL. (1995) **EFFECT OF FERTILIZER AND ORGANIC MANURE ON RICE (ORYZA SATIVA) AND THEIR RESIDUAL EFFECT ON WHEAT (TRITICUM AESTIVUM).** *Indian Journal of Agronomy. 40(2):292-294.* English. [CROP RES STN BAHARAIACH 271801 UTTAR PRADESH INDIA].

264 Raupp, J. (Institut fuer Biologisch Dynamische Forschung e.V., Darmstadt (Germany)); Reents, H.J.; Bachinger, J. (1994) **[Effects of organic and mineral fertiliser on yield and quality of spring wheat at a dry-warm site]. Ertrag und Qualitaet von Sommerweizen bei organischer und mineralischer Duengung an einem trocken-warmen Standort.** 38. Jahrestagung der Gesellschaft fuer Pflanzenbauwissenschaften; Halle/Saale (Germany); 29 Sep - 1 Oct 1994. *Mitteilungen der Gesellschaft fuer Pflanzenbauwissenschaften (Germany) v. 7 p. 253-256.* 2 graphs, 2 tables; 4 ref. German. (AGRIS 95-130379).

265 Rogalski, L. (Akademia Rolniczo Techniczna, Olsztyn (Poland). Zaklad Agrolotnictwa) (1994) **[Influence of cumulative foliar spray nutrition and plant protection on yield of spring barley]. Wplyw dolistnego dokarmiania laczonego z ochrona roslin na plonowanie jeczmienia jarego.** *Acta Academiae Agriculturae ac Technicae Olstenensis. Agricultura (Poland) (no.57) p. 101-109.* 4 tables; 6 ref. Polish. (AGRIS 95-150539).

The foliar spray nutrition by urea solution was combined with fungicidal protection. The cumulative spray effectiveness was about 150 kg grain on 1 kg N and was highest in all experiment. The top-dressing fertilization applied together with foliar spray nutrition was not additional increase of spring barley grain yield.

266 Rogoz, A. (University of Agriculture, Krakow (Poland). Dept. of Agricultural Chemistry) (1994) **Influence of liming on the content of some microelements in plants.** Zeszyty Problemowe Postepow Nauk Rolniczych (Poland); no. 413 p. 255-261. Instytut Agrofizyki. 1 fig., 1 table; 18 ref. p. 255-261. English. (AGRIS 95-150538).

Liming, irrespective of lime dose, had no marked influence on the amount of oats yield, while the yield of beets tops and roots increased parallel with the dose of lime. As a result of liming, Cu concentration in oats tops decreased along with an increase in lime dose, whilst in beets leaves the level of copper increased under the same conditions. Zn and Mn concentrations in tops and roots of both plants decreased along with the raise in calcium fertilizer dose. Liming had no greater effect on Fe level in oats tops, but it decreases this element content in beet leaves. The effect of liming was slightly dependent on lime dose, the species and part of a plant, and on the time which elapsed since the application of calcium fertilizer.

267 Rowe, BA.; Johnson, DE. (1995) **RESIDUAL BENEFITS OF LIMESTONE AND SUPERPHOSPHATE ON BARLEY YIELDS AND SOIL-WATER DEFICITS ON A KRASNOZEM IN NORTH-WESTERN TASMANIA.** *Australian Journal of Experimental Agriculture. 35(5):611-617.* English. [DEPT PRIMARY IND & FISHERIES NEW TOWN RES LABS NEWTOWN TAS 7008 AUSTRALIA].

Twelve years after the last application of limestone, the residual benefits of 15 t/ha of surface-applied limestone were measured on barley grown on a krasnozem [Gn4.11, pH 5.5 (15 soil : water)] at Elliott in north-western Tasmania. Liming increased grain yield by 77% (1.9 t/ha) when phosphorus (P), sulfur (S), potassium (K), and molybdenum (Mo) were nonlimiting. An increase in the number of ears per m(2) accounted for 73% of the yield increase, number of seeds per ear 20%, and slightly larger grains 7%. The soil-water deficit on the limed plots at the end of the growing season did not exceed that on the unlimed plots. We suggest that the crop responses to liming were due not to an increase in the potential soil-water available for extraction by the crop but to increased levels of available nitrogen on the limed plots, which increased tillering before the onset of water stress. Termination of superphosphate applications 20 years before reduced yield by 1.18 t/ha, to 59% of the yield obtained with superphosphate applied at 500 kg/ha.year. By comparison, the liming effect was 1.6 times larger. The barley crop responded equally to both the P and S components of the superphosphate, but did not respond to K or Mo fertilisers. [References: 14].

268 Saha, U.K.; Rahman, A.F.M.; Islam, M.S.; Haque, M.A. (Bangladesh Agricultural Research Inst., Gazipur (Bangladesh). Division of Soil Science) (1993) **Optimizing fertilizer rate for wheat in calcareous dark floodplain soil of Bangladesh [Triticum aestivum].** *RACHIS (ICARDA); Barley and Wheat Newsletter v. 12(1-2) p. 51-56.* 4 tables; 1 fig., 10 ref. English. (AGRIS 95-150611).

A field experiment was conducted on calcareous dark grey floodplain soil of Ishurdi, Bangladesh, for the 1987-89 rabi (winter) seasons to observe yield response, nutrient uptake and fertilizer economy of wheat (Triticum aestivum L. ssp. aestivum) as influenced by N-P-K-S-Zn fertilization. The highest grain yield and nutrient uptake were recorded with the treatment 150-60-60-20-5 kg/ha. Yield responses of wheat were most pronounced with N, S and Zn fertilization producing 261, 54 and 33 increased grain yield over control due to application of 150 kg N/ha, 40 kg S/ha and 5 kg Zn/ha, respectively. Economic evaluation suggested that application of 120-60-30-20-5 kg/ha might be sufficient for optimum wheat yield (about 4 t/ha) giving a marginal rate of return as high as 758.

269 Salim, R. (1993) **Effect of phosphorus on the yield, zinc and copper concentrations in wheat LU 26-S.** University of Agriculture, Faisalabad (Pakistan). Dept. of Soil Science. UAF. 18 tables, 100 ref. 80 p. English. (AGRIS 95-130394).

270 Santana Suarez, N.P. (1993) **[Effect of three fertilization levels and three sowing densities on five barley varieties (Hordeum vulgare L.) in San Juan de Yanamuclo - Jauja]. Efecto de tres niveles de abonamiento y tres densidades de siembra en cinco variedades de cebada (Hordeum vulgare L.) en la localidad de San Juan de Yanamuclo - Jauja.** Universidad Nacional Agraria La Molina, Lima (Peru). Facultad de Agronomia. Departamento de Fitotecnia. 11 fig. 32 cuadros; 80 ref. 67 p. Spanish. (AGRIS 95-130277).

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273 Semyanenka, M.M.; San'ko, T.V.; Bulgakava, I.M. (Belarus Research Institute for Soil Science and Agrochemistry, Minsk (Belarus)) (1994) **[Optimization of barley nitrogen nutrition on the basis of soil diagnosis data]. Aptymizatsyya azotnaga zhywlennya yachmenyu na asnove danykh glebavaj dyyagnostyki.** *Vestsi Akadehmii Agrarnykh Navuk Belarusi (Belarus) (no.4) p. 7-10.* 3 tables, 3 ref. Byelo Russian. (AGRIS 95-130279).

274 Shafiq, M. (National Agricultural Research Centre, Islamabad (Pakistan). Water Resources Research Inst.); Amin, R.; Ikram, M.Z.; Sandhu, G.R. (1994) **Effect of fertilizer and mulches on wheat growth and yield under rainfed conditions.** *Journal of Agricultural Research (Pakistan) v. 32(2) p. 165-171.* 3 ills., 2 tables, 10 ref. English. (AGRIS 95-150622).

275 Sharma, S.N. (Indian Agricultural Research Inst., New Delhi (India). Div. of Agronomy); Prasad, R.; Singh, S. (1995) **The role of mungbean residues and Sesbania aculeata green manure in the nitrogen economy of rice-wheat cropping system.** *Plant and Soil (Netherlands) v. 172(1) p. 123-129.* 13 ref. English. (AGRIS 95-130317).

276 Soliman, M.A.M. *(1994)* **Nitrogen requirements and cutting treatments in relation to grain and forage yield of wheat and barley.** Cairo Univ. (Egypt). Faculty of Agriculture. 18 tables; ref. p. 95-101. 108 p. English. (AGRIS 95-130382).

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280 Wooding, A.R.; Martin, R.J.; Wilson, D.R. (New Zealand Inst. for Crop and Food Research Ltd, Christchurch); MacRitchie, F. (Commonwealth Scientific and Industrial Research Organisation, North Ryde (Australia). Div. of Plant Industry) (1993) **Effect of sulfur-nitrogen treatments on work input [wheat; fertilizers]. *[Conference paper].*** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 499.* Abstract only. English. (AGRIS 95-130254).

281 Xiang Mingchao; Mao Duanming (Xinjiang Academy of Agricultural Sciences, Urumqi (China). Inst. of Soils and Fertilizers) (1994) **End-result of ureal nitrogen in system of winter wheat and irrigated puddled soils.** *Xinjiang Agricultural Sciences (China) (no. 2) p. 71-74.* 4 tables; 4 ref. Chinese. (AGRIS 95-130257).

282 Yassien, H.E.; Shafey, S.A.; Salem, M.S.A. (Azhar Univ., Cairo (Egypt). Faculty of Agriculture) (1993) **Effect of boron and iron application on productivity of wheat.** *Annals of Agricultural Science, Moshtohor (Egypt) v. 31(4) p. 1917-1929.* 4 tables; 33 ref. English. (AGRIS 95-130385).

283 Zaki, N.M.; El Gazzar, M.M.; Ahmed, M.A. (National Research Centre, Cairo (Egypt). Botany Dept.) (1992) **Effect of nitrogen fertilizer levels and time of application on grain and forage yield of barley in Egypt.** *Annals of Agricultural Science, Moshtohor (Egypt) v. 30(1) p. 53-67.* 7 tables; 15 ref. English. (AGRIS 95-130282).

284 Zawartka, L. (Akademia Rolniczo Techniczna, Olsztyn (Poland). Katedra Chemii Rolnej) (1994) **[Potassium polyposphate in the vegetation experiments. Pt. 4. Effect of potassium polyphosphate used every year and for the future on the yield and chemical composition of plants in a field experiment]. Polifosforan potasu w doswiadczeniach wegetacyjnych. Cz. 4. Wplyw polifosforanu, stosowanego corocznie i na zapas, na plon i sklad chemiczny roslin w doswiadczeniu polowym.** *Acta Academiae Agriculturae ac Technicae Olstenensis. Agricultura (Poland) (no.58) p. 93-101.* 7 tables; 6 ref. Polish. (AGRIS 95-150655).

The effect of polyphosphate on total plant yield was similar as of triple superphosphate applied with potassium chloride. Yearly doses resulted in significantly higher yields irrespective of the fertilizer used when compared with the fertilization for future. Phosphorus content in plants and utilization of this element depended on the method of fertilization, but potassium content was higher in the plants fertilization with potassium polyphosphate.

F06 IRRIGATION

285 Agbary, A.T.; Sallam, A.R.; Bamatraf, A.M. (Sanaa Univ. (Yemen). Faculty of Agriculture) (1993) **The biological yield and harvest index of some wheat varieties growth under different moisture regimes and fertilizers.** *Annals of Agricultural Science, Moshtohor (Egypt) v. 31(2) p. 771-784.* 8 ill. 3 tables; 24 ref. English. (AGRIS 95-130750).

286 Allen, R.R. (USDA, ARS, Conservation and Production Research Laboratory, Bushland, TX.); Musick, J.T. (1994) **Graded furrow irrigation of winter wheat with blocked ends.** *Applied engineering in agriculture (USA) v. 10(5) p. 687-692.* references. English. (AGRIS 95-130725).

Winter wheat is widely irrigated by graded furrow application on the Central and Southern High Plains of the United States. A study was conducted to determine the effectiveness of blocking furrow ends and cutting-off furrow inflow earlier to eliminate runoff and save water, rather than using the common practice of 4- to 6-h runoff to wet the beds on the lower ends of fields. Earlier cutoff is feasible with wheat because flow retardance by the plants in furrows increases transient flow volume, thus causing soil wetting to closely follow furrow advance. Both adequate (3 to 4 applications) and deficit (1 to 2 applications) irrigation regimes were evaluated during the study. With adequate irrigation, the elimination of runoff with blocked furrows and earlier cutoff reduced average gross irrigation applications from 430 to 335 mm (16.9 to 13.2 in.) or 22% without reducing grain yield. Seasonal water use savings averaged 95 mm (3.8 in.) with adequate irrigation. With deficit irrigation, water savings were 17% or 48 mm (2 in.). Grain yields averaged 5.6 Mg/ha (83 bu/acre) and 4.2 Mg/ha (63 bu/acre), respectively, with adequate and deficit irrigation on blocked furrows.

287 Barta, V. (Vyskumny Ustav Zavlahoveho Hospodarstva, Bratislava (Slovak Republic)) (1992) **[Residual effect of winter wheat irrigation on yield of spring barley grain]. Nasledny ucinok zavlahy ozimnej psenice na vysku urody zrna jarneho jacmena.** *Vedecke Prace Vyskumneho Ustavu*

Zavlahoveho Hospodarstva v Bratislave (Slovak Republic) (no.20) p. 153-163. 5 tables; 8 ref. Slovak. (AGRIS 95-150956).

Direct effect of 8 various water regimes in soil combined with 2 levels of N fertilization, on grain of winter wheat, proceeded by alfa-alfa, as well as residual effect of these measurements on spring barley were studied in field trials from 1986 till 1988. The obtained results give evidence that irrigation apart from helping winter wheat to manage dry periods and incresing its yield by 6.7 to 30.3 %, fullfils its task to improve soil fertility. This latter indicates its residual effect on spring barley, cultivated next year, through increasing its yield by 9 % (total average) and by 25.7 to 29.7 % in 1988, this depending on N fertilization level.

288 Bokhari, S.G.A. (1992) **Effect of irrigation water applied at different growth stages on growth and yield of wheat (Triticum aestivum L.).** University of Agriculture, Faisalabad (Pakistan). Dept. of Agronomy. UAF. 5 ills., 20 tables, 54 ref. 88 p. English. (AGRIS 95-130753).

289 Katterer, T.; Andren, O. (1995) **MEASUREMENTS AND SIMULATIONS OF HEAT AND WATER BALANCE COMPONENTS IN A CLAY SOIL CROPPED WITH WINTER WHEAT UNDER DROUGHT STRESS OR DAILY IRRIGATION AND FERTILIZATION.** *Irrigation Science. 16(2):65-73.* English. [SWEDISH UNIV AGR SCI DEPT ECOL & ENVIRONM RES POB 7072 S-75007 UPPSALA SWEDEN].

Soil water and temperature dynamics were measured in a field experiment with winter wheat on a clay soil. There were four treatments: Control (C), receiving natural precipitation, drought (D), protected from rain by plastic screens during the growing season, daily irrigation (I) and daily irrigation and fertilization (IF). Treatments C, D and I received the nitrogen fertilizer as a single application of solid fertilizer in spring. In IF daily dressings of nutrients were supplied in the irrigation water. All treatments received 20 g N m(-2). An associated experiment with a newly sown grass ley (L) that was irrigated and fertilized daily (total 5.6 g N m(-2)) was also performed. Standard meteorological variables (air temperature and humidity, wind speed, precipitation, global radiation, and relative cloudiness) and crop development data (green area index, crop height, relative root distribution in depth) above and below ground were used as driving variables within a physically based dynamic model (SOIL) for simulating water and heat fluxes. Measured soil temperature and water content from one treatment (I) were used to tune the model parameters, tentatively set from literature data. Thereafter, water and heat fluxes in the other treatments were simulated using the same parameter values but with different crop-related measurements as driving Variables for each treatment. Measured soil temperature and water content in C, D, IF and L could thus be used for validation of the simulations. The theory formulated in the model could accurately explain measured treatment differences in soil water and temperature dynamics. Since the soil-related parameters were identical in all treatments, the model was shown to be applicable over a wide range of moisture conditions. [References: 35].

290 Mishra, HS.; Rathore, TR.; Tomar, VS. (1995) **WATER USE EFFICIENCY OF IRRIGATED WHEAT IN THE TARAI REGION OF INDIA.** *Irrigation Science. 16(2):75-80.* English. [GOVIND BALLABH PANT UNIV AGR & TECHNOL COLL AGR DEPT SOIL SCI PANTNAGAR 263145 UTTAR PRADESH INDIA].

Experiments were conducted during the winter seasons of 1983-1984 and 1984-1985 to identify suitable irrigation regimes s for wheat grown after rice in soils with naturally fluctuating shallow water table (SWT) at a depth of 0.4 to 0.9 m and medium water table (MWT) at a depth of 0.8 to 1.3 m. Based on physiological stages, the crop was subjected to six irrigation regimes viz., rainfed (I-0); irrigation only at crown root initiation (I-1); at only crown root initiation and milk (I-2); at crown root initiation, maximum tillering and milk (I-3); at crown root initiation, maximum tillering, flowering and milk (I-4); and at crown root initiation, maximum tillering, flowering milk and dough (I-5). Tube-well water with an EC <0.4 dsm(-1) was used for irrigation. Based on 166 mm effective precipitation during the cropping season, 1983-1984 was designated as a wet year and 1984-1985 with 51 mm as a dry year. The change in profile soil water content Delta W (depletion) in the wet year was less (23%) under SWT and 10% under MWT as compared to the dry year. The ground water contribution (GWC) to evapotranspiration (ET) was 58% under SWT and 42% under MWT conditions in both the years. The GWC in the wet year was 20% under SWT and 23% under MWT. Of the total net water use (NWU), about 85% was ET and 15% drainage losses. The NWU was highest (641 and 586 mm) in I-5 under SWT and MWT conditions, respectively, but not the yield (5069 kg ha(-1)). Compared to I-5, NWU in I-2 treatment decreased by 10% in the wet and 25% in the dry year. A similar trend was observed in the I-3 treatment under MWT condition. However, there was no statistically significant difference between yields of the I-1 to I-5 treatments of either water table depth during the wet year. This was also true during the dry year for the I-2 to I-5 treatments. Under SWT, in I-2, the grain yield was 5130 kg ha(-1) and under I-3 regime, 5200 kg ha(-1). Under MWT in I-3, the yield was 5188 kg hal and under I-4 regime, 5218 kg ha(-1). Thus it appears that in the Tarai region where the water table remains shallow (<0.9 m) and medium (<1.3 m) for most of the wheat growing season applications of more than 120 and 180 mm irrigation under SWT and MWT conditions, respectively were not necessary. Irrigation given only at crown root initiation and milk stages under shallow water table conditions, and at crown root initiation, maximum tillering and milk stages under medium water table conditions, appears to be as effective as frequent irrigations. [References: 18].

291 Mohamed, J. (IAR, Addis Abeba (Ethiopia)) (1994) **Performance of Wheat Genotypes Under Irrigation in Awash Valley, Ethiopia.** *African Crop Science Journal (Uganda) v. 2(2) p. 145-151.* 6 Tables; 10 Ref. English. (AGRIS 95-150955).

Field experiments were undertaken for three consecutive seasons at Melka Werer Research Centre to identify potential wheat (Triticum aestivum) genotypes for production during the cool season (November-February) in the Awash Valley, Ethiopia. Results revealed that wheat can be grown successfully in the Middle Awash Valley during the cool season with mean grain yelle of up to 4.4 ha-1. Rate of grain filling ranged from 40 kg ha-1 day-1 to 53 kg ha-1 day-1 depending on maturity. Although the late maturing genotypes had higher straw yields, early maturing genotypes had higher grain production rates and practically the same grain yield level as the late cultivars. Three early maturing genotypes, Blue Jay "S", MILKS-11, and PAI 4 were identified for use in the cotton-wheat double-cropping scheme in the Middle Awash Valley.

292 Przybyla, C. (Agricultural Univ., Poznan (Poland)) (1994) **Scheduled irrigation system as a factor increasing the effectivity of sprinkling irrigation.** Possibilities of Irrigation Efficiency Increasing; Bratislava (Slovak Republic); 7-8 Jun 1994. *Possibilities of increasing irrigation efficiency. Proceedings from international conference. Vyskumny Ustav Zavlahoveho Hospodarstva, Bratislava (Slovak Republic); Vysoka Skola Polnohospodarska, Nitra (Slovak Republic) p. 214-220.* VUZH. 2 tables; 6 ref. English. (AGRIS 95-151006).

293 Shahid, A.D. (1992) **Effect of different irrigation levels on growth and yield of wheat (Triticum aestivum L.) varieties PAK-81 and PB-85.** University of Agriculture, Faisalabad (Pakistan). Dept. of Agronomy. UAF. 27 tables, 97 ref. 102 p. English. (AGRIS 95-130754).

294 Sharma, AK.; Singh, P. (1995) **PERFORMANCE OF WHEAT (TRITICUM AESTIVUM) UNDER LIMITED IRRIGATION RESOURCES OF BUNDELKHAND REGION.** *Indian Journal of Agronomy. 40(2):294-296.* English. [CENT SOIL & WATER CONSERVAT RES & TRAINING INST RES CTR DATIA 475661 MADHYA PRADESH INDIA].

F07 SOIL CULTIVATION

295 Arvidsson, J. (1995) **[Recompaction in ploughless tillage]. Aaterpackning vid saadd i ploejningsfri odling.** *Meddelanden fraan Jordbearbetningsavdelningen, Sveriges Lantbruksuniversitet, Institutionen foer Markvetenskap (Sweden); no. 16 12 p.* 5 ref. SLU-JB-M--16-SE. Swedish. (AGRIS 95-130837).

296 Kwakye, PK.; Bobo, UG. (1995) **TILLAGE DEPTH AND FERTILIZATION WHEAT (TRITICUM AESTIVUM L) NIGERIAN SAVANNA SOIL.** *Tropical Agriculture. 72(2):126-129.* English. [UNIV CAPE COAST SCH AGR DEPT SOIL SCI CAPE COAST GHANA].

The effects of traditional tillage (hoeing), shallow (15 cm) and deep (23 cm) ploughing, and NPK fertilization on total N, P, and K uptake and dry biomass yield or irrigated wheat (Triticum aestivum L.) were evaluated on a sandy loam soil (Typic Ustipsamment) in Borno State, Nigeria. Ploughing

and fertilization significantly decreased organic C and total N contents of the soil, but significantly increased the content of available K. Shallow ploughing in combination with low fertilizer input under irrigation resulted in the highest N and K uptake and highest biomass. Deep ploughing resulted in lower nutrient uptake and lower yield of the wheat biomass than shallow ploughing probably due to accelerated downward movement of both native and applied nutrients. [References: 18].

297 Liebhard, P. (1995) **INFLUENCE OF PRIMARY TILLAGE ON YIELD AND YIELD CHARACTERISTICS OF WINTER WHEAT (TRITICUM AESTIVUM L) IN THE CENTRE OF UPPER AUSTRIA .6.** *Bodenkultur. 46(3):205-222.* German. [AGR UNIV VIENNA INST PFLANZENBAU & PFLANZENZUCHTUNG GREGOR MENDEL STR 33 A-1180 VIENNA AUSTRIA].

The influence on yield and yield stability of long-term, different primary tillage methods at varying depths within a four-field crop rotation was examined. testing was based on the results of previous works using selected biochemical and *physical* parameters. On the medium-heavy loam and clay rich soil in a semihumid climate, it could be proven that the yield results for winter wheat are equal, whether using tillage systems with reduced intensity or conventional tillage methods. The compression of the soil caused by cultivation can be countered effectively by means of periodic ploughing at topsoil depth for root-crops. The twelve-year test results (1981 to 1992), after three rotations, show that the wheat plants are influenced in all phases of their development by the physical soil changes (density, pore volume, pore distribution, aggregate stability) caused by varying tillage methods. These soil changes, however, have a significant but relatively slight effect on the grain yield. The number of germinated plants decreased about 3 to 11 % with the increasing duration of ploughless tillage. The significant influence of the number of germinated plants on the grain yield remained even under optimum conditions during the sprouting phase from the third rotation on. In the yearly average, the highest yields of 70.9 dt/ha for wheat were obtained on the plots rotary-tilled and on the plots ploughed to the customary depth of 24 cm for the root crops. The grain yield decreased by 1.7 to 3.1 % after yearly ploughing. The harvest quantity diminished between 4.1 and 4.7 % after medium or deep grubbing treatment. The harvest was reduced by 6.1 % after annual flat grubbing at only 17 cm depth. The regularly lowest grain yield - on average 10.9 % less - was harvested on rotary-tilled plots. There were more distinct annual fluctuations in the accrued amount of straw, but on the average, the straw yield was similar to the grain yield.

298 Lipiec, J.; Stepniewski, W. (1995) **EFFECTS OF SOIL COMPACTION AND TILLAGE SYSTEMS ON UPTAKE AND LOSSES OF NUTRIENTS.** *Soil & Tillage Research. 35(1-2):37-52.* English. [POLISH ACAD SCI INST AGROPHYS POB 121 PL-20236 LUBLIN POLAND].

In the framework of research on the environmental consequences of soil compaction, the impact of soil compaction and tillage systems on uptake and losses of nutrients, in particular nitrogen, are discussed. Evidence is presented to indicate interactive relationships between the amount of soil compaction, root growth, soil water and soil aeration status, and nutrient supply and uptake by plants. The importance of soil structure and pore size distribution in influencing the transport of nutrients in compacted soil is illustrated. Emphasis is given to the negative effects of soil compaction on components of the environment due to nutrient leaching, surface runoff and gaseous losses to the atmosphere. [References: 71].

299 Michalski, T. (Akademia Rolnicza, Poznan (Poland). Katedra Uprawy Roli i Roslin) (1993) **[Effect of post-sowing soil tillage on the development and yielding of spring barley, oats and spring Triticale]. Wplyw posiewnych zabiegow uprawowych na rozwoj i plonowanie jeczmienia, owsa i pszenzyta jarego.** *Roczniki Nauk Rolniczych. Seria A - Produkcja Roslinna (Poland); Polish Agricultural Annual. Series A - Plant Production v. 110(1-2) p. 139-148.* 5 tables; 16 ref. Polish. (AGRIS 95-130836).

The effect of post-sowing harrowing, harrowing and rolling and harrowing, rolling and harrowing on the growth, development and yielding of barley, oats and Triticale was investigated. The most favourable way appeared to be harrowing and rolling. It led to acceleration of the plant emergence and caused a grain yield gain by 6 percent on the average. Harrowing after rolling *diminished* the favourable effect of this measure, since the yield gain did not exceed 2 q/ha. The harrowing alone after sowing led to no yield gain, but even caused sometimes a certain yield decrease. This reaction was independent on the species, nevertheless it was more visible in barley, less in oats and hardly visible in Triticale.

300 Reichart, K. (Bonn Univ. (Germany). Inst. fuer Pflanzenbau. Abt. Bodenbearbeitung und Angewandte Bodenphysik); Franken, H. (1994) **[Effect of green fallow on selected soil characteristics and on yield and quality of crops after turning and nonturning tillage]. Einfluss der Gruenbrache auf ausgewaehlte Bodeneigenschaften sowie Ertrag und Qualitaet bei wendender und nicht wendender Bodenbearbeitung.** 38. Jahrestagung der Gesellschaft fuer Pflanzenbauwissenschaften; Halle/Saale (Germany); 29 Sep - 1 Oct 1994. *Mitteilungen der Gesellschaft fuer Pflanzenbauwissenschaften (Germany) v. 7 p. 307-310.* 3 graphs, 2 tables; 3 ref. German. (AGRIS 95-130865).

301 Roy, I. (Bangladesh Agricultural Research Council, Farmgate, (Bangladesh)); Sarkar, A.K.D. (Regional Agricultural Research Station, Jamalpur (Bangladesh). Wheat Research Center) (1993) **Effect of minimum tillage in wheat grown after rice [Oryza sativa; Triticum aestivum].** *RACHIS (ICARDA); Barley and Wheat Newsletter v. 12(1-2) p. 49-51.* 2 tables; 6 ref. English. (AGRIS 95-151083).

The study was conducted to investigate the effect of minimum tillage on yield and yield characters of wheat (Triticum aestivum L. ssp. aestivum) grown after rice (Oryza sativa L.). A field experiment with wheat variety Kanchan was conducted in the 1989/90 growing season at Jamalpur, Bangladesh. Three tillage treatments - minimum (opening furrow), reduced (one plowing and one laddering) and conventional (five plowings and five ladderings) - were compared under irrigated and rainfed conditions. Grain yield with minimum or reduced tillage was not different from yield obtained with conventional tillage. However, plant emergence in minimum and reduced tillage treatments was significantly less, although each plant produced more spikelets and grains/spike.

302 Sharma, SK.; Tomar, RK.; Gangwar, KS. (1995) **EFFECT OF CROP-ESTABLISHMENT AND TILLAGE PRACTICES ON YIELD AND ECONOMICS OF IRRIGATED RICE (ORYZA SATIVA)-WHEAT (TRITICUM AESTIVUM) SYSTEM.** *Indian Journal of Agricultural Sciences. 65(9):636-638.* English. [PROJECT DIRECTORATE CROPPING SYST RES MODIPURAM 250110 UTTAR PRADESH INDIA].

A field experiment was conducted during 1991-92 and 1992-93 to evaluate the crop-establishment and tillage practices for irrigated rice (Oryza sativa L.)-wheat (Triticum aestivum L. emend. Fiori & Paol.) system in decreasing labour or energy requirement of the system. Grain yield of rice and wheat was not affected significantly due to different methods of rice crop establishment and tillage practice followed in wheat. However, higher total productivity of 9.30 tonnes/ha was recorded under direct-seeded, puddled condition, followed by transplanting (9.10 tonnes/ha) and direct-seeded, dry condition (8.99 tonnes/ha). Owing to substantial saving of labour under direct-seeded, puddled condition higher net return of Rs 14741/ha was obtained compared with Rs 13 498/ha under direct-seeded, dry condition and Rs 12981/ha under transplanting. Different tillage practices adopted for wheat cultivation gave similar yields and indicated that reduced tillage (with 1 barrow + 1 cultivator) was more remunerative than optimum tillage (with 2 harrows + 2 cultivators) owing to substantial saving of Rs 406/ha under the reduced tillage.

F08 CROPPING PATTERNS AND SYSTEMS

303 **Farm resource management program annual report for 1993** (1994) International Center for Agricultural Research in the Dry Areas, Aleppo (Syria). ICARDA. Tables; fig. 227 p. ICARDA--043. English. (AGRIS 95-151231).

The activities and research results of the program in 1993 on agro-ecological characterization for resource management, management of soil and nutrients, and adoption and impact of technology and international cooperation are presented.

304 Adamiak, J.; Zawislak, K.; Adamiak, E. (Akademia Rolniczo Techniczna, Olsztyn (Poland). Katedra Ogolnej Uprawy Roli i Roslin) (1994) **[Response of spring barley to the share of cereals in crop rotation and pre-harvest plants]. Reakcja jeczmienia jarego na udzial zboz w plodozmianie i dobor**

przedplonow. *Acta Academiae Agriculturae ac Technicae Olstenensis. Agricultura (Poland) (no.58) p. 103-112.* 5 tables; 11 ref. Polish. (AGRIS 95-151189).

An increase of cereal share from 50 to 67 percent in the crop rotation decreased yield of spring barley by 19 percent on the average. More pronounced yield decrease (24 percent) was observed in the 3-field rotation in which sugar beets were the pre-harvest. Yield of spring barley decreased by 14 percent when cultivated after winter wheat. Decrease of yield in long-term monoculture reached 25 percent. There were no significant differences in the responses of spring barley to increasing share of cereals in crop rotation and to monoculture.

305 Aly, A.M.; Badr, S.K.; Sherif, M.N. (Ministry of Agriculture, Cairo (Egypt). Field Crops Research Inst.) (1993) **Relay intercropping maize with potatoes and succession of wheat.** *Annals of Agricultural Science, Moshtohor (Egypt) v. 31(4) p. 1959-1976.* 9 tables; 23 ref. English. (AGRIS 95-130984).

306 Dauro, D.; Mohamedsaleem, MA. (1995) **SHOOT AND ROOT INTERACTIONS IN INTERCROPPED WHEAT AND CLOVER.** *Tropical Agriculture. 72(2):170-172.* English. [INT LIVESTOCK CTR AFRICA ADDIS ABABA ETHIOPIA].

The effect of the interaction of shoots and roots of intercropped wheat (Triticum durum var. Boohai) and clover (Trifolium quartinianum A. Rich) on the dry matter yield of shoots and roots and on the seed yield of wheat and clover was studied in wooden boxes in the dry and wet seasons with and without N applied to wheat. Root interaction, but not shoot interaction, affected the yields of the two component crops significantly. The intermingling of clover roots with wheat roots increased wheat yield while reducing that of clover. An application of N fertilizer to wheat did not alter this relationship, although it increased wheat yield. Nitrogen increased wheat yield more in the presence of root interaction with clover than in its absence, Early competition for N reduced clover yield when both root systems interacted. [References: 13].

307 Dossantos, HP.; Fancelli, AL.; Reis, EM.; Lhamby, JCB. (1995) **EFFECT OF CROP ROTATION ON GRAIN YIELD AND ON THE SEVERITY OF WHEAT ROOT DISEASES, UNDER NO-TILLAGE SYSTEM.** *Pesquisa Agropecuaria Brasileira. 30(7):923-929.* Portuguese. [EMBRAPA CTR NACL PESQUISA TRIGO CAIXA POSTAL 569 BR-99001970 PASSO FUNDO RS BRAZIL].

During five years, at the Cooperativa Agraria Mista Entre Rios Ltda., in Guarapuava, PR, Brazil, the effects of some crop rotation systems on grain yield and on the severity of wheat root diseases were assessed. Four rotation systems for wheat were studied: 1) monoculture; 2) rotation of one winter without wheat: 3) rotation of two winters without wheat; 4) rotation of three winters without wheat. A randomized complete block design with four replications and plots with 60 m(2) was used. The severity of wheat root diseases in monoculture (33%), under no-tillage, was higher than the one found in rotation with one (12%), two (9%), and three winters wheat (11%).

308 Dossantos, HP.; Reis, EM.; Andia, LH. (1995) **CROP ROTATION IN GUARAPUAVA .18. ECONOMIC ANALYSIS OF FOUR ROTATION SYSTEMS FOR BARLEY, UNDER NO-TILLAGE.** *Pesquisa Agropecuaria Brasileira. 30(6):811-817.* Portuguese. [EMBRAPA CTR NACL PESQUISA TRIGO CAIXA POSTAL 569 BR-99001970 PASSO FUNDO RS BRAZIL].

From 1984 to 1988, at the Cooperativa Agraria Mista Entre-Rios Ltda., in Guarapuava, Parana Brazil, the effects of rotation systems for barley were assessed, The economic analysis of these systems is presented in this paper. Four rotation systems for barley were studied: system I (100% of barley, in winter, and 100% of soybean, in summer); system II (50% of barley and 50% of common vetch, in winter, and 50% of soybean and 50% of corn, in summer); system III (33% of barley, 33% of flax and 33% of common vetch, in winter, and 66% of soybean and 33% of corn, in summer); and system IV (25% of barley, 25% of flax, 25% of white oat and 25% of commom vetch, in winter, and 75% of soybean and 25% of corn, in summer). Both winter and summer crops were sown under no-tillage. A randomized complete block design with four replications and plots with 60 m(2) were used. Even though the global analysis showed no difference among rotation systems, the system Ii (barley/soybean and common vetch/corn) tended to be more attractive and presented higher gross return when compared annually with other rotation systems.

309 Dressmann, Stefan (1994) **[Crop farming investigations of red clover- and luzerngrass-lea in a modified crop rotation sugar beet-winter wheat-winter barley]. Pflanzenbauliche Untersuchungen zu Rotklee- und Luzernegras - Gruenbrachen in der modifizierten Fruchtfolge Zuckerruebe-Winterweizen-Wintergerste.** Bonn Univ. (Germany). graphs 112 p. German. (AGRIS 95-151246).

310 Hansen, E.M.; Djurhuus, J.; Simmelsgaard, S.E. (1995) **[Rye grass as aftercrop in spring barley: effect of nitrate leaching and yield in sandy soil]. Alm. rajgraes som efterafgroede i vaarbyg: effekt paa nitratudvaskning og udbytte paa sandjord.** Statens Planteavlsforsoeg, Lyngby (Denmark). *Groen Viden. Landbrug (Denmark); no. 157 6 p.* SP. 4 ill. Danish. (AGRIS 95-131070).

311 Harris, H.C. (ICARDA, PO Box 5466, Aleppo (Syria)) (1994) **Water use efficiency of crop rotations in a Mediterranean environment.** Efficiency of water use in crop systems; Reading (United Kingdom); 6-8 Jul 1994. *Aspects of Applied Biology (United Kingdom) (no.38) p. 165-172.* 17 ref. English. (AGRIS 95-151239).

312 Hosamani, MH.; Kattimani, KN.; Chittapur, BM. (1995) **PERFORMANCE OF WHEAT (TRITICUM AESTIVUM)-BASED INTERCROPPING SYSTEMS UNDER RAINFED CONDITIONS.** *Indian Journal of Agronomy. 40(2):265-266.* English. [UNIV AGR SCI MAIN RES STN ALL INDIA COORDINATED WHEAT IMPROVEMENT PROJECT DHARWAD 580005 KARNATAKA INDIA].

313 Jasper, Joerg (1993) **[The effect of different fallows with vegetation cover on the rotation crop winter wheat]. Zur Effizienz unterschiedlicher Gruenbrachevarianten auf die Folgefrucht Winterweizen.** Giessen Univ. (Germany). graphs. 178 p. German. (AGRIS 95-151175).

314 Jin Rui; Hoang Gaobao; Huang Peng (Gansu Agricultural Univ., Lanzhou (China). Dept. of Agronomy) (1994) **Integrated analysis of relationship among spatial structure, plant density, fertilizer levels and yields in intercropping fields of wheat and maize.** *Journal of Gansu Agricultural University (China) v. 29(4) p. 359-365.* 6 tables; 4 ill., 4 ref. Chinese. (AGRIS 95-131015).

315 Justus, M. (Bonn Univ. (Germany)) (1993) **[Horse bean growing: Strategies for minimizing of N-loss and maximizing of the effect of the preceding crop]. Hesteboennedyrkning: Strategier til minimering af N-tab og maksimering af forfrugtsvirkning.** [Nitrogen in Organic Farming]; Lyngby (Denmark); 10-11 Aug 1992. *[Nitrogen in organic farming: Seminar]. Faellesudvalget for Oekologisk og Biodynamisk Jordbrug, Aarhus (Denmark) p. 13-15.* FOeBJ. 4 tables; 2 ref. Danish. (AGRIS 95-131069).

316 Kertikov, T.; Tsochev, I. (Institut po Furazhite, Pleven (Bulgaria)) (1995) **[Irrigated areas as additional sources of cheap forages]. Dop"lnitelni iztochnitsi na visokobelt"chen i eftin furazh ot nalichnite polivni ploshchi.** Selskostopanska Akademiya, Sofia (Bulgaria). *Ikonomika i upravlenie na selskoto stopanstvo (Bulgaria); Agricultural economics and management v. 40(1) p. 37-40.* 4 tables; 5 ref. Bulgarian. (AGRIS 95-130980).

317 Kurowski, T.P.; Hruszka, M.; Sadowski, T. (Akademia Rolniczo Techniczna, Olsztyn (Poland)) (1994) **[Health state of spring wheat in specialistic crop rotations]. Zdrowotnosc pszenicy jarej uprawianej w specjalistycznych zmianowaniach.** *Acta Academiae Agriculturae ac Technicae Olstenensis. Agricultura (Poland) (no.57) p. 127-134.* 3 tables; 17 ref. Polish. (AGRIS 95-151207).

The experiments revealed an increase in diseases of the stem base in all cropping systems; the highest increase was observed in continuous cultivation and in three-field rotation with winter wheat being the forecrop of spring wheat. Diseases of leaves and ears developed to a greater extent on spring wheat grown after field bean. No obvious correlation has been noticed between a degree of spring wheat infection and grain yield.

318 Savin, R.; Satorre, EH.; Hall, AJ.; Slafer, GA. (1995) **ASSESSING STRATEGIES FOR WHEAT CROPPING IN THE MONSOONAL CLIMATE OF THE PAMPAS USING THE CERES-WHEAT**

SIMULATION MODEL. *Field Crops Research. 42(2-3):81-91.* English. [UNIV BUENOS AIRES FAC AGRON DEPT PROD VEGETAL AV SAN MARTIN 4453 RA-1417 BUENOS AIRES DF ARGENTINA].

We evaluated a series of management strategies for rainfed wheat cropping in a monsoonal climate in the Pampas using the CERES-Wheat model with 24 years of daily weather records. These strategies included the combination of two cultivars of different maturity (intermediate and short) and two sowing dates (early and late), in two different locations (Pergamino and Marcos Juarez). In addition, the impact of not controlling weeds during the fallow preceding each crop was assessed. Simulation experiments showed that without limitations of nitrogen, maximum yields could be achieved by early sowing of the intermediate-cycle cultivar. The highest yield achieved by this strategy was partially associated with greater water consumption during the crop cycle, However, in the lowest-yield years of both sites, but particularly in Marcos Juarez, the intermediate cultivar sown early did not appear to be the best option. An analysis of stability of grain yield indicated that late sowing of the short-cycle cultivar was the most stable system. For weedy fallows, the yield of the short-cycle cultivar was more affected than the intermediate one, particularly in years of low yield. [References: 38].

319 Schmidt, J. (Halle Wittenberg Univ., Halle (Germany). Inst. fuer Allgemeinen Pflanzenbau, Ackerbau) (1994) **[Effect of the preceding crop on yield formation of winter wheat and spring barley with limited water supply on a loess-chernozem soil in the Central German Arid Zone]. Wirkung der Vorfrucht auf die Ertragsstruktur von Winterweizen und Sommergerste bei limitierter Wasserversorgung auf einem Loess-Schwarzerdestandort des mitteldeutschen Trockengebietes.** 38. Jahrestagung der Gesellschaft fuer Pflanzenbauwissenschaften; Halle/Saale (Germany); 29 Sep - 1 Oct 1994. *Mitteilungen der Gesellschaft fuer Pflanzenbauwissenschaften (Germany) v. 7 p. 269-272.* 1 graph, 3 tables; 4 ref. German. (AGRIS 95-131016).

320 Schulz Marquardt, J. (Bonn Univ. (Germany). Inst. fuer Organischen Landbau); Weber, M.; Koepke, U. (1994) **[Cropping of green fallow strips in alternation with spring wheat to produce breadmaking wheat in high quality]. Anbau von Gruenbrachestreifen im Wechsel mit Sommerweizen zur Erzeugung von Qualitaets-Backweizen.** VDLUFA-Schriftenreihe (Germany); no. 38 p. 549-552. VDLUFA. 2 ill., 2 tables; 5 ref. p. 549-552. German. (AGRIS 95-151174).

321 Sharma, N.; Prasad, R.; Singh, S. (1995) **PERFORMANCE OF POTATO (SOLANUM TUBEROSUM) PLUS WHEAT (TRITICUM AESTIVUM) RELAY CROPPING SYSTEM.** *Indian Journal of Agronomy. 40(2):176-180.* English. [INDIAN AGR RES INST DIV AGRON NEW DELHI 110012 INDIA].

A field experiment was conducted for 2 years at New Delhi, to study agronomic aspects of potato (Solanum tuberosum L.) + wheat (Triticum aestivum L. emend. Fiori & Paol.) relay cropping system. Row spacing of 50 cm as well as seed rate of 80 kg/ha of wheat was found the optimum practice for this cropping system. Nitrogen application to wheat not only increased the grain and straw yields and gross and net income of wheat but also the tuber yield of potato crop. The response of wheat to P was associated with available P content of soil.

322 Smith, E.G. (Agriculture Canada Research Station, Lethbridge, Alberta, Canada); Johnston, A.M.; Janzen, H.H. (1994) **Influence of organic amendments on the economic performance of long-term spring wheat rotations in southern Alberta.** *Journal of sustainable agriculture (USA) v. 4(3) p. 31-45.* references. English. (AGRIS 95-131008).

323 Weber, M. (Bonn Univ. (Germany). Inst. fuer Organischen Landbau); Schulz Marquardt, J.; Koepke, U. (1994) **[Alternation of greenfallow strips and spring wheat in organic farming]. Gruenbrachestreifen im Wechsel mit Sommerweizen im Organischen Landbau.** VDLUFA-Schriftenreihe (Germany); no. 38 p. 139-142. VDLUFA. 2 ill.; 5 ref. p. 139-142. German. (AGRIS 95-151229).

324 YADVINDERSINGH.; BIJAYSINGH.; Maskina, MS.; Meelu, OP. (1995) **RESPONSE OF WETLAND RICE TO NITROGEN FROM CATTLE MANURE AND UREA IN A RICE-WHEAT ROTATION.** *Tropical Agriculture. 72(2):91-96.* English. [PUNJAB AGR UNIV DEPT SOILS LUDHIANA 141004 PUNJAB INDIA].

The effect of different rates of N application from cattle manure, urea, and a combination of manure and urea (1:1) on yield and nutrient uptake of wetland rice and soil fertility was studied from 1987 to 1989. The residual effects of cattle manure and urea were assessed on the succeeding wheat crop. Cattle manure significantly (P = 0.05) improved rice yield but was less efficient than urea. The combined application of cattle manure and urea showed no positive interaction effects. The mean fertilizer N equivalents of manure ranged from 42 to 52% during the three years. Total N uptake by rice was also significantly higher from urea than manure. Apparent N recovery ranged from 35 to 48% for urea and was about 20% for cattle manure. Phosphorus and K uptake by rice increased in response to N application from urea and cattle manure, but the differences between the two treatments were small. The manure improved Olsen P, and NH4OAc-extractable K contents of the soil. Cattle manure at 120 and 180 kg N ha(-1) showed significant residual effects on the yield of the succeeding wheat crop. [References: 13].

325 Zhang Xiling (Chinese Academy of Agricultural Sciences, Anyang (China). Research Inst. of Cotton) (1994) **A study on direct cotton planting techniques of optimized cultivation under 3-1 cotton-wheat growing pattern.** *Acta Gossypii Sinica (China) v. 6(2) p. 114-121.* 8 tables; 1 ill., 5 ref. Chinese. (AGRIS 95-131038).

F30 PLANT GENETICS AND BREEDING

326 **Annual report 1993 [Scottish Crop Research Inst.]** (1994) Scottish Crop Research Institute, Dundee (United Kingdom). SCRI. 16 pp. of ref., many col. fig. and pl. 172 p. English. (AGRIS 95-131774).

327 **Germplasm program cereals annual report for 1994** (1995) International Center for Agricultural Research in the Dry Areas, Aleppo (Syria). ICARDA. Tables; fig. 258 p. ICARDA--039. English. (AGRIS 95-151516).

This report presents the results of cereal crop improvement research mainly done with the national programs in WANA region and other developing countries and in some of the mentor institutions in the industrialized countries during the 1993/94 season. The training and network activities and publications of the Program are also listed.

328 **[Research report on winterwheat (Triticum aestivum) and spelt (Triticum spelta)]. Versuchsbericht Winterweizen und Spelzweizen** (1993) Landesanstalt fuer Pflanzenbau und Pflanzenschutz, Mainz (Germany). *Bericht. Landesanstalt fuer Pflanzenbau und Pflanzenschutz Mainz (Germany); no. 93, 4 72 p.* German. (AGRIS 95-131704).

329 Abadie, TE.; Busch, RH.; Gustafson, JP. (1995) **EFFECT OF A 1R(1D) CHROMOSOME SUBSTITUTION ON TWO SPRING WHEAT CULTIVARS.** *Crop Science. 35(6):1550-1555.* English. [UNIV MINNESOTA USDA ARS PLANT SCI RES UNIT 411 BORLAUG HALL ST PAUL, MN 55108 USA].

The effect of a 1R(1D) chromosomal substitution on the spring wheat (Triticum aestivum L.) cultivars Wheaton and Marshall was studied to determine if the yield advantage, found in preliminary trials with 'Anza' in California, would be expressed in different environments and genetic backgrounds. Three experiments were conducted at two locations in Minnesota, from 1989 through 1991, with populations with and without the rye chromosome substitution developed in each cultivar background: (i) F-2 derived F-6 bulks; (ii) F-4 derived F-6 random lines; and (iii) paired F-6 lines derived from the same F-3 plant. Although, frequently, test weight was the only trait significantly reduced by the presence of the substitution, the 1R(1D) bulks and lines also tended to have lower grain yield protein content. In Experiments 2 and 3, the 1R(1D) lines tended to have shorter vegetative cycle and tailer plants. Kernel weight was rarely affected by the substitution, but when there was an effect, it was increased. Considerable genetic variability among bulks and lines within the 1R(1D) and normal wheat groups in all the populations was observed. This allowed the identification of 1R(1D) lines that were similar to the parental check cultivars for grain yield. The random lines detected effects of the rye chromosome substitution with

most resolution, probably because the lines were more homogeneous that the bulks and more random lines were tested than paired lines. [References: 17].

330 Abd El Moneim, A.M. (Suez Canal Univ., El Arish (Egypt). Faculty of Environmental and Agricultural Sciences) (1993) **Evaluation of some introduced bread wheat groups for heading, maturity and grain yield under drought conditions.** *Annals of Agricultural Science, Moshtohor (Egypt) v. 31(4) p. 1879-1888.* 7 tables; 15 ref. English. (AGRIS 95-131706).

331 Abd El Moneim, A.M. (Suez Canal Univ., El Arish(Egypt). Faculty of Environmental and Agricultural Sciences) (1993) **Study on associations and selection efficiency of some characters on durum wheat under drought conditions.** *Annals of Agricultural Science, Moshtohor (Egypt) v. 31(4) p. 1867-1878.* 6 tables; 16 ref. English. (AGRIS 95-131745).

332 Abd El Sabour, M.S.; Hassan, A.M. (Zagazig Univ., Moshtohor (Egypt). Faculty of Agriculture); Abd El Shafi, A.; Sherif, H.S.; Hamada, A. (1993) **Inheritance of resistance to stem rust in wheat at different locations in Egypt.** *Annals of Agricultural Science, Moshtohor (Egypt) v. 31(4) p. 2035-2052.* 6 ill. 9 tables; 26 ref. English. (AGRIS 95-131708).

333 Aldesuquy, HS. (1995) **HORMONES-INDUCED MODIFICATIONS IN THE RESPONSE OF WHEAT FLAG LEAF TO NACL.** *Biologia Plantarum. 37(4):605-611.* English.

A field experiment was carried out to investigate the effects of presoaking the wheat grains (Triticum aestivum L.) in 33 or 66 mM NaCl and indolyl-3-acetic acid (IAA at 50 g m(-3)), gibberellic acid (GA(3) at 100 g m(-3)) or kinetin (100 g m(-3)) on some tolerance criteria in wheat flag leaf at different stages of development. At various stages of flag leaf development pretreatment with 33 or 66 mM NaCl decreased degree of succulence (particularly 66 mM), relative growth rate, net assimilation rate, relative water content, K+ content and K+/Na+ ratio and at the same time induced accumulation of abscisic acid and Na+. In the majority of cases grain pretreatment with GA(3) or kinetin and to a lesser extent with IAA alleviated either partially or completely the deleterious effect of salinity on the above mentioned parameters.

334 Alison, M.W. (Louisiana Agricultural Experiment Station, Northeast Research Station, Winnsboro); Chaney, C.R.; Corkern, D.L.; Cuomo, G.; Eichhorn, M.M.; Faw, W.F.; Hintz, R.W.; Hafley, J.L.; Kennedy, D.; Willis, C.C. (1993) **Performance of cool-season annual forage crops in Louisiana, 1992-93.** *LAES mimeo series (USA); no. 82 34 p.* English. (AGRIS 95-131681).

335 Amawate, J.S.; Behl, P.N. (Indian Agricultural Research Institute, New Delhi (India). Division of Genetics) (1995) **Genetical analysis of some quantitative components of yield in bread wheat.** *Indian Journal of Genetics and Plant Breeding (India) v. 55(2) p. 120-125.* 3 tables; 9 ref. English. (AGRIS 95-131712).

336 Amsal Tarekegne; Getinet Gebeyehu (Institute of Agricultural Research, Addis Abeba (Ethiopia)); Tesfaye Tesema; Tanner, D.G. (1995) **Improvement in Yield Potential of Rainfed Bread Wheat in the Central Highlands of Ethiopia.** 6. Annual Conference of the Crop Science Society of Ethiopia; Addis Abeba (Ethiopia); 3-4 May 1994. *Annual Conference of the Crop Science Society of Ethiopia. Crop Science Society of Ethiopia, Addis Abeba (Ethiopia) p. 10-14.* CSSE. 4 Tables; 17 ref. English. (AGRIS 95-151652).

Experiments were conducted at the Holetta Research Center in 1989 and Kulumsa Research Center in 1989 and 1990 to estimate the progress made in improving grain yield potential of rainfed bread wheat in Ethiopia since 1949. Thirteen popular varieties released between 1949 and 1987 in the central highlands of Ethiopia were grown with the effects of other genetic changes minimized by spraying fungicides to control foliar diseases, by using nets to prevent lodging and by periodic hand weeding to control weeds. Non-limiting levels of fertilizer were applied. There were significant differences among varieties for all crop parameter studied. The grain yield potential of bread wheat varieties released since 1949 has increased at a mean rate of 77 kg ha-1 (2.21 percent) year -1 of release at Holetta and 50 kg ha-1 (1.77 percent) year-1 of release at Kulumsa. This increase in grain yield potential of bread wheat was strongly associated with increases in harvest index and showed strong and positive correlations with the number of grains m-2 and spike-1 at both locations. The results indicate that genetic improvement has substantially increased the grain yield potential of rainfed bread wheat in the central highlands of Ethiopia, resulting from improvements in harvest inter associated with an increased number of grains spike-1 and grains m-2.

337 Anderson, O.D.; Weeks, J.T.; Blechl, A.E.; Tam, A. (US Dept. of Agriculture, Albany (USA). Agricultural Research Service); Greene, F.C. (US Dept. of Agriculture, Athens (USA). Agricultural Research Service) (1993) **Progress towards genetic engineering of wheat with improved quality. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 495.* Abstract only. English. (AGRIS 95-131327).

338 Andrews, J.L.; Blundell, M.J.; Skerritt, J.H. (Commonwealth Scientific and Industrial Research Organisation, North Ryde (Australia). Div. of Plant Industry) (1993) **Wheat-rye translocation detection using antibodies to rye prolamins. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 503.* Abstract only. English. (AGRIS 95-131332).

339 Andrews, J.L.; Skerritt, J.H. (Commonwealth Scientific and Industrial Research Organisation, North Ryde (Australia). Div. of Plant Industry) (1993) **Identifying amino-acid sequences relevant to wheat dough strength using antibody reactions [glutenin].** *Chemistry in Australia (Australia) v. 60(9) p. 457.* 12 ref. English. (AGRIS 95-131324).

340 Art, S.; Bilgen, G.; Cobanoglu, G.; Gurel, F.; Gozukirmizi, N. (1995) **DETERMINATION OF BARLEY HYBRIDS WITH MOLECULAR MARKERS.** *Cereal Research Communications. 23(3):229-234.* English. [TUBITAK MARMARA RES CTR GENET ENGN & BIOTECHNOL RES INST POB 21 GEBZE 41470 TURKEY].

Wild lines and cultivars of barley (Hordeum vulgare, L. cvs. Kaya, Quantum, Tokak, Yercil and Cumhuriyet) and their hybrids were characterized by random amplified polymorphic DNA assay. DNA's isolated from parents and F-1 hybrids were amplified using ten base long primers by a polymerase chain reaction (PCR). Hybrids giving selective banding patterns from both the cultivars and wild parents were taken as real hybrids. This technique is convenient for plant breeders since it is rapid, sensitive and inexpensive.

341 Atkinson, MD.; Whelan, EDP.; Miller, TE. (1995) **IDENTIFICATION AND BREEDING BEHAVIOUR OF A MAJOR DELETION OF CHROMOSOME 5D OF TRITICUM AESTIVUM.** *Euphytica. 84(3):189-195.* English. [UNIV WOLVERHAMPTON SCH APPL SCI WOLVERHAMPTON WV1 1SB ENGLAND].

A study was undertaken to evaluate the breeding behaviour and to identify a spontaneously produced putative chromosomal deletion in the winter wheat (Triticum aestivum L. em. Thell.) cv Norstar. Male and female transmission studies of plants heterozygous for the deletion chromosome indicated 9.5% and 48.8% transmission through the pollen and the egg, respectively. Meiotic analyses of progeny from deletion heterozygotes indicated that the deletion chromosome was eliminated from half of the plants, which agreed with the male and female transmission frequencies. Testcrosses of the deletion chromosome with telocentrics and nullisomic-tetrasomic combinations suggested that the deletion involved the long arm of chromosome 5D. This was confirmed by restriction fragment length polymorphism (RFLP) analysis. Also, monosomic plants obtained in progeny of deletion heterozygotes were shown to be monosomic for 5D. Studies of plants homozygous for the deletion showed relatively normal pairing between the deletion chromosomes, and with the short arm (5DS), but not the long arm (5DL). Deletion homozygotes were self-sterile, and morphologically similar to plants nullisomic for 5D, but plants that also contained 5DL, or a homoeologous chromosome were self-fertile and had normal morphology. Studies of chromosome morphology indicated that the deletion chromosome was metacentric, and the length of the long arm was reduced by approximately 60%. RFLP studies showed that, in terms of genetic distance, 90% of the arm was missing. [References: 21].

342 Autran, J.C. (Institut National de la Recherche Agronomique, Montpellier (France). Centre de Montpellier, Technologie des Cereales) (1995) **[Wheat selection for industrial purposes [ECLAIR program, European Collaborative Linkage of Agriculture and Industry through Research]]. Selection: comment mieux repondre aux attentes des industriels? [programme agro-industriel ECLAIR, European Collaborative Linkage of Agriculture and Industry through Research].** *Perspectives Agricoles (France) (no 203) p. 40-43.* French. (AGRIS 95-131365).

343 Backlund, J.E. (Minnesota Univ., St.Paul (USA). United States Dept. of Agriculture/Agricultural Research Service. Cereal Rust Lab.); Boehm, E.W.A.; Szabo, L.J.; Bushnell, W.R. (1992) **Genome size and chromosome number of the wheat stem rust fungus, Puccinia graminis f.sp. tritici.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 19-21.* 2 graphs; 4 ref. English. (AGRIS 95-131272).

The haploid genome size of Puccinia graminis f.sp. tritici was estimated to be 58 Mb by reassociation kinetics, and consists of two major components: a unique fraction, and a repetitive fraction. Similar genome sizes of 54 and 62 Mb have been estimated by reassociation kinetics for two other phytopathogenic fungi, Bremia lactucae and Phytophthora megasperma, respectively. The relative amount of repetitive sequences among these three organisms ranges from 30 to 60%. Reconstructions of serially sectioned nuclei have yielded a haploid karyotype of 18 for P. graminis, 17 for P. coronata and 18 for M. lini. These rust fungi have significantly higher chromosome numbers than it has been reported previously.

344 Badaeva, ED.; Jiang, JM.; Gill, BS. (1995) **DETECTION OF INTERGENOMIC TRANSLOCATIONS WITH CENTROMERIC AND NONCENTROMERIC BREAKPOINTS IN TRITICUM ARARATICUM - MECHANISM OF ORIGIN AND ADAPTIVE SIGNIFICANCE.** *Genome. 38(5):976-981.* English. [KANSAS STATE UNIV AGR & APPL SCI DEPT PLANT PATHOL WHEAT GENET RESOURCE CTR MANHATTAN, KS 66506 USA].

Triticum araraticum Jakubz. (2n = 4x = 28, A(t)A(t)GG), a wild progenitor of the polyploid cultivated wheat T. timopheevii, shows extensive chromosome translocation polymorphism in natural populations from the Middle East and Transcaucasia. From an extensive survey, eight intergenomic translocation types were observed and their breakpoints analyzed by genomic in situ hybridization. The previously reported species-specific 6A(t)-1G-4G cyclic translocation was found in all accessions studied. In four translocation types, the breakpoints were in interstitial regions of chromosomes and the other four arose via centric-breakage-fusion. A model is presented on the mechanism of origin and the adaptive significance of translocations with centromeric and noncentromeric breakpoints. [References: 14].

345 Bahaa El Den, J. (Directorate of Agricultural Research, Douma (Syria)) (1993) **Development of a new barley line by induced mutation [Hordeum vulgare].** *RACHIS (ICARDA); Barley and Wheat Newsletter v. 12(1-2) p. 8-10.* 4 tables. English. (AGRIS 95-151519).

Sodium azide was applied to induce mutations in barley (Hordeum vulgare L. spp. vulgare) variety ER/APAM, with the objective of increasing plant height. The sodium azide induced chlorophyll mutations. Few chromosome aberrations were observed. A mutant line, E-3559, was compared with the original variety over three years (1987-1989) at Al-Moujarje Research Center, Hassakeh (annual rainfall 250 mm). The mutant line was consistently taller and produced more straw compared with the original variety, ER/APAM.

346 Baier, AC.; Somers, DJ.; Gustafson, JP. (1995) **ALUMINIUM TOLERANCE IN WHEAT - CORRELATING HYDROPONIC EVALUATIONS WITH FIELD AND SOIL PERFORMANCES.** *Plant Breeding-Zeitschrift fur Pflanzenzuchtung. 114(4):291-296.* English. [UNIV MISSOURI DEPT AGRON PLANT SCI UNIT COLUMBIA, MO 65211 USA].

The objective of this study was to correlate root length of wheat (Triticum aestivum L.) genotypes grown in Al-containing, acidic hydroponic solutions, with root weights from acid-soil experiments and field scores from Brazilian acid-field trials. A total of 43 wheat genotypes, primarily from Brazil, were evaluated by growing seedlings for 4 days in hydroponic solutions containing 0.0-4.0 mg/l Al. The root growth rate of all the genotypes was reduced with the addition of Al to the solution and the Al-sensitive and Al-tolerant wheat genotypes were clearly identified. Genotypes with intermediate Al-tolerance levels showed variable root lengths in response to Al stress. Correlations between root length or a root tolerance index (RTI) in the Al solutions versus acid-soil experiments and acid-field trials were highly significant ($r = 0.71$-0.85, $P < 0.01$). The most significant correlation was observed among seedlings grown in 1 mg/l Al. This study presents evidence that this short duration and simple screening technique provides a highly significant correlation with previous acid-soil Al-tolerance evaluations. Furthermore, the data obtained suggest that hydroponic screening of wheat seedlings for Al tolerance may be used in breeding programmes or in screening germplasm collections. [References: 23].

347 Balatero, C.H.; Darvey, N.L. (Sydney Univ., Cobbitty (Australia). Plant Breeding Inst.) (1992) **In vitro androgenesis and doubled haploid production in hexaploid triticale (XTriticosecale Wittmack). [Conference paper].** Abstracts of the Australian Society of Plant Physiologists (Australia) p. P6. Australian Society of Plant Physiologists. p. P6. English. (AGRIS 95-131312).

348 Balevska, P.; Vassileva, I. (1995) **ATTEMPTS IN BROADENING VARIABILITY OF TRITICALE PRODUCTIVITY.** *Cereal Research Communications. 23(3):263-266.* English. [BULGARIAN ACAD SCI INST GENET ACAD D KOSTOFF BU-1113 SOFIA BULGARIA].

F2 hybrid plants obtained via the following hybridization schedule: (F1 wheat-rye polyhaploids)x primary hexaploid triticales were analyzed. More expressed variability of plant height and number of spikelets per spike is observed in the hybrid combinations with S. cereale as compared to those with S. montanum. Number of florets show least variability in both types of hybrid combinations. Grain number per spike and plant grain weight show the greatest diversity. A proposition is made for the leading role of triticale and wheat parents in determination of the hybrids' productive variability.

349 Balkandzhieva, Yu. (Institut po Genetika, Sofia (Bulgaria)); Karadzhova, J. (1994) **[Genetic sources of resistance to Fusarium on the barley ears]. Genetichni iztochnitsi za ustojchivost na echemika k"m fuzarioza po klasa.** Selskostopanska Akademiya, Sofia (Bulgaria). *Rasteniev"dni Nauki (Bulgaria); Plant Science v. 31(7-10) p. 79-82.* 1 table; 6 ref. English. (AGRIS 95-151502).

350 Bastergue, P. (Centre Technique Permanent de la Selection des Plantes Cultivees (France). Section Cereales a Paille) (1995) **[Straw cereals. The come back of hybrid soft wheats. The French official catalogue is enriched with 3 varieties of hybrid soft wheat]. Cereales a paille. Le retour des bles tendres hybrides. Le catalogue officiel francais s'enrichit de 3 varietes de ble tendre hybride.** *Bulletin de la Federation Nationale des Agriculteurs Multiplicateurs de Semences (France) (no 130) p. 45-46.* French. (AGRIS 95-131672).

351 Baum, B.R. (Agriculture Canada, Ottawa, Ontario, Canada); Johnson, D.A. (1994) **Simultaneous PCR amplification of two barley 5S rDNA sequence types in the same PCR reaction.** *Plant molecular biology reporter (USA) v. 12(4) p. 341-346.* references. English. (AGRIS 95-151513).

352 Becker, J.; Heun, M. (1995) **MAPPING OF DIGESTED AND UNDIGESTED RANDOM AMPLIFIED MICROSATELLITE POLYMORPHISMS IN BARLEY.** *Genome. 38(5):991-998.* English. [AGR UNIV NORWAY DEPT BIOTECHNOL SCI DIV POPULAT GENET POB 5040 N-1432 AS NORWAY].

The broad use of microsatellites as a tool for constructing linkage maps in plants has been limited by the need for sequence data to detect the underlying simple sequence repeats. Therefore, random amplified microsatellite polymorphisms (RAMPs) were studied as an alternative approach for barley mapping. Labelled (GA)(n) simple sequence repeat primers were combined with RAPD primers of different length and sequence to generate RAMPs. To get additional polymorphisms (called dRAMPs), the obtained products were also analysed after digestion with MseI. There were 0-11 polymorphisms found per primer combination. Sixty RAMPs/dRAMPs identifying 40 new loci were mapped onto a barley RFLP map. The new DNA markers are found on all chromosomes and they increased the length of the barley map by 174 cM to a total of 1270 cM. Interestingly, the

RAMPs/dRAMPs caused stretching effects in genome areas where stretching was also observed for AFLPs. [References: 30].

353 Belay, G.; Tesemma, T.; Mitiku, D. (Debre Zeit Agricultural Center (Ethiopia)) (1993) **Variability and correlation studies in durum wheat in Alem-Tena, Ethiopia [Triticum durum].** *RACHIS (ICARDA); Barley and Wheat Newsletter v. 12(1-2) p. 38-41.* 2 tables; 6 ref. English. (AGRIS 95-151638).

Variability and correlation studies were carried out on seed yield and nine component characters of 70 durum wheat (Triticum turgidum L. ssp. durum (desf.) Husn.) genotypes in Alem-Tena, Ethiopia. Seed yield showed the highest variation indicating the wide opportunity for direct selection. The lowest variation was shown by days-to-heading. Higher variations were also observed for number of tillers and kernels/spike. Seed yield exhibited a strong positive association with all characters except days-to-heading and harvest index. Besides seed yield itself, plant height and 1000-kernel weight may be considered good indirect selection criteria under Alem-Tena conditions.

354 Boskovic, J. (Faculty of Agriculture, Novi Sad (Yugoslavia). Inst. for Plant Protection); Boskovic, M. (1992) **A Boolean algebraic approach to modeling the gene-for-gene relationship in Puccinia recondita tritici and wheat hybrids.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 97-99.* 4 ref. English. (AGRIS 95-131702).

355 Brennan, J.P.; Fox, P.N. (New South Wales Agriculture, Wagga Wagga (Australia)) (1995) **Impact of CIMMYT wheats in Australia: evidence of international research spillovers. [Economics Research report no 1/95].** New South Wales Agriculture. 4 fig., 17 tables. 67 p. English. (AGRIS 95-131341).

Provides detailed analyses of the impacts, in both yield and financial terms, on Australian wheat production of varieties introduced over the years from the CIMMYT breeding programme in Mexico. Although the programme is directed at developing countries, Australia has received spillover benefits in the material which has been imported over the past 20 years. Few of the imported lines have been used directly in Australia, but have been used as parent lines in the breeding of new varieties specifically adapted to the Australian environment. The increased yields and improved resistance to diseases which have resulted can be translated into specific financial benefits on a national scale and these are detailed in the report. This report revises and updates a cost benefit report produced in 1986 on the CIMMYT breeding programme benefits.

356 Brettell, R.I.S.; Chamberlain, D.A.; Drew, A.M.; McElroy, D.; Witrzens, B.; Dennis, E.S. (Commonwealth Scientific and Industrial Research Organisation, Canberra (Australia). Div. of Plant Industry) (1993) **An assessment of methods for the genetic transformation of wheat. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 495.* Abstract only. English. (AGRIS 95-131328).

357 Bucholc, M.; Buchowicz, J. (1994) **A minichromosome-like structure in wheat embryos.** *Plant molecular biology reporter / (USA) v. 12(3) p. 204-208.* references. English. (AGRIS 95-131733).

358 Busch, W.; Herrmann, RG.; Martin, R. (1995) **REFINED PHYSICAL MAPPING OF THE SEC-1 LOCUS ON THE SATELLITE OF CHROMOSOME 1R OF RYE (SECALE CEREALE).** *Genome. 38(5):889-893.* English. [UNIV MUNICH INST BOT MENZINGERSTR 67 D-80638 MUNICH GERMANY].

The Sec-1 locus (omega-secalin) of rye (Secale cereale L.) was mapped in the satellite of the short arm of chromosome 1R using fluorescence in situ hybridization and a genomic probe called pSec2B. Sec-1 is located in the middle of the satellite at the junction of the proximal euchromatic and the distal heterochromatic regions. Double hybridization experiments using rDNA and pSec2B showed that the NOR spans over the secondary constriction of the short arm of chromosome 1R and that there is a clearly visible gap between the NOR and Sec-1. Heterologous hybridization of pSec2B to barley visualized the B-hordein locus on chromosome 1H. [References: 31].

359 Caillaud, CM.; Dedryver, CA.; Dipietro, JP.; Simon, JC.; Fima, F.; Chaubet, B. (1995) **CLONAL VARIABILITY IN THE RESPONSE OF SITOBION AVENAE (HOMOPTERA, APHIDIDAE) TO RESISTANT AND SUSCEPTIBLE WHEAT.** *Bulletin of Entomological Research. 85(2):189-195.* English. [ENSAR INRA CHAIRE ZOOL LAB DOMAINE MOTTE VICOMTE F-35650 LE RHEU FRANCE].

The development and reproduction of 60 clones of Sitobion avenae (Fabricius), collected in the Rennes Basin, were compared on a resistant Triticum monococcum (Linnaeus) line (Tm44) and a susceptible Triticum aestivum (Linnaeus) cultivar (Arminda). All clones had lower larval survival and mean fecundity when reared on Tm44 in comparison with Arminda. They all performed equally well on Arminda whereas there was a marked and continuously distributed variation in performance parameters among clones maintained on Tm44. The plant species, from which clones originated, significantly affected aphid performances on resistant Tm44. A more detailed experiment was carried out with four clones, shown to differ in their level of fitness on Tm44. Their performances were compared on resistant (Tm44 and Tm46) and susceptible (Tm47 and Arminda) wheat genotypes. On the basis of larval development time and intrinsic rate of natural increase (r(m)), two types of response were distinguished among the four clones: clones Sal and Sa39 appeared to be less affected by Tm44 and Tm46 resistance than Sar2 and Sa48. Moreover, Tm46 was much less resistant to clone Sal than was Tm44. These results are discussed in relation to the origins of the variation in performance of S. avenae on resistant wheat, and their implications in plant breeding for resistance to S. avenae. [References: 37].

360 Calderini, D.F.; Torres Leon, S.; Slafer, G.A.; Dreccer, M.F. (Buenos Aires Univ. (Argentina). Dept. of Plant Production) (1992) **Relationship between grain number and individual grain weight in old and modern Argentinian wheat cultivars. [Conference paper].** Abstracts of the Australian Society of Plant Physiologists (Australia) p. P10. Australian Society of Plant Physiologists. p. P10. English. (AGRIS 95-131338).

361 Chalhoub, B.A.; Lapierre, H.D. (Institut National de Recherches Agronomiques (INRA), Versailles (France). Station de Pathologie Vegetale); Sarrafi, A. (Ecole Nationale Superieure Agronomique, Toulouse (France)) (1995) **[Diallel analysis for partial resistance of five barley (Hordeum vulgare L.) genotypes to a PAV-like isolate of barley yellow dwarf virus]. Analisi diallelica della resistenza parziale di cinque genotipi di orzo (Hordeum vulgare L.) a un isolato tipo PAV del virus del nanismo giallo dell'orzo.** *Journal of Genetics and Breeding (Italy) v. 49(1) p. 31-36.* 4 tables; 14 ref. English. (AGRIS 95-131412).

Five barley (Hordeum vulgare L.) genotypes chosen for their differential reaction to a PAV-like isolate of barley yellow dwarf virus (BYDV), were crossed in a diallel mating design to study the inheritance of resistance. Plants of these genotypes and their F1 hybrids were inoculated at the first leaf stage with isolate RG of the BYDV-PAV and grown in a growth chamber. Virus titer in shoots, estimated by enzyme linked immunosorbent assay (ELISA), and fresh shoot weight were recorded 25 days after inoculation. A partial resistance index (PRI) calculated as the ratio of the fresh shoot weight of inoculated and non inoculated plants (used as control) was also calculated. Significant general combining ability (GCA) effects and a good association between GCA effects for fresh shoot weight, PRI and ELISA values were observed, indicating that all measures were good indicators for partial resistance to BYDV-PAV. Specific combining ability effects were significant only for fresh shot weight. The whole results showed the resistant line 80-81 BQCD 10 and cv. Vixen to be good combiners for partial resistance to this disease.

362 Chalhoub, BA.; Sarrafi, A.; Lapierre, HD. (1995) **PARTIAL RESISTANCE IN THE BARLEY (HORDEUM VULGARE L) CULTIVAR CHIKURIN IBARAKI 1 TO TWO PAV-LIKE ISOLATES OF BARLEY YELLOW-DWARF VIRUS - ALLELIC VARIABILITY AT THE YD2 GENE LOCUS.** *Plant Breeding-Zeitschrift fur Pflanzenzuchtung. 114(4):303-307.* English. [INRA PATHOL VEGETALE STN ROUTE ST CYR F-78026 VERSAILLES FRANCE].

The Japanese barley cultivar, 'Chikurin Ibaraki 1', is partially resistant to the PAV serotype of barley yellow-dwarf virus (BYDV), but its induced

mutant line, Ea52, is susceptible. The inheritance of resistance in cv. 'Chikurin Ibaraki I' to BYDV-PAV was investigated. The F-1 and F-2 plants of crosses of cvs 'Chikurin Ibaraki I', Ea52, 'Vixen', carrying the Yd2 gene of resistance, and 'Plaisant', a susceptible French cultivar, were tested in growth chamber and field conditions. Isolate RG, against which 'Chikurin Ibaraki I' is partially resistant in growth chamber and field conditions, and isolate 2t, which overcomes the partial resistance of 'Chikurin Ibaraki I' in field conditions (Chalhoub et al. 1994) were used. The segregation of F-2 plants of crosses between 'Chikurin Ibaraki I' and the susceptible cultivars to isolate RG (one resistant to three susceptible) suggests that the resistance of 'Chikurin Ibaraki I' is controlled by a single recessive gene. All 537 F-2 plants of 'Chikurin Ibaraki 1' x 'Vixen' tested with isolate RG in growth chamber and field conditions were resistant, The F-2 plants of this cross were all resistant to isolate 2t in growth chamber conditions but segregated with a ratio of one resistant to three susceptible in field conditions owing to the susceptibility of 'Chikurin Ibaraki 1' to this isolate. Results suggest that the resistance gene in 'Chikurin Ibaraki 1' is tightly linked or allelic with the Yd2 gene in 'Vixen'. However, it differs from this gene in 'Vixen' in that it can be overcome by isolate 2t in field conditions. [References: 16].

363 Chaudhry, M.H.; Anwar, J.; Hussain, S.; Salah ud Din, S. (Wheat Research Inst., AARI, Faisalabad (Pakistan)) (1994) **Interrelationship between wheat yield and its components.** *Journal of Agricultural Research (Pakistan) v. 32(2) p. 119-126.* 3 tables, 20 ref. English. (AGRIS 95-151655).

364 Chen Xuanmin; Yang Yuchuo (Zhejiang Academy of Agricultural Sciences, Hangzhou (China). Inst. of Plant Protection) (1994) **A preliminary built database management system of diseases resistance of barley germplasm resources in China.** *Acta Phytophylacica Sinica (China) v. 21(1) p. 85--89.* 1 ill., 4 ref. Chinese. (AGRIS 95-131395).

365 Cornish, G.B.; Palmer, G.A. (South Australian Research and Development Inst., Adelaide. Cereals Lab.); Wrigley, C.W. (Commonwealth Scientific and Industrial Research Organisation, North Ryde (Australia). Div. of Plant Industry) (1993) **Mapping the origins of some HMW and LMW glutenin subunit alleles in Australian wheat germplasm. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 508.* Abstract only. English. (AGRIS 95-131334).

366 Cox, T.S. (Kansas State Univ., Manhattan (USA). United States Dept. of Agriculture/Agricultural Research Service. Dept. of Agronomy and Plant Pathology. Wheat Genetics Resource Center); Gill, B.S. (1992) **Use of diploid progenitors to improve leaf rust resistance in hexaploid wheat.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 185-187.* 1 table; 4 ref. English. (AGRIS 95-131703).

367 Dao Quang Vinh; Tran Hong Uy (1993) **[Some research results on collection of wheat at the Maize Research Institute [of Vietnam]]. Ket qua buoc dau ve chon giong lua mi tai Vien Nghien cuu Ngo.** *Nong Nghiep Cong Nghiep Thuc Pham (Viet Nam) (no.7) p. 258-260.* 3 tables. Vietnamese. (AGRIS 95-131349).

368 Delaney, DE.; Nasuda, S.; Endo, TR.; Gill, BS.; Hulbert, SH. (1995) **CYTOLOGICALLY BASED PHYSICAL MAPS OF THE GROUP 3 CHROMOSOMES OF WHEAT.** *Theoretical & Applied Genetics. 91(5):780-782.* English. [KANSAS STATE UNIV AGR & APPL SCI DEPT PLANT PATHOL 425 THROCKMORTON HALL MANHATTAN, KS 66506 USA].

Cytologically based physical maps for the group 3 chromosomes of wheat were constructed by mapping 25 Triticum aestivum deletion lines with 29 T. tauschii and T. aestivum RFLP probes. The deletion lines divide chromosomes 3A, 3B, and 3D into 31 discrete intervals, of which 18 were tagged by marker loci. The comparison of the consensus physical map with a consensus RFLP linkage map of the group 3 chromosomes of wheat revealed a fairly even distribution of marker loci on the long arm, and higher recombination in the distal region. [References: 4].

369 Delaney, DE.; Nasuda, S.; Endo, TR.; Gill, BS.; Hulbert, SH. (1995) **CYTOLOGICALLY BASED PHYSICAL MAPS OF THE GROUP-2 CHROMOSOMES OF WHEAT.** *Theoretical & Applied Genetics. 91(4):568-573.* English. [KANSAS STATE UNIV AGR & APPL SCI DEPT PLANT PATHOL MANHATTAN, KS 66506 USA].

We have constructed cytologically based physical maps (CBPMs), depicting the chromosomal distribution of RFLP markers, of the group-2 chromosomes of common wheat (Triticum aestivum L. em Thell). Twenty-one homozygous deletion lines for 2A, 2B, and 2D were used to allocate RFLP loci to 19 deletion-interval regions. A consensus CBPM was colinearily aligned with a consensus genetic map of group-2 chromosomes. The comparison revealed greater frequency of recombination in the distal regions. Several molecularly tagged chromosome regions were identified which may be within the resolving power of pulsed-field gel electrophoresis. The CBPMs show that the available probes completely mark the group-2 chromosomes, and landmark loci for sub-arm regions were identified for targeted-mapping. [References: 28].

370 Dhawan, P.S.C. (Indian Agricultural Research Inst., New Delhi (India). Div. of Nematology); Gulati, S.C. (Indian Agricultural Research Inst., New Delhi (India). Div. of Genetics) (1995) **[Inheritance of resistance in barley to the cereal cyst nematode - Heterodera avenae [India]]. Ereditarieta' della resistenza nell'orzo al nematode da cisti dei cereali - Heterodera avenae [India].** *Nematologia Mediterranea (Italy) v. 23(1) p. 77-79.* 3 tables; 10 ref. English. (AGRIS 95-151512).

The F1, F2 and backcross (BC1 and BC2) progenies of cross combinations DL 482 x RD 2052 and DL 482 x C 164 were tested against the pathotype-1 (Delhi population) of Heterodera avenae. The F1 of both the cross combinations were resistant, suggesting that resistance was dominant. In F2, the plants segregated into 3 Resistant: 1 Susceptible ratio thus suggesting a monogenic dominant control of resistance over susceptibility. The backcross (BC1) with the susceptible parent, DL 482 gave 1 Resistant: 1 Susceptible ratio which confirmed the monogenic dominant nature of resistance in the two barley cultivars "RD 2052" and "C 164". The backcross (BC2) gave all the resistant plants, further confirming the results obtained in the F2 generation.

371 Dhir, S.K.; Pajeau, M.E.; Fromm, M.E.; Fry, J.E. (Monsanto Co., St Louis (USA). Agricultural Group) (1993) **Anthocyanin genes as visual markers for wheat transformation. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 512.* Abstract only. English. (AGRIS 95-131336).

372 Donini, P.; Koebner, RMD.; Ceoloni, C. (1995) **CYTOGENETIC AND MOLECULAR MAPPING OF THE WHEAT-AEGILOPS LONGISSIMA CHROMATIN BREAKPOINTS IN POWDERY MILDEW-RESISTANT INTROGRESSION LINES.** *Theoretical & Applied Genetics. 91(5):738-743.* English. [UNIV TUSCIA DEPT AGROBIOL & AGROCHEM I-01100 VITERBO ITALY].

The amount of alien chromatin introgressed in eight wheat/Ae, longissima Pm13 recombinant lines, involving breakpoints on the short arms of wheat chromosomes 3B and 3D, was evaluated by cytogenetic and molecular approaches. For each line the residual homologous synaptic ability of the recombinant chromosome in its proximal wheat and distal alien portion was estimated through meiotic analyses. Subsequently, telocentric and RFLP mapping were used to assess the genetic distance from the wheat centromere to the wheat/Ae, longissima breakpoints. One 3B recombinant line was distinguished from the other four by the chromosome pairing and telocentric mapping analyses, RFLP analysis succeeded in differentiating the remaining four lines into two groups. Chromosome pairing and telocentric mapping of the three 3D recombinant lines suggested that all had distinct breakpoints. However, the RFLP data could not discriminate between the two more proximal translocations. Physical locations for some RFLP loci were determined by a comparison of genotypes and C-banding karyotypes, This showed a considerable expansion of the genetic map compared to its physical length. [References: 36].

373 Dubcovsky, J.; Luo, MC.; Dvorak, J. (1995) **LINKAGE RELATIONSHIPS AMONG STRESS-INDUCED GENES IN WHEAT.** *Theoretical & Applied Genetics. 91(5):795-801.* English. [INTA IRB RA-1712 CASTELAR BUENOS AIRES ARGENTINA].

Linkage relationships among genes responding to water-deficit, salt stress, and heat shock were investigated in diploid wheat, Triticum monococcum L. The position of these gene loci relative to closely linked markers and the

centromeres is reported. It is proposed to continue to use the present T. monococcum mapping population and the genetic maps based thereon as a framework for future determination of relationships among other genes related to environmental stress in the tribe Triticeae. [References: 45].

374 Dyubin, V.N.; Novikova, M.V.; Serbin, A.D. (1993) **[Agroclimatic evaluation of winter wheat plant height]. Agroklimaticheskaya otsenka vysoty rastenij sortov ozimoj pshenitsy.** *Nauchno-tekhnicheskij byulleten' VIR (Russian Federation) (no.231) p. 6-10.* Russian. (AGRIS 95-151657).

375 El Bawab, A.M.O (1994) **Response of some barley cultivars to grow under different environmental conditions.** Cairo Univ. (Egypt). Faculty of Agriculture. 26 tables; ref. p. 114-131. 138 p. English. (AGRIS 95-131408).

376 El Madidi, S. (Institut National de la Recherche Agronomique, Gif sur Yvette (France). Centre de Versailles, Genetique Vegetale); Zivy, M.; Thiellement, H. (1995) **[Phylogenetic relationships in the Triticeae tribe using protein markers]. Relations phylogeniques dans la tribu des Triticees etablies a partir de marqueurs proteiques.** Colloques de l'INRA (France); no. 72 p. 203-207. INRA. 6 ref. p. 203-207. French. (AGRIS 95-131656).

377 Elkeles, A.; Devos, KM.; Graur, D.; Zizi, M.; Breiman, A. (1995) **MULTIPLE CDNAS OF WHEAT VOLTAGE-DEPENDENT ANION CHANNELS (VDAC) - ISOLATION, DIFFERENTIAL EXPRESSION, MAPPING AND EVOLUTION.** *Plant Molecular Biology. 29(1):109-124.* English. [TEL AVIV UNIV GEORGE S WISE FAC LIFE SCI DEPT BOT IL-69978 RAMAT AVIV ISRAEL].

The mitochondrial outer membrane of eukaryotic cells contains voltage-dependent anion channels (VDAC) also termed porins. Three cDNAs from wheat (Triticum aestivum) were isolated and sequenced (Tavdac 1-3). They share 65% similarity of their amino acid sequences, and therefore they probably represent isoforms. The deduced amino acid sequence of one of the cDNAs was found to be identical to the purified VDAC protein from wheat mitochondria [8]. Secondary structure analysis of the deduced amino acid sequences of the three vdac cDNAs revealed a characteristic ct helix at their N-terminal and beta-barrel cylinders characteristic of VDAC channels. The Tavdac cDNAs are differentially expressed in meristematic tissues. The transcript levels of Tavdac I in all wheat tissues is at least 2.5-fold higher than Tavdac 2 and Tavdac 3. Tavdac 2 has a low level of expression in all floral tissues whereas Tavdac 3 is highly expressed in anthers. This is the first report on differential expression of vdac genes in plants. The Tavdac genes have been mapped on the wheat genome. Tavdac I is located on the long arm of chromosome 5, Tavdac 2 on the long arm of chromosome 1 and Tavdac 3 on the long arm of chromosome 3. A phylogenetic reconstruction indicates that vdac genes underwent numerous duplication events throughout their evolution. All duplications occurred after the separation of plants from animals and fungi, and no orthologous genes are shared among phyla. Within plants, some of the vdac gene duplications probably occurred before the monocotydelon-dicotydelon split. [References: 48].

378 Esmail, S.E. (Monoufeyia Univ., Shebin El Kom (Egypt). Faculty of Agriculture); El Tabbakh, S.S. (1995) **Evaluation of some bread wheat genotypes for drought resistant and estimation of their similarities by cluster analysis.** *Menofiya Journal of Agricultural Research (Egypt) v. 20(1) p. 67-82.* 1 ill. 5 tables; 18 ref. English. (AGRIS 95-131710).

379 Faccioli, P.; Terzi, V.; Monetti, A.; Nicola, J.; Pecchioni, N. (1995) **B-HORDEIN STS MARKERS FOR BARLEY GENOTYPE IDENTIFICATION - COMPARISON WITH RFLPS, HORDEIN A-PAGE AND MORPHOPHYSIOLOGICAL TRAITS.** *Seed Science & Technology. 23(2):415-427.* English. [IST SPERIMENTALE CEREALICOLTURA SEZ FIORENZUOLA A VIA S PROTASO 302 I-29017 FIORENZUOLA DARDA ITALY].

A sequence tagged site (STS) for identification of barley cultivars has been developed from a B-hordein cDNA sequence. Its efficiency in discriminating between genotypes has been evaluated in comparison with twenty-two morpho-physiological traits, four RFLP probes and hordein acid polyacrylamide gel electrophoresis (A-PAGE). The results of the similarity matrixes, computed by Jaccard's coefficient, have been used to perform a principal coordinate analysis (PCO) to study the relationships between the different cultivars. Procrustes analysis of the PCO data was used to demonstrate the capability of each barley fingerprinting method to show tile same or different kinds of variability. The results are discussed and the possible use for B-hordein STS markers in barley cultivar identification is proposed.

380 Fang Furong; Shang Hong (Xinjiang Academy of Agricultural Sciences, Urumqi (China). Inst. of Grain Crops) (1994) **Preliminary study on the genetic difference among barley varieties.** *Xinjiang Agricultural Sciences (China) (no. 6) p. 256-259.* 3 tables; 1 ill., 5 ref. Chinese. (AGRIS 95-131397)

381 Farooq, S.; Asghar, M.; Iqbal, N.; Askari, E.; Arif, M.; Shah, TM. (1995) **PRODUCTION OF SALT-TOLERANT WHEAT GERMPLASM THROUGH CROSSING CULTIVATED WHEAT WITH AEGILOPS CYLINDRICA .2. FIELD EVALUATION OF SALT-TOLERANT GERMPLASM.** *Cereal Research Communications. 23(3):275-282.* English. [NUCL INST AGR & BIOL FAISALABAD PAKISTAN].

Wheat germplasm produced through wide hybridization and three wheat varieties were compared for salt-tolerance potential under field conditions at an electrical conductivity varying between 6-10 dS/m. Comparative performance of the same material with direct sowing and transplanting and possible effects of the cultivation method on the concentration of sodium (Na+) and potassium (K+) was also studied. There was little difference in the yield components of the salt-tolerant wheats and lines, except for mean grain yield, which was significantly reduced in cultivated wheat varieties growing under saline fields compared with non-saline fields. Differences due to the method of cultivating plants were also nonsignificant in most cases. Two lines produced significantly higher yields under saline conditions compared with wheat variety LU-26 that was used as a salt-tolerant check. The values for K at the seedling stage and those for the K/Na ratio at seedling and heading stages were significantly higher with direct sowing compared to transplanting. The overall performance of the new germplasm under saline fields was better than that of the salt-tolerant wheat varietiy LU-26.

382 Farsi, M.; Vanstone, VA.; Fisher, JM.; Rathjen, AJ. (1995) **GENETIC VARIATION IN RESISTANCE TO PRATYLENCHUS NEGLECTUS IN WHEAT AND TRITICALES.** *Australian Journal of Experimental Agriculture. 35(5):597-602.* English. [UNIV ADELAIDE WAITE AGR RES INST DEPT PLANT SCI GLEN OSMOND SA 5064 AUSTRALIA].

The root lesion nematode Pratylenchus neglectus occurs throughout the South Australian cereal belt, where it potentially contributes to yield l[illegible]. Genetic material was examined for resistance to P. neglectus, and included 2 susceptible local commercial wheat varieties (Spear, Molineux), 2 derivatives from Spear (RAC 613-27, RAC 613-47), wheat varieties varying in reaction to P. thornei, rye and rye derivatives, triticales, and 1R substitution lines in Chinese Spring. Seeds were surface-sterilised and germinated, and 3-day-old seedlings were inoculated with about 250 larvae and 150 eggs. Plants were grown in pots containing pasteurised soil and transferred to a controlled temperature waterbath at 22 +/- 1 degrees C. After 7 weeks, nematodes were extracted and counted. A significant difference for the number of nematodes per plant and per gram dry root was found between the 3 main groups of genetic material: the wheat varieties, the substitution lines, and lines with the whole genome of rye (including triticales). The triticales Abacus and Muir showed the lowest number of nematodes (per gram root and per plant). None of the wheat varieties was resistant, so genetic mechanisms conferring resistance or tolerance to P. thornei are not effective against P. neglectus. [References: 26].

383 Federmann, G.R.; Goecke, E.U.; Steiner, A.M.; Ruckenbauer, P. (University of Hohenheim, Stuttgart (Germany)) (1994) **Biochemical markers for selection towards better cooking quality in F2-seeds of durum wheat (Triticum durum Desf.).** *Plant Varieties and Seeds (United Kingdom) v. 7(2) p. 71-77.* 18 ref. English. (AGRIS 95-131674).

384 Fekadu Fufa (Institute of Agricultural Research, Addis Abeba (Ethiopia)) (1995) **Performance of Barley Genotypes Grown in Different Enviroments in North Western Ethiopia.** 6. Annual Conference of the Crop Science Society of Ethiopia; Addis Abeba (Ethiopia); 3-4 May 1994. *Annual Conference of the Crop Science Society of Ethiopia. Crop Science Society of Ethiopia, Addis Abeba (Ethiopia) p. 20-23.* CSSE. 2 Tables; 7 ref. English. (AGRIS 95-151511)

Fifteen barley genotypes were evaluated in five environments in northwestern Ethiopia to determine their performance and stability. The combined analysis of variance showed highly significant (P less than 0.01) genotype, environment and genotype x environment effects on grain yield. The regression coefficients for the 15 genotypes ranged from 0.884 to 1.348 and were not significantly different from 1.0. Genotypes PG3510(1), PG3515(1), and PG319(1) with regression coefficients close to d1.0, minimum deviations from regression and which had mean yields above the grand mean were fairly stable in performance across environments. Kulumsa 1/88 and Kulumsa 7/88 in that order appeared more productive where growing conditions are favorable. The highest mean grain yield of the genotypes was obtained in both years at Adet. Hence, it is suggested that initial selection of genotypes from any source at Adet will produce varieties that would be used across the diverse barley growing environments in north western Ethiopia.

385 Felicio, JC.; Camargo, CEDO.; Gallo, PB.; Decamargo, MBP. (1995) **EVALUATION OF TRITICALE GENOTYPES UNDER LOW LAND CONDITIONS IN THE STATE OF SAO PAULO, BRAZIL.** *Pesquisa Agropecuaria Brasileira. 30(7):939-946.* Portuguese. [INST AGRON CAMPINAS CAIXA POSTAL 28 BR-13001970 CAMPINAS SP BRAZIL].

Experiments involving triticale genotypes carried out under low land conditions, at the Mococa Experiment Station, in Mococa, SP, Brazil, during 1985-92, were evaluated in relation to grain yield and to the occurrence of sterile spikelets. The triticale cultivar IAC 1 showed high grain yield in comparison to the other cultivars studied, and good adaptation to these soil conditions. The wheat cultivars IAC 5 and IAC 60 used as controls presented low productivity. The triticale cultivars IT 8029, TCEP 8136, ICT 8433, ICT 8437 and BR 2 showed high percentages of occurrence of sterile spikelets: above 50%. The triticale cultivar PFT 7882 exhibited the lowest percentage of sterile spikelets.

386 Ferrer, E.; Loarce, Y.; Hueros, G. (1995) **MOLECULAR CHARACTERIZATION AND CHROMOSOME LOCATION OF REPEATED DNA SEQUENCES IN HORDEUM SPECIES AND IN THE AMPHIPLOID TRITORDEUM (XTRITORDEUM ASCHERSON ET GRAEBNER).** *Genome. 38(5):850-857.* English. [UNIV ALCALA DE HENARES DEPT CELL BIOL & GENET E-28871 MADRID SPAIN].

Genomic DNA from 19 species and subspecies representing the four basic genomes (H, I, X, and Y) of Hordeum was restricted with HaeIII and hybridized with two repeated DNA sequences of Hordeum chilense. The potential use of repeated sequences in ascertaining genomic affinities within the genus Hordeum was studied by comparing restriction fragment patterns. The study demonstrated the following: (i) species that shared a basic genome showed more similar hybridization fragment patterns than species with different genomes, whether with pHch1 or pHch3; (ii) hybridization with pHch1 revealed the presence nf certain fragments limited to the species with a H genome; and (iii) the alloploid nature of species like H. jubatum was confirmed. The chromosomal distribution of the two repeated sequences was studied in species representing each basic genome and in the amphiploid tritordeum using fluorescent in situ hybridization. No interspecific differences were found between the diploid species. In situ experiments indicated the alloploid nature of H. depressum. Both sequences allow H. chilense chromatin to be distinguished from wheat chromosomes in tritordeum. [References: 27].

387 Fincher, G.B. (Adelaide Univ., Glen Osmond (Australia). Dept. of Plant Science) (1993) **Potential for the improvement of malting quality of barleys by genetic engineering. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 496.* Abstract only. English. (AGRIS 95-131390).

388 Friebe, B.; Zhang, W.; Raupp, JW.; Gill, BS.; Porter, DR. (1995) **NON-HOMOEOLOGOUS WHEAT-RYE CHROMOSOMAL TRANSLOCATIONS CONFERRING RESISTANCE TO GREENBUG.** *Euphytica. 84(2):121-125.* English. [KANSAS STATE UNIV AGR & APPL SCI CTR WHEAT GENET RESOURCE MANHATTAN, KS 66506 USA].

C-banding and in situ hybridization were used to determine the chromosomal constitution of the greenbug-resistant germplasm GRS 1204. The results showed that this line had the radiation-induced non-homoeologous wheat-rye translocation chromosomes T2AS-1RS . 1RL and T2AL . 2AS-1RS. C-banding analysis further revealed the presence of a wheat-Agropyron elongatum translocation chromosome T1BL . 1BS-3Ae#1L in line GRS 1204, that was derived from 'Teewon'. The greenbug resistance of line GRS 1204 is similar to that of line GRS 1201 that was earlier shown to have the greenbug resistance gene Gb6 located on the IRS arm of the wheat-rye translocation chromosome T1AL . 1RS. Because Gb6 in line GRS 1204 is present on one of the non-homoeologous translocation chromosomes, agronomically line GRS 1201 should be the better adapted source of Gb6 resistance and be used in cultivar improvement. [References: 15].

389 Fritz, AK.; Cox, TS.; Gill, BS.; Sears, RG. (1995) **MARKER-BASED ANALYSIS OF QUANTITATIVE TRAITS IN WINTER WHEAT X TRITICUM TAUSCHII POPULATIONS.** *Crop Science. 35(6):1695-1699.* English. [KANSAS STATE UNIV AGR & APPL SCI USDA ARS MANHATTAN, KS 66506 USA].

Triticum tauschii (Coss.) Schmal. has become a commonly used genetic resource for wheat improvement. Although genes controlling qualitative traits such as disease and insect resistances are generally targeted in germplasm development programs, genes for quantitative traits may be introgressed along with the target genes. This study was designed to identify genomic regions associated with quantitative traits from hexaploid/diploid wheat crosses. One hundred forty-seven BC2F1-derived families from crosses between elite common wheat (Triticum aestivum L.) lines and T. tauschii were evaluated for yield, kernel weight, protein concentration, and kernel hardness in held experiments at two locations during 2 yr. Genotypes of these families were determined by testing with one protein, 25 restriction fragment length polymorphism probes, and eight random amplified polymorphic DNA (RAPD) markers. Two RAPD markers were associated with consistent effects on grain yield. Three markers were associated with kernel weight, accounting for 16% of the variance among families. In addition, two loci associated with protein concentration and one locus associated with kernel hardness were identified, accounting for 29 and 9% of the variance among families for the respective traits. In most instances, quantitative trait Loci had relatively small effects, and regression analysis of agronomic performance on proportion of marker alleles from T. tauschii showed that the majority of linked chromatin from the diploid species had no detectable effect on any trait. Based on these results and previous studies, T. tauschii can be considered a primary source of resistance genes for wheat improvement. [References: 22].

390 Fritz, AK.; Cox, TS.; Gill, BS.; Sears, RG. (1995) **MOLECULAR MARKER-FACILITATED ANALYSIS OF INTROGRESSION IN WINTER WHEAT X TRITICUM TAUSCHII POPULATIONS.** *Crop Science. 35(6):1691-1695.* English. [KANSAS STATE UNIV AGR & APPL SCI USDA ARS DEPT AGRON MANHATTAN, KS 66506 USA].

Triticum tauschii (Coss.) Schmal., a wild, diploid ancestor of common wheat (Triticum aestivum L.) has become an important genetic resource for wheat improvement. As this trend continues, a detailed understanding of the introgression process becomes increasingly important. This study utilized molecular markers to track introgression of T. tauschii DNA into common wheat. Genotypes of 147 BC2F1 lines derived from crosses between wheat and T. tauschii were determined for one protein, 25 restriction fragment length polymorphisms, and eight random amplified polymorphic DNA markers. MAPMAKER and GMENDEL computer programs were used to determine Linkage groups and genetic distances. Map orders and recombination distances of linked probes compared favorably with the existing T. tauschii map except for chromosome 4D, which was inherited as a unit. Certain chromosomal segments from either T. aestivum or T. tauschii were transferred more frequently than expected, and choice of recurrent parent played a role in the level of introgression that occurred. Recombination between the D genomes of T. aestivum and T. tauschii occurs at a level similar to that in an intraspecific cross; any abnormalities that exist should not hinder the ability to transfer genes of interest while eliminating Banking chromatin that may be responsible for deleterious effects. [References: 26].

391 Funatsuki, H.; Kuroda, H.; Kihara, M.; Lazzeri, PA.; Muller, E.; Lorz, H.; Kishinami, I. (1995) **FERTILE TRANSGENIC BARLEY GENERATED BY DIRECT DNA TRANSFER TO PROTOPLASTS.** *Theoretical & Applied Genetics. 91(5):707-712.* English. [HOKKAIDO NATL AGR EXPT STN

GENET RESOURCE UTILIZAT LAB FUKURO 2 ENGARU HOKKAIDO 09904 JAPAN].

We report the generation of transgenic barley plants via PEG-mediated direct DNA uptake to protoplasts. Protoplasts isolated from embryogenic cell suspensions of barley (Hordeum vulgare L. cv 'Igri') were PEG-treated in a solution containing a plasmid which contained the neomycin phosphotransferase (NPT II) gene under the control of the rice actin promoter and the nos terminator. Colonies developing from the treated protoplasts were incubated in liquid medium containing the selective antibiotic G418. Surviving calli were subsequently transferred to solid media containing G418, on which embryogenic calli developed. These calli gave rise to albino and green shoots on antibiotic-free regeneration medium. NPT II ELISA revealed that approximately half of the morphogenic calli expressed the foreign gene. In total, 12 plantlets derived from NPT-positive calli survived transfer to soil, Southern hybridization analysis confirmed the stable transformation of these plants. However, the foreign gene seemed to be inactivated in plants from one transgenic line. Most of the transgenic plants set seed, and the foreign gene was transmitted and expressed in their progenies, which was ascertained by Southern hybridization and NPT II ELISA. [References: 28].

392 Gao Chongsheng (Tianjin Animal and Plant Quarantine Bureau (China)) (1994) **Influence of resistance of wheat varieties to the population growth of Macrosiphum avenae.** *Entomological Knowledge (China) (no. 4) p. 201-205.* 6 tables; 6 ref. Chinese. (AGRIS 95-131691).

393 Geng Tao; Qin Shuqin; Yang Xinchuan (Tarim Univ. of Land Reclamation, Alal, Xinjiang (China)) (1994) **Study on correlation of the genetic distance of parents and characters of F2 generation in winter wheat.** *Xinjiang Agricultural Sciences (China) (no. 3) p. 95-97.* 2 tables; 14 ref. Chinese. (AGRIS 95-131343).

394 Ghaemi, M.; Sarrafi, A.; Alibert, G. (1995) **INFLUENCE OF GENOTYPE, MEDIA COMPOSITION, COLD PRETREATMENT AND THEIR INTERACTIONS ON ANDROGENESIS IN DURUM WHEAT (TRITICUM TURGIDUM).** *Cereal Research Communications. 23(3):215-222.* English. [INRA BIOTECHNOL & AMELIORAT PLANTES LAB ENSAT INP 145 AVE MURET F-31076 TOULOUSE FRANCE].

The effect of genotype, liquid and solid medium, ancymidol in liquid medium, spike cold pretreatment and their interaction was investigated in two tetraploid wheat genotypes. In each treatment approximately 1000 anthers were studied. Pollen embryoid induction frequency in liquid medium with 0.1 mg/l of ancymidol (growth retardant) was 2 times higher than control liquid medium and approximately 5 times more than solid medium. Cold pretreatment of spikes (7 days at 4 degrees C +/- 1) usually reduced embryo yield. The highest frequency of embryoid formation per 100 anthers was obtained in the liquid medium containing 0.1 mg/l of ancymidol without cold pretreatment in Dicoccoides noir genotype (79.72). Green and total regenerations per 100 embryos were influenced by genotypes. The use of ancymidol decreased green regeneration when compared with control liquid medium. Liquid medium improved total regeneration when compared with solid medium (4.04 to 7.68%). In liquid medium the number of embryoids and green regeneration was increased for both genotypes and by using this medium, at least one plantlet per 100 to 200 cultured anthers should be obtained, and these two genotypes can be no more considered as recalcitrants.

395 Gustafson, VD.; Baenziger, PS.; Mitra, A.; Kaeppler, HF.; Papa, CM.; Kaeppler, SM. (1995) **ELECTROPORATION OF WHEAT ANTHER CULTURE-DERIVED EMBRYOIDS.** *Cereal Research Communications. 23(3):207-213.* English. [UNIV NEBRASKA DEPT AGRON LINCOLN, NE 68583 USA].

Electroporation, a method of DNA delivery successfully used to transform other cereal crops, shows potential to be a useful method for wheat transformation. The goal of this research was to identify the electroporation parameters that would result the highest number of regenerated plants and evaluate selection criteria for transformation. Anther culture-derived embryoids were electroporated at 500 and 960 mu F with and without an enzyme pretreatment. Electroporation at 500 mu F produced more regenerable embryoids than electroporation at 960 mu F. The plasmid used for electroporation and transformation selection contained the uidA (GUS) and bar genes encoding for beta-glucuronidase and phosphinothricin acetyl transferase which imparts resistance to the herbicide Pasta. Of the 66 plants regenerated thus far, one has expressed GUS activity. None have expressed Pasta resistance.

396 Haak, I.C.; Brennan, P.S. (Queensland Dept. of Primary Industries, Toowoomba (Australia). Queensland Wheat Research Inst.); McKinnon, G.E.; Henry, R.J. (Queensland Agricultural Biotechnology Centre, St Lucia (Australia)) (1993) **Transfer of an alpha-amylase inhibitor from barley to wheat via tissue culture. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 507-508.* Abstract only. English. (AGRIS 95-131431).

397 Hadjichristodoulou, A. (1995) **EVALUATION OF BARLEY LANDRACES AND SELECTIONS FROM NATURAL OUTCROSSES OF H-VULGARE SSP SPONTANEUM WITH SSP VULGARE FOR BREEDING IN SEMI-ARID AREAS.** *Genetic Resources & Crop Evolution. 42(1):83-89.* English. [AGR RES INST NICOSIA CYPRUS].

Landraces of barley and tough rachis genotypes selected from natural crosses of ssp. spontaneum with ssp. vulgare were evaluated in Cyprus under rainfed conditions with the best commercially grown grain varieties. Landraces, eliminated from cultivation around 40 years ago, gave grain yields comparable to those to the best commercially grown varieties, Athenais and Kantara. Also, selected genotypes from the natural hybrids gave grain yields approaching those of Athenais and Kantara, in spite of the fact that human interference was limited only to visual individual plant selection in natural habitats, followed by the evaluation of 44 genotypes in the present studies. Locally adapted landraces and selected genotypes from the natural hybrids expressed valuable measurable traits, such as 1000-grain weight, crude protein content, volume weight, lodging and disease resistance, which could be used in breeding programmes. The heading date of these 44 selected tough rachis genotypes was within a narrow range, which lies within the optimum range determined by long term studies for Cyprus. Furthermore, non-visible gene complexes for adaptation to moisture, heat and other stresses present in land races and natural hybrids could be exploited for breeding in semi-arid areas. These natural hybrids apparently contributed towards maintaining genes present in landraces which became extinct long time ago. [References: 17].

398 Hang, X.; Zhijuan, B.; Zongheng, Z.; Bao, L. (Northeast Normal University, Changchun (China). Institute of Genetics and Cytology) (1994) **Effects of gamma-irradiation on wheat protoplast culture and cytological characteristics of the recovered calli.** *Journal of Nuclear Agriculture and Biology (India) v. 23(4) p. 214-218.* 1 table; 2 ill., 6 ref. English. (AGRIS 95-131714).

399 Harwood, W.A.; Bean, S.J.; Snape, J.W.; Mullineaux, P.J. (Cambridge Laboratory, John Innes Centre, Norwich Research Park, Colney, Norwich NR4 7UH (United Kingdom)) (1994) **Progress towards a reproducible barley transformation system.** *Annual report 1993. p. 18-19.* AFRC Institute of Plant Science Research, Cambridge Laboratory, John Innes Institute, Nitrogen Fixation Laboratory and Sainsbury Laboratory. English. (AGRIS 95-131434).

400 Hassan, E.E. (Zagazig Univ. (Egypt). Efficient Productivity Inst.) (1993) **Gene action for yield and its attributes and their implications in bread wheat breeding.** *Zagazig Journal of Agricultural Research (Egypt) v. 20(3) p. 995-1005.* 5 tables; 12 ref. English. (AGRIS 95-131689).

401 Hassan, E.E. (Zagazig Univ. (Egypt). Efficient Productivity Inst.) (1993) **Genetic analysis of some main spike characteristics in four wheat crosses (Triticum aestivum L.).** *Zagazig Journal of Agricultural Research (Egypt) v. 20(2A) p. 611-621.* 5 tables; 12 ref. English. (AGRIS 95-131709).

402 Helderkamp, F. (Center of Phytotechnology, Wassenaarseweg (Netherlands)) (1993) **Genetic modification of barley for end use quality. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 495.* Abstract only. English. (AGRIS 95-131389).

403 Helm, J.L. (North Dakota State University, Fargo, ND.) (1993) **1993 North Dakota hard red spring wheat variety performance descriptions.** *NDSU Extension Service : [publication] (USA); no. A-574 12 p.* English. (AGRIS 95-131683).

404 Henry, R.J.; McKinnon, G.E. (Queensland Univ., St Lucia (Australia). Queensland Agricultural Biotechnology Centre); Haak, I.A.; Brennan, P.S. (Queensland Dept. of Primary Industries, Toowoomba (Australia). Wheat Research Inst.) (1993) **Genetic engineering of resistance to quality losses resulting from pre-harvest sprouting [wheat]. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p.* 497. Abstract only. English. (AGRIS 95-131329).

405 Hohmann, U.; Endo, TR.; Herrmann, RG.; Gill, BS. (1995) **CHARACTERIZATION OF DELETIONS IN COMMON WHEAT INDUCED BY AN AEGILOPS CYLINDRICA CHROMOSOME - DETECTION OF MULTIPLE CHROMOSOME REARRANGEMENTS.** *Theoretical & Applied Genetics. 91(4):611-617.* English. [UNIV MUNICH INST BOT MENZINGER STR 67 D-80638 MUNICH GERMANY].

An Aegilops cylindrica chromosome induces terminal deletions of chromosomes in wheat as identified by C-banding. We are constructing high-density physical maps of wheat chromosomes and have detected additional chromosome rearrangements. Among 63 lines with chromosomal subarm deletions in group 7 chromosomes, 7 lines (11.1%) were shown to harbor additional chromosome rearrangements. Two other lines were also omitted from the physical mapping because of the nature of the breakpoint calculations. The presence or absence of chrome some-specific restriction fragment length polymorphism (RFLP) or random amplified polymorphic DNA (RAPD) markers indicated that additional interstitial deletions are present in 3 lines (4.8%) with deletions in the short chromosome arms and in 4 lines (6.3%) with deletions in the long chromosome arms. We also used chromosome pairing analysis of F-1 plants of deletion lines with double ditelosomic lines of 'Chinese Spring' wheat to detect small terminal deletions. The deletion of the most distal 1% of chromosome arm 7AL was associated with a pairing reduction of 60%. [References: 30].

406 Hohmann, U.; Graner, A.; Endo, TR.; Gill, BS.; Herrmann, RG. (1995) **COMPARISON OF WHEAT PHYSICAL MAPS WITH BARLEY LINKAGE MAPS FOR GROUP 7 CHROMOSOMES.** *Theoretical & Applied Genetics. 91(4):618-626.* English. [UNIV MUNICH INST BOT MENZINGER STR 67 D-80638 MUNICH GERMANY].

Comparative genetic maps among the Triticeae or Gramineae provide the possibility for combining the genetics, mapping information and molecular-marker resources between different species. Dense genetic linkage maps of wheat and barley, which have a common array of molecular markers, along with deletion-based chromosome maps of Triticum aestivum L. will facilitate the construction of an integrated molecular marker-based map for the Triticeae. A set of 21 cDNA and genomic DNA clones, which had previously been used to map barley chromosome 1 (7H), were used to physically map wheat chromosomes 7A, 7B and 7D. A comparative map was constructed to estimate the degree of linkage conservation and synteny of chromosome segments between the group 7 chromosomes of the two species. The results reveal extensive homoeologies between these chromosomes, and the first evidence for an interstitial inversion on the short arm of a barley chromosome compared to the wheat homoeologue has been obtained. In a cytogenetically-based physical map of group 7 chromosomes that contain restriction-fragment-length polymorphic DNA (RFLP) and random amplified polymorphic DNA (RAPD) markers, the marker density in the most distal third of the chromosome arms was two-times higher than in the proximal region. The recombination rate in the distal third of each arm appears to be 8-15 times greater than in the proximal third of each arm where recombination of wheat chromosomes is suppressed. [References: 39].

407 Holtorf, S.; Apel, K.; Bohlmann, H. (1995) **SPECIFIC AND DIFFERENT EXPRESSION PATTERNS OF TWO MEMBERS OF THE LEAF THIONIN MULTIGENE FAMILY OF BARLEY IN TRANSGENIC TOBACCO.** *Plant Science. 111(1):27-37.* English. [ETH ZURICH ETH ZENTRUM INST PLANT SCI UNIV STR 2 LFW D58 CH-8092 ZURICH SWITZERLAND].

Thionins are cysteine-rich, basic, and toxic proteins that are assumed to be involved in the defense against pathogens. Barley (Hordeum vulgare L. cv. Carina) contains a large gene family coding for leaf-specific thionins that comprises more than 50 genes per haploid genome. How the expression of these variants is regulated was not known. To address this question, we have cloned 2 of these thionin genes, BTH6 and BTH7, each belonging to one of 2 subgroups, and analysed their sequences. Both code for typical leaf thionin proteins. Their promoter regions have an identity of about 40% except for a region of 90 bp in the downstream region which has an identity of 80%. As reflected by these sequence differences, both promoters behave differently when placed in front of the uidA gene and analysed in transgenic tobacco plants. Whereas the BTH6 promoter is constitutively expressed in most tissues of transgenic tobacco plants except the roots, the BTH7 promoter is only active in the vascular strands of the stem and older leaves. The BTH6 promoter is highly active in the epidermis and in xylem elements whereas the BTH7 promoter shows very high activity in phloem elements. In addition, both promoters are differently regulated by light. The BTH7 promoter is only active in the light. The BTH6 promoter shows a differential regulation in seedlings, being active in the hypocotyl in darkness but not in the cotyledons and vice versa in the light. Our results indicate that the expression of the barley leaf thionin multigene family is regulated differentially at the transcriptional level. [References: 45].

408 Hooglander, N.B. (Wageningen Agricultural Univ. (Netherlands). Dept. of Plant Breeding); Dekens, R.G. (1992) **Analysis of the barley cross L94 x Vada with RFLP markers to localise genes responsible for partial resistance to leaf rust (Puccinia hordei).** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p.* 44. 1 ref. English. (AGRIS 95-131404).

409 Horvath, L. (Ustredny Kontrolny a Skusobny Ustav Polnohospodarsky, Bratislava (Slovak Republic)); Horvath, L. (1994) **[An automatic system for description and identification of plant varieties in the Control and Testing Institute for Agriculture, Bratislava (Slovakia)]. Automatizovany system pre popis a identifikaciu odrod v UKSUP.** *Polnohospodarske Skusobnictvo (Slovak Republic) v. 2(2-3) p. 5-7.* 6 ill.; 8 ref. Slovak. (AGRIS 95-131732).

410 Hucl, P. (Crop Development Centre, University of Saskatchewan, Saskatoon, Sask. S7N 0W0 (Canada)) (1994) **Repeatability of a simplified method for determining sprouting resistance in wheat.** *Plant Varieties and Seeds (United Kingdom) v. 7(2) p. 79-84.* 15 ref. English. (AGRIS 95-131682).

411 Ibrahim, I.F.; Al Janabi, K.K.; Al Maaroof, E.M.; Al Aubaidi, M.O.; Mahmood, A.H.; Al Janabi, A.A. (Nuclear Research Center, Baghdad (Iraq). Department of Agricultural Research); Haidar, H.O.; Ali, A.H. (Station of Applied Agricultural Research, Telafer (Iraq)) (1993) **Induction of a new Iraqi wheat cultivar by gamma rays [Triticum aestivum].** *RACHIS (ICARDA); Barley and Wheat Newsletter v. 12(1-2) p. 28-35.* 7 tables; 3 fig., 20 ref. English. (AGRIS 95-151641).

Iratom-1 is a new Iraqi wheat (Triticum aestivum L. ssp. aestivum) cultivar induced by seed-treatment with 13 krad gamma rays and developed through 13 generations (M1-M13) of testing. Results revealed that Iratom-1 was moderately resistant to leaf rust (Puccinia recondita Rob.ex Desm.), yellow rust (P. striiformis West) and common bunt (Tilletia spp.), while the original cultivar was susceptible to these diseases. Iratom-1 was also moderately resistant to lodging. Iratom-1 surpassed its parent in kernel weight of 100 spikes, 1000-kernel weight, and in grain and protein yield per unit area. Isozyme and protein analysis (plants and grains) of Iratom-1 showed high genetic purity and stability. Chemical analysis of flour from the mutant cultivar indicated that it could be successfully used for bread-making.

412 Ito, T.; Fujimoto, Y.; Nakayama, T.; Iwabuchi, M. (1995) **A FAR-UPSTREAM SEQUENCE OF THE WHEAT HISTONE H3 PROMOTER FUNCTIONS DIFFERENTLY IN RICE AND TOBACCO CULTURED CELLS.** *Plant & Cell Physiology. 36(7):1281-1289.* English. [KYOTO UNIV FAC SCI DEPT BOT SAKYO KU KYOTO 60601 JAPAN].

The cis-regulatory function of a far-upstream sequence (-1, 711 to -186) of the promoter of the wheat gene for histone H3 (TH012) was analyzed in cultured rice and tobacco cells in a transient expression system with the gene

for beta-D-glucuronidase as a reporter gene. The far-upstream sequence was necessary for full activity of the H3 promoter in rice cells but did not enhance the activity of the proximal promoter in tobacco cells. Dissection analysis of the far-upstream sequence revealed the existence of several positive and negative cis-acting sequences in this region, some of which functioned differently in rice and tobacco cells. In gain-of-function experiments with rice cells, the sequence from -848 to -704, containing the CCAAT and octamer (CaCGGATC) motifs, functioned in an orientation-independent manner, whereas the sequence from -703 to -486 functioned in an orientation-dependent manner. By contrast, both sequences exhibited an orientation-dependent cis-function in tobacco cells. These findings suggest that some cis-regulatory sequences in the far-upstream region of the H3 promoter function differently in rice and tobacco cells. [References: 42].

413 Jafarishabestari, J.; Corke, H.; Qualset, CO. (1995) **FIELD EVALUATION OF TOLERANCE TO SALINITY STRESS IN IRANIAN HEXAPLOID WHEAT LANDRACE ACCESSIONS.** *Genetic Resources & Crop Evolution. 42(2):147-156.* English. [UNIV CALIF DAVIS GENET RESOURCES CONSERVAT PROGRAM DAVIS, CA 95616 USA].

The responses of 400 Iranian tetraploid and hexaploid landrace wheat accessions to variation in soil salinity were investigated at a field site in the San Joaquin Valley of California, U.S.A. The salinity treatments were represented by soil conductivity values (EC(e)) of 1.0 (control), 5.0, and 8.0 dS m(-1) and were maintained by irrigation with water of similar or slighly higher conductivity. A subset of 200 hexaploid accessions was analyzed from the first year of study. For the second year, 77 accessions were selected as having high, low, or random salinity tolerance based on the Fischer-Mauer stress index (S) estimated in the first year. In both years the accessions and three check varieties were evaluated in hill-plots. The interyear correlations for S were very low in contrast to grain yield whereas the correlations at the same salinity level between years were significant: 0.42, 0.46, and 0.44, respectively, for control, intermediate, and high salinity. High grain yield under salinity stress appeared to be a better selection criterion for salinity tolerance than biomass yield, harvest index, or S. Analysis of accessions from 12 Iranian provinces from which five or more accessions originated gave evidence for geographic differentiation for characters related to salinity tolerance. Several accessions, differing in geographical origin within Iran, were shown to be consistently high ranking for grain yield in the control and two salinity treatments. [References: 19].

414 Jahoor, A. (Technische Univ. Muenchen, Freising (Germany). Lehrstuhl fuer Pflanzenbau und Pflanzenzuechtung); Fischbeck, G. (1992) **RFLP analysis of powdery mildew resistance genes in barley.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 39-40.* 11 ref. English. (AGRIS 95-131402).

415 Jones, SS.; Murray, TD.; Allan, RE. (1995) **USE OF ALIEN GENES FOR THE DEVELOPMENT OF DISEASE RESISTANCE IN WHEAT [Review].** *Annual Review of Phytopathology. 33:429-443.* English. [WASHINGTON STATE UNIV USDA ARS PULLMAN, WA 99164 USA].

The genus Triticum contains three ploidy levels and about 30 species. Most of these species have been investigated as sources of disease-resistance genes and several have been used in successful transfers of resistance to domestic wheat (T. aestivum, genomes AABBDD). In addition, at least six genera from the tribe Triticeae have been used successfully as donors of disease-resistance genes for domestic wheat. The amount of alien chromatin involved in these transfers varies from a single gene to chromosome arms or entire chromosomes. No attempt was made in this review to describe all alien resistance gene transfers in wheat or to outline the various techniques involved. Alien disease resistance genes covered in detail are those that confer resistance to barley yellow dwarf virus, wheat streak mosaic virus, Cephalosporium stripe (caused by Cephalosporium gramineum) and eyespot (caused by Pseudocerosporella herpotrichoides). [References: 94].

416 Joppa, LR.; Nevo, E.; Beiles, A. (1995) **CHROMOSOME TRANSLOCATIONS IN WILD POPULATIONS OF TETRAPLOID EMMER WHEAT IN ISRAEL AND TURKEY.** *Theoretical & Applied Genetics. 91(5):713-719.* English. [USDA ARS NO CROP SCI LAB STATE UNIV STN BOX 5677 FARGO, ND 58105 USA].

Translocation frequencies (as compared to the standard chromosome arrangement typified by that in 'Chinese Spring) in 9 or more genotypes from each of 15 populations of Triticum dicoccoides in Israel were determined. Data also were obtained from 2 genotypes of the southernmost population (Jaba). A single population from Turkey was also investigated. There were 119 genotypes with translocations in the sample of 171 genotypes investigated (70%). The frequency of translocations in different populations varied from 0.27 to 1.00, and all populations had 1 or more genotypes with one or more translocations. Some populations such as Qazrin appeared to be homogeneous for translocations, but most populations were heterogeneous. A sample of 17 genotypes from 12 of the populations were crossed with the Langdon D-genome disomic substitutions to determine the identity of the chromosomes involved in the translocations. There were nine genotypes with translocations and with the exception of a 2A/2B translocation, none of them involved the same chromosomes. The B-genome chromosomes were involved in translocations more frequently than the A-genome chromosomes. Translocation frequencies (TF) of the various populations were correlated with environmental variables, primarily with water availability and humidity, and possibly also with soil type. In general, TF was higher in peripheral populations in the ecologically heterogeneous frontiers of species distribution than in the central populations located in the catchment ar ea of the upper Jordan valley. [References: 17].

417 Jovanovic, B. (Poljoprivredni fakultet, Beograd Zemun (Yugoslavia)); Prodanovic, S.; Mladenov, N. (1994) **[Estimates of wheat hybrid populations in F2 and F3 generations obtained by Bulk method]. Primena bulk metode za ocenu osobina hibridnih populacija psenice F2 i F3 generacije.** Prvi jugoslovenski naucno-strucni simpozijum iz selekcije i semenarstva (1. JUSEM); Vrnjacka Banja (Yugoslavia); 25-28 May 1994. *Selekcija i semenarstvo (Yugoslavia) v. 1(1) p. 17-19.* 1 table; 3 ref. Serbian. (AGRIS 95-131353).

Ten wheat populations in initial generations of mass selection were estimated by calculating mean values of recombinant genotypes developed as a result of dominant genes effects. The value of these recombinations depends on the grain yield of the hybrid populations, the value of the middle parent and the relations of frequencies of the genotypes which contribute. The value of such recombinations is used as a basic criterion in order to determine the importance of hybrid populations in selection. Based on the results, new superior wheat lines in F6 generations could be expected, from wheat hybrid populations Beogradjanka x Skopljanka, Beogradjanka x Zitarka, Skopljanka x Agrounija and Zitarka x Zemunka.

418 Kartha, K.K.; Nehra, N.S.; Chibbar, R.N. (Plant Biotechnology Inst., Saskatoon (Canada). National Research Council) (1993) **Genetic engineering of wheat and barley. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 496-497.* Abstract only. English. (AGRIS 95-131430).

419 Kelly, J.T. (University of Arkansas); Bacon, R.K. (1994) **Selection for nitrate reductase activity in soft red winter wheat.** *Arkansas farm research (USA) v. 43(3) p. 6-7.* English. (AGRIS 95-131737).

420 Khalid, M. (1993) **Study of inheritance of salt tolerance in local and exotic varieties of wheat (Triticum aestivum L.) grown in hydroponic culture.** University of Agriculture, Faisalabad (Pakistan). Dept. of Agronomy. UAF. 16 tables, 89 ref. 89 p. English. (AGRIS 95-131730).

421 Khan, M.A.; Ahmad, S.; Jalil, S.A.; Mirza, Z.; Alvi, A.S. (Arid Zone Research Inst., Quetta (Pakistan)) (1993) **Germplasm evaluation in the arid highlands of Balochistan: 1993 annual report of the Azri germplasm research group: research report no. 80.** International Center for Agricultural Research in the Dry Areas, Aleppo (Syria); USAID, Washington (USA); Arid Zone Research Institute, Quetta (Pakistan). AZRI. 32 tables; 5 ref. 33 p. English. (AGRIS 95-151922).

Results of the evaluation and selection on bread wheat, barley and food and forage legumes trials conducted during the 1992/93 seasons are reported. The trials were conducted at Quetta and Surab (in Kalat Division), two different but representative agro-ecological sites in Balochistan. The climatic conditions at Quetta were mild but at Surab the crop was exposed to moisture stress at the time of anthesis. Overall precipitation at Quetta was

above average but at Surab it was below average. This provided a good opportunity for drought screening at the Surab test site. Germplasm in five bread wheat trials (186 entries) with fall planting was evaluated for biotic and abiotic stresses. Out of these entries, 60 were selected for further testing. The bread wheat lines HAW-16 and WOL-89-73 were again multiplied, along with Gerek and ICW-1471. They have all shown resistance to yellow rust and better productivity than the local landrace. Nine barley trials (517 entries) with fall planting were conducted at several locations and 80 of the entries were chosen for further testing. Three genotypes (Di Jou 3-2-5; Rihane-03; Arabi Abiad/Emir, ICB82-1292-0AP-0AP-6AP-0AP) were again multiplied at AZRI farm in Quetta, along with Arabic Abiad and 39-58. These lines have shown superior performance at different sites and resistance to yellow rust. Five lentil trials (69 entries) were conducted during the 1992/93 season. All entries performed well and were selected for further testing in the 1993/94 season in highland Balochistan. Two promising lines of lentil (ILL 5865 and ILL 5677) were increased. Five forage legume trials (vetch and lathyrus) with 100 different genotypes were planted at Quetta and Surab and 15 were chosen for future testing.

422 Kheralla, K.A.; Mahdy, E.E.; Dawood, R.A. (Assiut Univ. (Egypt). Faculty of Agriculture) (1993) **Selection for early heading and correlated response in grain yield and its components of spring wheat.** *Assiut Journal of Agricultural Sciences (Egypt) v. 24(4) p. 95-106.* 5 tables; 18 ref. English. (AGRIS 95-131705).

423 Kim, MY.; Mullet, JE. (1995) **IDENTIFICATION OF A SEQUENCE-SPECIFIC DNA BINDING FACTOR REQUIRED FOR TRANSCRIPTION OF THE BARLEY CHLOROPLAST BLUE LIGHT-RESPONSIVE PSBD-PSBC PROMOTER.** *Plant Cell. 7(9):1445-1457.* English. [TEXAS A&M UNIV DEPT BIOCHEM & BIOPHYS COLLEGE STN, TX 77843 USA].

The plastid gene psbD encodes the photosystem II reaction center chlorophyll protein D2. psbD is located in a complex operon that includes psbC, psbK, psbI, orf62, and trnG. The operon is transcri bed from at least three different promoters. One of the psbD promoters is differentially activated when plants are exposed to blue light. In this study, the psbD blue light-responsive promoter was accurately transcribed in vitro in high-salt extracts of barley plastids. Transcription required supercoiled templates and was inhibited by tagetitoxin, an inhibitor of plastid transcription. Escherichia coli RNA polymerase did not recognize the psbD light-responsive promoter with the same specificity as plastid RNA polymerase. Deletion analyses demonstrated that sequences between -39 and -68, upstream of the transcription initiation site, were required for transcription of the psbD blue light-responsive promoter. This DNA region is highly conserved among plant species and contains multiple AAG sequences. Gel shift assays and DNase I footprinting experiments demonstrated that the AAG-rich DNA sequence interacts with a sequence-specific DNA binding factor termed AGF. Point mutations in the AAG cis element decreased binding of AGF and inhibited transcription from the psbD light-responsive promoter. We concluded that AGF is an essential factor required for transcription of the psbD light-responsive promoter. [References: 44].

424 Kisana, N.S. (1992) **The nature of inheritance of quantitative traits in a diallel cross of bread wheat (Triticum aestivum L. em. Thell.).** University of Agriculture, Faisalabad (Pakistan). Dept. of Plant Breeding and Genetics. UAF. 10 ills., 20 tables, 90 ref. 80 p. English. (AGRIS 95-131726).

425 Kmecl, A.; Mauch, F.; Winzeler, M.; Winzeler, H.; Dudler, R. (1995) **QUANTITATIVE FIELD RESISTANCE OF WHEAT TO POWDERY MILDEW AND DEFENSE REACTIONS AT THE SEEDLING STAGE - IDENTIFICATION OF A POTENTIAL MARKER.** *Physiological & Molecular Plant Pathology. 47(3):185-199.* English. [UNIV ZURICH INST PLANT BIOL ZOLLIKERSTR 107 CH-8008 ZURICH SWITZERLAND].

Quantitative field resistance of winter wheat (Triticum aestivum L.) to powdery mildew (Erysiphe graminis DC f. sp. tritici EM) is an important trait that is selected for by plant breeders. Due to the necessary assessment in the field, the estimation of quantitative held resistance is very expensive and time-consuming. Therefore, the availability of easily scorable markers for this trait would be of great advantage in wheat breeding. In this study, host-responses that can be scored on individual plants at the seedling stage were assessed to see if they could serve as markers for quantitative resistance in the held. The accumulation characteristics of five defence-related gene transcripts and the formation of papillae and cell wall appositions following an infection by powdery mildew were compared in six wheat lines and one spell (triticum spelta L.). The lines represented a broad spectrum of different degrees of quantitative field resistance but carried no effective major resistance gene against powdery mildew. No clear correlation was found between the kinetics of levels of accumulation of defence-related defence-related gene transcripts following infection at the seedling stage and the degree of quantitative field resistance. However, cytological analysis showed that the proportion of adaxial epidermal cells that responded to pathogen attack by the formation of papillae or cell wall appositions appeared to be an indicator of high quantitative field resistance. In lines exhibiting a high quantitative field resistance, more than 80% of attacked adaxial cells responded, while in the more susceptible lines, this value dropped to less than 20%. Thus, the easily scorable proportion of attacked cells that show no cytologically visible host-response may provide a valuable marker to predict the degree of quantitative field resistance. (C) 1995 Academic Press Limited [References: 26].

426 Koebner, RMD.; Martin, PK.; Anamthawatjonsson, K. (1995) **MULTIPLE BRANCHING STEMS IN A HYBRID BETWEEN BREAD WHEAT (TRITICUM AESTIVUM) AND LYMEGRASS LEYMUS MOLLIS.** *Canadian Journal of Botany-Revue Canadienne de Botanique. 73(9):1504-1507.* English. [JOHN INNES CTR NORWICH RES PK COLNEY NR4 7UH ENGLAND].

Hybrids have been produced between bread wheat (Triticum aestivum L. em. Thell.) and lymegrass (Leymus mollis (Trin.) Pilger), and these are vegetatively highly vigorous but sexually sterile. The plants are unusual for Triticeae in having both extensive intravaginal branching along the length of the stem and the ability to spontaneously develop aerial roots from the stem nodes. These morphological changes are probably genetically determined, since the phenotype was expressed in a number of independent hybrids grown in widely differing environments. It may, however, be an epigenetic effect, arising from the tissue culture period necessary for embryo rescue. As the hybrids are self-sterile, the character is useful as it allows for ready vegetative reproduction. [References: 8].

427 Komatsuda, T.; Taguchishiobara, F.; Oka, S.; Takaiwa, F.; Annaka, T.; Jacobsen, HJ. (1995) **TRANSFER AND MAPPING OF THE SHOOT-DIFFERENTIATION LOCUS SHD1 IN BARLEY CHROMOSOME 2.** *Genome. 38(5):1009-1014.* English. [NATL INST AGROBIOL RESOURCES DEPT CELL BIOL TSUKUBA IBARAKI 305 JAPAN].

The locus Shd1, which we previously mapped to the long arm of chromosome 2 of Hordeum vulgare L., controls the differentiation of shoots from immature barley embryo callus. The locus has major effects and its action explains more than 65% of the total genetic variance in the shoot-differentiation rate. The allele of cultivar Kanto Nakate Gold designated Shd1(K) has a significant positive effect on the shoot-differentiation rate, whereas Shd1(A) of cultivar Azumamugi does not promote shoot differentiation. To identify gene products and characterize the function of Shd1, a set of near-isogenic lines is essential. In this study we produced BC5F1 plants by repeated backcrossing of 'Azumamugi' to F-1 plants ('Azumamugi' X 'Kanto Nakate Gold'). The BC5F1 plants were examined for their RFLP genotype and for the shoot-differentiation ability of immature embryo-derived callus. The results indicated that the Shd1 locus was located in a chromosomal region between MWG2081 and MWG503 that flanks the MWG801, cMWG699, nu (ear type), and MWG865 loci. Shd1(K) from 'Kanto Nakate Gold' functions effectively in the genetic background of 'Azumamugi', an indication that backcross breeding is possible for production of near-isogenic lines that would be very suitable for tissue culture. [References: 36].

428 Kovacev Djolai, M.; Radoicki, N.; Racic, M. (Institut za ratarstvo i povrtarstvo, Novi Sad (Yugoslavia)) (1995) **[Technological quality of the Novi Sad [Yugoslav] wheat varieties released in the period from 1992 to 1994]. Tehnoloski kvalitet novosadskih [jugoslovenskih] sorti psenice priznatih 1992-1994. godine.** 29. seminar agronoma; Vrnjacka Banja (Yugoslavia); 30 Jan - 4 Feb 1995. *Zbornik radova - Poljoprivredni fakultet u Novom Sadu, Institut za ratarstvo i povrtarstvo (Yugoslavia) (no. 23) p. 143-151.* 3 tables; 4 ref. Serbian. (AGRIS 95-131351).

The paper presents the study of the quality of 32 wheat varieties developed at the Institute of Field and Vegetable Crops in Novi Sad,

Yugoslavia, and released by the Yugoslav Federal Commission for Varietal Approval in 1992, 1993 and 1994. The varieties are classified into quality classes and technological groups. According to Yugoslav Standards (JUS E. B1. 200/1), 12 varieties are in the 1st quality class, 19 varieties are in the 2nd quality class, and 1 variety is in the 3rd quality class. According to the classification into technological groups, 6 varieties are quality enhancers, 12 varieties are bread varieties, 13 varieties are basic and 1 is out of any class.

429 Kowalska, M.; Winiarski, J.; Burek, J. (Instytut Hodowli i Aklimatyzacji Roslin, Krakow (Poland). Zaklad Roslin Zbozowych) (1994) **[Economic value of the latest generation foreign brewing barley cultivars under Poland's conditions in 1989-91]. Wartosc gospodarcza nowych zagranicznych odmian jeczmienia browarnego w warunkach Polski w latach 1989-91.** *Biuletyn Instytutu Hodowli i Aklimartyzacji Roslin (Poland); Bulletin of Plant Breeding and Acclimatization Institute (no.189) p. 3-23.* 6 tables; 13 ref. Polish. (AGRIS 95-131418).

Technological value was estimated after grain malting, on the basis of the protein content, extractability, fine-coarse grind extract difference, wort viscosity, soluble nitrogen compounds content, Kolbach index and diastic power. In comparison with foreign cultivars, mainly from Germany, home-bred cultivars seem to have, on the whole, better technological value because of the lower protein content in grain, higher extractability, lower wort viscosity and higher amylolytic activity of enzymes of malt.

430 Kruk, B.C.; Slafer, G.A. (Buenos Aires Univ. (Argentina). Dept. of Plant Production) (1992) **Defoliation effects on grain growth of three modern wheat cultivars of high grain number per unit area. [Conference paper].** Abstracts of the Australian Society of Plant Physiologists (Australia) p. P11. Australian Society of Plant Physiologists. p. P11. English. (AGRIS 95-131339).

431 Landgeva, S.; Ganeva, G.; Georgieva, V. (1995) **SOMATIC KARYOTYPES AND N-BANDING PATTERNS OF TETRAPLOID WHEATS.** *Biologisches Zentralblatt. 114(3):253-265.* English. [BULGARIAN ACAD SCI INST GENET DEPT CYTOGENET BU-1113 SOFIA BULGARIA].

The present paper reports on the chromosome morphology and the N-banding patterns of five tetraploid wheats (Triticum durum Desf. var. graecum cv. Langdon and cv. Almas, Triticum carthlicum Nevski. var. fuliginosum and var. ismeticum, and Triticum dicoccoides Korn. var. hostianum). Some differences have been established between the genotypes analysed, regarding the N-band distribution, which can be used for their cytological differentiation. The most variable in their heterochromatin patterns are the satellite region of chromosomes 1B and 6B, the distal regions of both arms of 2B, 3B, 4B and 6B, and the median region of 6AL and 5BL chromosome arms. T. dicoccoides N-banding pattern differs in higher extent in comparison with the other genotypes examined. [References: 19].

432 Landzheva, S. (Institut po Genetika B"lgarska Akademiya na Naukite, Sofia (Bulgaria)); Todorova, M.; Ganeva, G. (1994) **[Immunogenetic investigation on the leaf rust (Puccinia recondita Rob ex. Desm. f.sp. tritici Erikss.) resistance in tetraploid wheats]. Imunogenetichno prouchvane na ustojchivostta na tetraploidni pshenitsi spryamo prichinitelya na listna r"zhda (Puccinia recondita Rob ex. desm. f. sp. tritici Erikss.).** Selskostopanska Akademiya, Sofia (Bulgaria). *Rasteniev"dni Nauki (Bulgaria); Plant Science v. 31(7-8) p. 266-269.* 2 tables; 6 ref. English. (AGRIS 95-151465).

433 Lange, FD.; Brown, PTH.; Kollmorgen, JF.; Lorz, H. (1995) **IN VITRO SELECTION FOR MODIFIED AMINO-ACID PATHWAYS IN TRITICUM SPECIES.** *Plant Breeding-Zeitschrift fur Pflanzenzuchtung. 114(4):351-354.* English. [SAATZUCHT FRITZ LANGE KG POSTFACH 1352 D-23602 BAD SCHWARTAN GERMANY].

In vitro selections were carried out to obtain mutant plants of Triticum aestivum L. and T. monococcum L. with modified amino-acid pathways. Embryogenic callus cultures were selected with the amino acids L-lysine plus L-threonine and the amino acid analogues S-2-aminoethyl-L-cysteine, 5-methyl-L-tryptophan and sulfometuron-methyl. A number of plants were regenerated from these selections and tested for resistance at the whole-plant level. Only plants from the selections with sulfometuron-methyl proved to be resistant and these were characterized biochemically. Three different mutant lines could be detected. The resistance of these plants could be associated with an altered enzyme. Acetolactate synthase was less sensitive to inhibition. A discussion of the suitability of the selection agents is presented. [References: 28].

434 Lannou, C.; Devallavieillepope, C.; Goyeau, H. (1995) **INDUCED RESISTANCE IN HOST MIXTURES AND ITS EFFECT ON DISEASE CONTROL IN COMPUTER-SIMULATED EPIDEMICS.** *Plant Pathology. 44(3):478-489.* English. [INRA PATHOL VEGETALE LAB THIVERVAL GRIGNON FRANCE].

The epidemic simulator EPIMUL was modified and used to study how induced resistance affected the development of epidemics in host mixtures. In the model, induced resistance resulted from the interaction of host tissue with avirulent spores and caused a reduction in the efficacy of virulent spores deposited afterwards. We defined three parameters to describe induced resistance: the level of protection, defined as the magnitude of reduction in the virulent spore efficacy for infecting host tissue; the host surface area protected by an interaction with one avirulent spore; and the duration of protection of the host tissue, in days. In our simulations, induced resistance slowed the epidemics and gave better disease control in the mixtures, even if protection lasted for only 2 days. The disease reduction in the mixture attributable to induced resistance was approximately proportional to the level of protection. The effect of induced resistance increased as the protected area increased. Epidemics were virtually unaffected by induced resistance restricted to the infection site, but the effect of induced resistance initially increased rapidly as larger areas were protected. There was little further gain as the protected area increased from 2.6% to 26%. The influence of induced resistance was reduced when the interactions between virulent and avirulent pathogens were reduced. [References: 35].

435 Laurie, D.A.; Pratchett, N.; Bezant, J.H.; Allen, R.L. (Cambridge Laboratory, John Innes Centre, Norwich Research Park, Colney, Norwich NR4 7UH (United Kingdom)) (1994) **Comparative mapping of barley chromosome 2(2H).** *Annual report 1993. p. 17-18.* AFRC Institute of Plant Science Research, Cambridge Laboratory, John Innes Institute, Nitrogen Fixation Laboratory and Sainsbury Laboratory. 5 ref. English. (AGRIS 95-131433).

436 Leboulch, V.; Goyeau, H.; Brabant, P.; Devallavieillepope, C. (1995) **IDENTIFICATION OF SPECIFIC POWDERY-MILDEW-RESISTANCE GENES IN INDIVIDUAL WHEAT PLANTS USING THE FIRST TWO SEEDLING LEAVES.** *Plant Breeding-Zeitschrift fur Pflanzenzuchtung. 114(4):281-286.* English. [INRA PATHOL VEGETALE LAB F-78850 THIVERVAL GRIGNON FRANCE].

Identification of resistance genes in individual plants requires the use of leaves that have homogeneous reactions to the pathogen. The reactions of the first two leaves of seedlings of 12 wheat differential varieties to 20 Erysiphe graminis f.sp. tritici isolates were compared using in vitro tests on detached leaf segments. The expression of resistance and susceptibility did not differ significantly between the first two leaves with the 12 resistance genes tested. Consequently, the identification of specific powdery-mildew-resistance genes in individual plants is possible if approximately 10 segments of the primary and secondary leaves are used, each of them inoculated by one out of a set of 10 differential isolates. The reaction pattern of a plant to the tester isolates is interpreted according to a procedure in two steps, that are easily computerized. Identification of resistance genes in individual plants is particularly useful for resistance studies in heterogeneous plant populations. [References: 32].

437 Lee, SJ.; Penner, GA.; Devos, KM. (1995) **CHARACTERIZATION OF LOCI CONTAINING MICROSATELLITE SEQUENCES AMONG CANADIAN WHEAT CULTIVARS.** *Genome. 38(5):1037-1040.* English. [AGR & AGRI FOOD CANADA WINNIPEG RES CTR 195 DAFOE RD WINNIPEG MB R3T 2M9 CANADA].

Two microsatellite sequences, one within a gamma-gliadin locus and another within a low molecular weight glutenin locus, were characterized on a set of 16 wheat lines. The wheat lines analyzed were primarily Canadian cultivars or breeding lines. A high level of variation was detected, especially between the Canadian Prairie Spring and the Canadian Western Red Spring Wheat classes. Markers based on microsatellite sequence sites appear to be more informative on closely related germplasm than either RFLP- or RAPD-

based markers. The applicability of these markers across a wide spectrum of classes and cultivars provides a starting point for developing a point of delivery wheat class identification system. [References: 7].

438 Lemaux, P.G.; Wan, Y.; Williams, R. (California Univ., Berkeley (USA). Dept. of Plant Biology) (1993) **Development and use of [genetic] transformation systems for maize and barley for agronomic improvement. [Conference paper].** 43. Royal Australian Chemical Institute Cereal *Chemistry* Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 496.* Abstract only. English. (AGRIS 95-131459).

439 Li Dawei; Qiu Jiwen (Academia Sinica, Beijing (China). Inst. of Genetics) (1994) **Wide hybridization between Triticum aestivum and Tripsacum dactyloides.** *Acta Genetica Sinica (China) v. 21(5) p. 398-402.* 1 table; 2 ill., 8 ref. Chinese. (AGRIS 95-131696).

440 Li Hongjie; Fang Ren; Guo Beihei (Hebei Academy of Agricultural and Forestry Sciences, Shijiazhuang (China). Inst. of Cereal and Oil Crops) (1994) **Cytological studies on F1 hybrids between hexaploid Aegilops and Triticum aestivum.** *Acta Botanica Sinica (China) v. 36(9) p. 714-719.* 2 tables; 11 ill., 17 ref. Chinese. (AGRIS 95-131366).

441 Limaylla Jurado, R. (1993) **[Evaluation of yield and other characteristics in mixtures of barley genotypes under condition of the Callejon of Huaylas]. Evaluacion de rendimiento y otras caracteristicas en mezclas de genotipos de cebada bajo condiciones del Callejon de Huaylas.** Universidad Nacional Agraria La Molina, Lima (Peru). Escuela de Post-Grado. Especialidad en Mejoramiento Genetico de Plantas. 8 graf. 4 fig. 32 cuadros; 58 ref. 127 p. Spanish. (AGRIS 95-131380).

442 Limin, AE.; Houde, M.; Chauvin, LP.; Fowler, DB.; Sarhan, F. (1995) **EXPRESSION OF THE COLD-INDUCED WHEAT GENE WCS120 AND ITS HOMOLOGS IN RELATED SPECIES AND INTERSPECIFIC COMBINATIONS.** *Genome. 38(5):1023-1031.* English. [UNIV SASKATCHEWAN CTR CROP DEV 51 CAMPUS DR SASKATOON SK S7N 0W0 CANADA].

Low-temperature response was measured at the whole plant and at the molecular level in wheat-rye amphiploids and in other interspecific combinations. Cold tolerance of interspecifics whose parents diverged widely in hardiness levels resembled the less hardy higher ploidy level wheat parent. Expression of the low-temperature induced Wcs120 gene of wheat (Triticum aestivum L. em. Thell.) has been associated with freezing tolerance and was used here to study mRNA and protein accumulation in interspecific and parental lines during cold acclimation. Northern and Western analyses showed that homologous mRNAs and proteins were present in all the related species used in the experiments. Cold-tolerant rye (Secale cereale L.) produced a strong mRNA signal that was sustained throughout the entire 49-day cold-acclimation period. The wheats produced a mRNA signal that had diminished after 49 days of low-temperature exposure. The wheat-rye triticales did not exhibit the independent accumulation kinetics of the cold-tolerant rye parent but, rather, more closely resembled the wheat parent in that the mRNA signal was greatly diminished after 49 days of low-temperature exposure. The influence of the rye genome was manifest in slightly greater mRNA and protein accumulation in earlier stages of acclimation. Protein accumulations in the triticales were also maintained to a somewhat greater extent than found in the wheats at the end of the 49-day acclimation period. Protein accumulations in the wheat-crested wheatgrass (*Agropyron* cristatum L. Gaertner) interspecific resembled that of the wheat parent. The influence of the higher ploidy level wheats of the expression of homologous gene families from wheat-related hardy diploids in interspecific combinations may in part explain the poor cold tolerance observed. [References: 33].

443 Liu Genqi (Academia Sinica, Beijing (China). Inst. of Genetics) (1994) **Direct transformation of foreign DNA uptake during wheat pollinating and its application in crop breeding.** *Acta Genetica Sinica (China) v. 21(6) p. 463-467.* 1 table; 7 ref. Chinese. (AGRIS 95-131695).

444 Loeschenberger, F. (Gemeinschaftskernkraftwerk Tullnerfeld G.m.b.H., Vienna (Austria)); Pfosser, M.; Heberle Bors, E. (Vienna Univ. (Austria). Inst. of Microbiology and Genetics) (1995) **[Genetic variability for the frequency of doubled haploid green plants is correlated with the ratio of green to albino plants in wheat (Triticum aestivum L.) microspore-derived plants]. La variabilita' genetica della frequenza di piante verdi aploidi raddoppiate e' correlata con il rapporto fra piante verdi e albine in piante derivate da microspore di grano (Triticum aestivum L.).** *Journal of Genetics and Breeding (Italy) v. 49(1) p. 37-44.* 1 table; 2 graphs; 33 ref. English. (AGRIS 95-131715).

Flow cytometry was used to investigate ploidy levels of pollen plants regenerated from anther cultures of hexaploid wheat (Triticum aestivum L.). Among 1487 analyzed green pollen plants, 55.6% were haploid, 40.7% were diploid, 0.5% were tetraploid and 3.2% were of mixed ploidy consisting of haploid and diploid tillers. Strong genotypic differences in diploid frequency were observed, both in cultivars and breeding lines, ranging from 26.1% to 54.8%. A correlation was observed between the frequency of green diploids and the frequency of albino plants. Genotypes that produced a high frequency of green diploids also produced a small ratio of green/albino plants. This correlation might indicate that albino plant formation and spontaneous diploidization are both expressions of gametoclonal variation arising during in vitro culture.

445 Luckett, D.J. (New South Wales Agriculture, Wagga Wagga (Australia)) (1992) **Development of barley anther culture techniques for doubled haploid production.** New South Wales Agriculture. 5 fig., 8 tables. 61 p. English. (AGRIS 95-151500).

Gives detailed results and analyses of experimental work using anther culture technology to develop a protocol for the production of pure breeding doubled haploid lines for routine barley breeding. Also being investigated were enhancements of the technology used in these breeding programmes, and field testing of the doubled haploid lines produced so that promising lines could be directed into further breeding programmes.

446 Luckett, D.J. (New South Wales Agriculture, Wagga Wagga (Australia)) (1992) **Overseas travel to the People's Republic of China [plant tissue culture].** New South Wales Agriculture. 7 p. English. (AGRIS 95-151485).

Gives an overview of work being done on plant tissue culture and plant genetic research for field and horticultural crops in the research institutes and centres visited in China. Seminars on tissue culture work being conducted at the Agricultural Research Institute at Wagga Wagga were given during the tour.

447 Lupotto, E.; Cattaneo, M.; Borrelli, GH.; Qiao, YM.; Marsan, PA.; Locatelli, F.; Torre, AD.; Patrucco, E. (1995) **PLANT REGENERATION FROM PROTOPLASTS OF WHEAT (TRITICUM AESTIVUM L) AND TOOLS FOR GENETIC TRANSFORMATION IN TRITICUM SPECIES [Review].** *Cereal Research Communications. 23(3):315-324.* English. [IST SPERIMENTALE CEREALICOLTURA SEZ BERGAMO VIA STEZZANO 24 I-24126 BERGAMO ITALY].

448 Madeley, J. (1994) **Breeding for the tough spots.** *Ceres. The FAO Review (FAO) v. 26(5, = no. 149) p. 23-26.* English. (AGRIS 95-151282).

449 Madeley, J. (1994) **[Breeding for the tough spots]. Croisements pour terres difficiles.** *Ceres. Revue de la FAO (FAO) v. 26(5, = no. 149) p. 23-26.* French. (AGRIS 95-151284).

450 Madeley, J. (1994) **[Breeding for the tough spots]. Luchando contra los elementos.** *Ceres. Revista de la FAO (FAO) v. 26(5, = no. 149) p. 23-26.* Spanish. (AGRIS 95-151286).

451 Mahgoub, E.M.I. (Zagazig Univ. (Egypt). Faculty of Agriculture) (1993) **Allelic variation and expression of high molecular weight (HMW) glutenin subunit genes in the tetraploid wheat (Triticum turgidum L.).** *Zagazig Journal of Agricultural Research (Egypt) v. 20(5) p. 1485-1494.* 1 fig. 1 table; 25 ref. English. (AGRIS 95-132341).

452 Mahgoub, E.M.I. (Zagazig Univ. (Egypt). Faculty of Agriculture) (1993) **Genetic variation in the high molecular weight, HMW glutenin subunits of wheat varieties and breeding lines grown in Egypt.** *Zagazig Journal of Agricultural Research (Egypt) v. 20(3) p. 1041-1049.* 1 fig. 2 tables; 19 ref. English. (AGRIS 95-131711).

453 Mahmood, M.T. (1993) **Interrelationship and combining ability for some drought related and yield characters in spring wheat.** University of Agriculture, Faisalabad (Pakistan). Dept. of Plant Breeding and Genetics. UAF. 20 tables, 77 ref. 102 p. English. (AGRIS 95-131727).

454 Mann, M.S.; Sharma, S.N. (Rajasthan Agricultural University, Sriganganagar (India). Agricultural Research Station) (1995) **Combining ability in the F1 and F2 generations of dialleles cross in macaroni wheat (Triticum durum Desf.).** *Indian Journal of Genetics and Plant Breeding (India) v. 55(2) p. 160-165.* 2 tables; 16 ref. English. (AGRIS 95-131746).

455 Marais, G.F.; Potgieter, G.F.; Roux, H.S. (Stellenbosch Univ. (South Africa). Dept. of Genetics and Inst. for Biotechnology); Le Roux, J. (1994) **An assessment of the variation for stem rust resistance in the progeny of a cross involving the Triticum species aestivum, turgidum and tauschii.** *South African Journal of Plant and Soil (South Africa) v. 11(1) p. 15-19.* English. (AGRIS 95-131741).

456 Marchetti, S.; Giordano, A.; Pappalardo, C.; Olivieri, A.M. (Udine Univ. (Italy). Istituto di Produzione Vegetale) (1995) **[Nuclear and cytoplasmic control of anther culture response in barley (Hordeum vulgare L.)]. Controllo nucleare e citoplasmatico di culture di antere nell'orzo (Hordeum vulgare L.).** *Journal of Genetics and Breeding (Italy) v. 49(1) p. 15-20.* 1 table; 2 graphs; 28 ref. English. (AGRIS 95-131411).

Six cultivars and seven experimental inbreds of barley were tested for their response to in vitro anther culture. Cv. Arda showed the highest values for percentage of responsive anthers and number of regenerated plants per 100 cultured anthers. Though a significant variation was noted among years of testing the ranking order of the inbreds was quite consistent, indicating that a single experiment may serve to screen the responsive genotypes from the nonresponsive ones. To study the genetics of anther culture response seven genotypes showing a different in vitro behaviour were crossed reciprocally with cv. Arda. The percentage of responsive anthers and the number of plants/100 cultured anthers were found to be controlled by different polygene systems. However, at least in some hybrids, the capacity to produce plants was also influenced by genes with dominant effects, nonresponsiveness resulting in recessive to good anther culture response. Moreover, it was possible to demonstrate that differences between reciprocals occurred independently of the type of cytoplasm. These differences were of secondary importance, as no significant nuclear x cytoplasmic interactions were observed.

457 Matus Tejos, Ivan Ariel (1993) **[Genetics of the resistance to Septoria tritici in flour wheats]. Genetica de la resistencia a Septoria tritici en trigos harineros.** Colegio de Postgraduados, Montecillo (Mexico). Centro de Genetica. 10 ilus.; 26 tablas; 44 ref. 82 p. Spanish. (AGRIS 95-131673).

458 May, C.E. (New South Wales Agriculture, Wagga Wagga (Australia)) (1993) **The incorporation of new septoria tritici blotch resistance genes into wheat.** New South Wales Agriculture. 3 fig. 9 p. English. (AGRIS 95-151463).

Reports on a project to investigate the diploid wheat Triticum tauschii and the wheat line M1696 as sources of septoria tritici blotch resistance genes to be introduced into commercial wheats. As part of the investigations tests to recognise variations of the causal pathogen and to detect infections early were undertaken.

459 Mcguire, PE.; Zhong, GY.; Qualset, CO.; Dvorak, J. (1995) **RESISTANCE TO BARLEY YELLOW-DWARF-VIRUS DISEASE IN DERIVATIVES OF CROSSES BETWEEN HEXAPLOID WHEAT AND SPECIES OF LOPHOPYRUM (TRITICEAE POACEAE).** *Plant Breeding-Zeitschrift fur Pflanzenzuchtung. 114(4):287-290.* English. [UNIV CALIF DAVIS DEPT AGRON & RANGE SCI DAVIS, CA 95616 USA].

Among the wheatgrasses that are possible sources of genetic resistance for wheat to barley yellow-dwarf-virus disease (BYD) are those that have been commonly subsumed under the name Agropyron elongatum (Host) P. Beauv. Two of these wheatgrass species are the diploid Lophopyrum elongatum (Host) A. Love (2n = 2x = 14) and the decaploid L. ponticum (Podp.) A. Love (2n = 10x = 70). These two species, the addition and substitution lines of L. elongatum chromosomes in hexaploid wheat (Triticum aestivum L.), and derivatives of hybrids between hexaploid wheat and L. ponticum, were screened for resistance to BYD, as defined by visual symptoms in held-grown plants, The two species, an amphiploid derived from L. elongatum x 'Chinese Spring' wheat, and the derivatives involving L. ponticum chromosomes were all highly resistant. The substitution and addition lines of L. elongatum chromosomes in 'Chinese Spring' revealed that the genetic control of resistance in L. elongatum must be complex, with more than one critical locus involved. Chromosomes 2E and 5E are involved and there are lesser contributions to resistance from the remaining wheatgrass chromosomes. One highly resistant derivative was determined to have only three pairs of L. ponticum chromosomes. It has a wheat-like morphology and shows promise for further characterization. [References: 20].

460 Mckendry, AL.; Mcvetty, PBE.; Evans, LE. (1995) **SELECTION CRITERIA FOR COMBINING HIGH GRAIN YIELD AND HIGH GRAIN PROTEIN CONCENTRATION IN BREAD WHEAT.** *Crop Science. 35(6):1597-1602.* English. [UNIV MISSOURI DEPT AGRON COLUMBIA, MO 65211 USA].

This study was designed to identify selection criteria for the simultaneous improvement of grain yield and grain protein concentration in spring wheat (Triticum aestivum L.). Eight cultivars were selected. Six expressed contrasting levels of grain protein concentration and grain yield. Two, the cultivars 'UM632' and 'UM684', expressed high levels of both traits concurrently. Plants in replicated plots were sampled from anthesis to maturity over 2 yr and data were collected on traits related to nitrogen N and dry matter accumulation and remobilization. Grain protein concentration was not correlated with grain yield but was correlated with post-anthesis N uptake ($r = 0.66^{**}$), total plant N at maturity ($r = 0.49^{**}$), and N harvest index ($r = 0.87^{**}$), and was inversely correlated with vegetative N at maturity ($r = -0.49^{**}$). Grain yield was correlated with both post-anthesis N ($r = 0.50^{**}$) and dry matter uptake ($r = 0.58^{**}$), with total N ($r = 0.78^{**}$) and dry matter ($r = 0.77^{**}$) at maturity, and with harvest index ($r = 0.83^{**}$), Grain protein yield was highly correlated with post-anthesis N accumulation ($r = 0.90^{**}$), total N at maturity ($r = 0.98^{**}$) and the sum of N harvest index and harvest index ($r = 0.93^{**}$). UM632 and UM684 coupled high post-anthesis N uptake and total N at maturity with high remobilization efficiency and N harvest index, while maintaining harvest index. We concluded that grain protein concentration and grain yield could be improved simultaneously if selection was practiced for threshold levels of grain yield or protein concentration followed by selection for grain protein yield in populations constructed from crosses combining high total N at maturity, N harvest index and harvest index. [References: 25].

461 McKinnon, G.E.; Henry, R.J. (Queensland Univ., St Lucia (Australia). Queensland Agricultural Biotechnology Centre) (1993) **Transformation of wheat tissues by microparticle bombardment. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 507.* Abstract only. English. (AGRIS 95-131333).

462 Mello, P.C. de (1994) **[Performance of wheat lineages and cultivars (Triticum aestivum (L.)) in two regions of Minas Gerais state]. Comportamento de linhagens e cultivares de trigo (Triticum aestivum (L.)) em dois locais do estado de Minas Gerais.** Escola Superior de Agricultura de Lavras, MG (Brazil). 9 tables; 36 ref. 46 p. Portuguese. (AGRIS 95-131690).

463 Mikami, K.; Katsura, M.; Ito, T.; Iwabuchi, M. (1995) **POTENTIAL TRANSCRIPTION REGULATORY SEQUENCES IN A PROMOTER REGION OF THE WHEAT BASIC LEUCINE ZIPPER PROTEIN *HBP-1B(C38)* GENE.** *Plant & Cell Physiology. 36(7):1375-1379.* English. [KYOTO UNIV FAC SCI DEPT BOT KYOTO 60601 JAPAN].

A gene encoding the wheat transcription factor HBP-1b(c38) and its promoter region have been structurally analyzed. Protein-DNA interaction studies indicated the specific binding of the hexamer motif ACGTCA found in the promoter to the HBP-1b isoforms including HBP-1b(c38), suggesting that transcription of the HBP-1b(c38) gene may be autoregulated. [References: 26].

464 Mishra, S.K.; Kushwaha, C.M. (IARI, New Delhi (India). Division of Genetics) (1993) **Inheritance of dwarfism in wheat [Triticum aestivum].**

RACHIS (ICARDA); Barley and Wheat Newsletter v. 12(1-2) p. 36-38. 2 tables; 7 ref. English. (AGRIS 95-151640).

The inheritance of dwarfism was studied using F1 and F2 populations of 40 wheat (Triticum aestivum L. ssp. aestivum) crosses involving 10 indigenous tall varieties and four sources of dwarfism. The study revealed that dwarfism caused by Rht1 was partially recessive and that of Rht2 was dominant. Additive gene action was found to control plant height in crosses involving Rht3 and Rht8 dwarfing sources. Rht8 can be successfully exploited in wheat breeding.

465 Misic, T.; Borojevic, S.; Dencic, S.; Mikic, D.; Mihaljev, I.; Jerkovic, Z.; Pankovic, L.; Jevtic, R. (Poljoprivredni fakultet, Novi Sad (Yugoslavia). Institut za ratarstvo i povrtarstvo) (1995) **[Novi Sad cultivars of winter wheat approved in 1994 [Yugoslavia]]. Novosadske sorte ozime psenice priznate 1994. godine [Jugoslavija].** 29. seminar agronoma; Vrnjacka Banja (Yugoslavia); 30 Jan - 4 Feb 1995. *Zbornik radova - Poljoprivredni fakultet u Novom Sadu, Institut za ratarstvo i povrtarstvo (Yugoslavia) (no. 23) p. 213-226.* 5 tables; 16 ref. Serbian. (AGRIS 95-131352).

The paper presents 13 wheat varieties developed at the Institute of Field and Vegetable Crops in Novi Sad (Yugoslavia) and approved by the Yugoslav Federal Commission for Varietal Approval in 1994. Most of these cultivars have genetic potential for grain yield over 12 t/ha, while a lot of them have an excellent technologic quality, field resistance to leaf rust, good resistance to stem rust and powdery mildew, lodging and low temperatures. The results of this breeding work confirm that the genes responsible for the main traits of winter wheat can be successfully combined into one cultivar by the single, three-way, successive and multiple crossing of genetically divergent parents at high intensity level.

466 Misic, T.; Mladenov, N. (Poljoprivredni fakultet, Novi Sad (Yugoslavia). Institut za ratarstvo i povrtarstvo) (1995) **[Wheat breeding for the resistance to lodging]. Oplemenjivanje psenice na otpornost prema poleganju.** 29. seminar agronoma; Vrnjacka Banja (Yugoslavia); 30 Jan - 4 Feb 1995. *Zbornik radova - Poljoprivredni fakultet u Novom Sadu, Institut za ratarstvo i povrtarstvo (Yugoslavia) (no. 23) p. 115-130.* 3 tables; 41 ref. Serbian. (AGRIS 95-131350).

Within the program of breeding winter wheat conducted at the Institute of Field and Vegetable Crops in Novi Sad, Yugoslavia, particular attention has been paid to stem shortening and its better resistance to lodging. For this purpose, the gene for height reduction Rht8 and the gene for shorter photoperiod (earliness) PPd1 from Akakomughi cultivar were used most often. Other Rht genes applied were Rht 1S from Saitama 27 cultivar and the genes Rht 1 and Rht 2 from Norin 10 cultivar. The paper presents resistance to lodging of 39 cultivars of winter wheat.

467 Mohamed, A.I.S. (Hudeiba Research Station, El Damer (Sudan)) (1993) **Performance of bread wheat genotypes in northern Sudan [Triticum aestivum].** *RACHIS (ICARDA); Barley and Wheat Newsletter v. 12(1-2) p. 43-49.* 5 tables; 3 ref. English. (AGRIS 95-151644).

Introduced bread wheat (triticum aestivum L. ssp. aestivum) genotypes were evaluated in the 1984-90 seasons at Hudeiba, northern Sudan. Heading of the genotypes was within 48-89 days, while maturity was within 80-131 days with significant differences among the genotypes. Grain yield also varied significantly with a highest yield of 5.6 t/ha and lowest of 0.5 t/ha. In general, the medium-maturity genotypes appear to yield better than early and late ones under the conditions of northern Sudan. Temperature during February and March seems to have a major effect on grain yield.

468 Morenosevilla, B.; Baenziger, PS.; Shelton, DR.; Graybosch, RA.; Peterson, CJ. (1995) **AGRONOMIC PERFORMANCE AND END-USE QUALITY OF *1B VS 1BL/1RS* GENOTYPES DERIVED FROM WINTER WHEAT RAWHIDE.** *Crop Science. 35(6):1607-1612.* English. [UNIV NEBRASKA DEPT AGRON LINCOLN, NE 68583 USA].

The winter wheat (Triticum aestivum L.) cultivar Rawhide is heterogenous for the 1BL/1RS translocation. The 1BL/1RS translocation has been proven to increase grain yield and decrease end-use quality in bread wheat. The objective of this research was to investigate if the excellent yield performance of Raw hide was due to higher yielding 1BL/1RS Lines compensating for lower yielding in lines and if the acceptable quality of Rawhide was produced by higher end-use quality in lines compensating for lower end-use quality 1BL/1RS lines. To do so, 19 homogeneous in genotypes and 18 homogeneous 1BL/1RS genotypes were selected from Rawhide. These genotypes, three composites (Composite In, Composite 1BL/1RS, and Composite Total), Rawhide, and three check cultivars, were evaluated in four Nebraska environments for grain yield, yield components, and end-use quality traits. No significant differences were found between chromosome classes for grain yield. The 1BL/1RS genotypes had a higher kernel weight (4%) than 1B genotypes; however, the in genotypes had a greater number of spikes per square meter (5%). Composites were no different from Rawhide and from each other for grain yield and yield components. For end-use quality traits, the 1BL/1RS genotypes had a higher protein content (137 mg g(-1)), similar mixing time (4.8 min), and lower mixing tolerance (3.5) than in genotypes (132 mg g(-1), 5.0 min, and 4.9, respectively). However, a mixing tolerance value of 3.5 is acceptable. In general, no differences were found among the composites and between the composites and Rawhide for quality traits. Hence, the 1BL/1RS translocation was not beneficial for yield nor was it detrimental for end-use quality in this genetic background. [References: 29].

469 Mos, M. (1994) **[Sprouting in winter triticale]. Porastanie pszenzyta ozimego.** Akademia Rolnicza, Krakow (Poland). Katedra Hodowli Roslin i Nasiennictwa. *Zeszyty Naukowe Akademii Rolniczej im. Hugona Kollataja w Krakowie. Rozprawy (Poland); no. 195 50 p.* Wydawnictwo Akademii Rolniczej w Krakowie. 10 fig., 12 tables; ref. p. 44-50. Polish. (AGRIS 95-151634).

The study consisted of three series experiments. The purpose of the first series was to examine sprouting resistance variability and to evaluate the postharvest dormancy in domestic cultivars and strains of triticale. The study revealed significant differences between cultivars in respect to sprouting resistance. The second series of study concentrated on cultivar, genotypical and topographical variability of sprouting. The existing variability shows that genotypes resistant to sprouting can be selected. The last series of experiments concentrated on alpha-amylase heritability for genotypes derived from crossing the Grado cultivar with 4 strains resistant to sprouting.

470 Mrva, K.; Mares, D.J. (Sydney Univ., Narrabri (Australia). Plant Breeding Inst.) (1993) **High amylase in wheat: identification of sources, inheritance and cultivar improvement. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 500-501.* Abstract only. English. (AGRIS 95-131330).

471 Mundt, CC.; Brophy, LS.; Schmitt, MS. (1995) **CHOOSING CROP CULTIVARS AND CULTIVAR MIXTURES UNDER LOW VERSUS HIGH DISEASE PRESSURE - A CASE STUDY WITH WHEAT.** *Crop Protection. 14(6):509-515.* English. [OREGON STATE UNIV DEPT BOT & PLANT PATHOL CORVALLIS, OR 97331 USA].

Four winter wheat cultivars and all possible equiproportional mixtures among them were grown under low and high severity of Septoria blotch (caused by Mycosphaerella graminicola and Leptosphaeria nodorum) and eyespot (caused by Pseudocercosporella herpotrichoides) in each of 3 years. On average, mixtures provided only a small reduction of Septoria blotch relative to their component pure stands (27, 9, 15% for the three seasons), however, mixtures containing both very resistant and very susceptible cultivars demonstrated larger reductions. Reductions of eyespot severity due to mixing averaged only 6% in the one mixture evaluated, and were statistically non-significant. The two most resistant cultivars yielded less than the two more susceptible cultivars under low disease pressure, while the opposite relationship between yield and disease resistance was found under high disease pressure. There was considerable variation among mixtures for yield, and the yield of a mixture could generally not be predicted a priori. Some mixtures demonstrated high yields over years and under both low and high disease pressure. For western Oregon and Washington, the best strategy may be to choose a cultivar with intermediate yield potential and disease resistance or to grow a cultivar mixture with proven yield performance. [References: 18].

472 Munns, R. (Commonwealth Scientific and Industrial Research Organisation, Canberra (Australia). Div. of Plant Industry); Schachtman, D.P. (California Univ., La Jolla (USA). Biology Dept.) (1992) **Significance of time scale in distinguishing genotypic differences in salt tolerance [wheat, barley]. [Conference paper].** Abstracts of the Australian Society of Plant

Physiologists (Australia) p. 33. Australian Society of Plant Physiologists. p. 33. English. (AGRIS 95-131432).

473 Nelson, JC.; Sorrells, ME.; Vandeynze, AE.; Lu, YH.; Atkinson, M.; Bernard, M.; Leroy, P.; Faris, JD.; Anderson, JA. (1995) **MOLECULAR MAPPING OF WHEAT - MAJOR GENES AND REARRANGEMENTS IN HOMOEOLOGOUS GROUPS 4, 5, AND 7.** *Genetics. 141(2):721-731.* English. [CORNELL UNIV DEPT PLANT BREEDING & BIOMETRY 252 EMERSON HALL ITHACA, NY 14853 USA].

A molecular-marker linkage map of hexaploid wheat (Triticum aestivum L. em. Thell) provides a framework for integration with the classical genetic map and a record of the chromosomal rearrangements involved in the evolution of this crop species. We have constructed restriction fragment length polymorphism (RFLP) maps of the A-, B-, and D-genome chromosomes of homoeologous groups 4, 5, and 7 of wheat using 114 F-7 lines from a synthetic x cultivated wheat cross and clones from 10 DNA libraries. Chromosomal breakpoints for known ancestral reciprocal translocations involving these chromosomes and for a known pericentric inversion on chromosome 4A were localized by linkage and aneuploid analysis. Known genes mapped include the major vernalization genes Vrn1 and Vrn3 on chromosome arms 5AL and 5DL, the red-coleoptile gene Rc1 on 7AS, and presumptively the leaf-rust (Puccinia recondita f.sp. tritici) resistance gene Lr34 on 7DS and the kernel-hardness gene Ha on 5DS. RFLP markers previously obtained for powdery-mildew (Blumeria graminis f.sp. tritici) resistance genes Pm2 and Pm1 were localized on chromosome arms 5DS and 7AL. [References: 69].

474 Newton, A.C. (Scottish Crop Research Inst., Dundee (United Kingdom)) (1992) **Expression of partial resistance to mildew in barley.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 31-33.* 3 tables; 5 ref. English. (AGRIS 95-131401).

Clearly amongst just 4 sources of partial resistance there is a wide variety of expressions of partial resistance representing a broad genetic basis. However, the usefulness of all these characters is questionable for all environments but there is scope for tailoring resistance expressions for different uses. Their durability may also be environmentally dependent and some of these characters such as the resistance in 7204 are not polygenic. However, their testing in variety mixtures does suggest that their resistance is race non-specific.

475 Nie Daotai (Academia Sinica, Beijing (China). Inst. of Genetics) (1994) **Characterization of a wheat germplasm for BYDV resistance using biochemical markers.** *Acta Genetica Sinica (China) v. 21(6) p. 468-470.* 1 table; 5 ill., 8 ref. Chinese. (AGRIS 95-131694).

476 O'Brien, L.; Ellison, F.W.; Trethowan, R.M. (Sydney Univ., Narrabri (Australia). Plant Breeding Inst.) (1993) **Breeding tolerance to weather damage in wheat.** *Chemistry in Australia (Australia) v. 60(9) p. 488.* 6 ref., 1 fig. English. (AGRIS 95-131325).

477 Ohm, HW.; Sharma, HC.; Patterson, FL.; Ratcliffe, RH.; Obanni, M. (1995) **LINKAGE RELATIONSHIPS AMONG GENES ON WHEAT CHROMOSOME 5A THAT CONDITION RESISTANCE TO HESSIAN FLY.** *Crop Science. 35(6):1603-1607.* English. [PURDUE UNIV DEPT AGRON W LAFAYETTE, IN 47907 USA].

Hessian By [Mayetiola destructor (Say)] is a serious pest of wheat (Triticum ssp.) in many wheat growing areas of the world. A number of genes (H1-H26) that confer resistance to Hessian By have been described. The linkage relationships of many of these genes, which are useful in breeding wheat for resistance to Hessian By, are unknown. Testcross analyses were made in tetraploid durum wheat (Triticum turgidum L.) and tested to biotype D of Hessian fly to determine the linkage relationships among genes H9, H10, H12, H14, H15, H16 and H17, all conferring resistance to biotype D. Also, monosomic 5A plants of susceptible cultivar Chinese Spring were crossed as seed parents to Purdue wheat (T. aestivum L. em Thell.) lines carrying gene H10 or H12. Testcross analyses indicated that six of these genes appear to occupy a single Linkage block on wheat chromosome 5A in the order H9 to H15, H10, H17, H16, and H12. Gene H14 did not appear to be within the Linkage block H9 to H12. Additionally, F-2 plants derived from 41-chromosome F-1 plants and F-3 families derived from F-2 resistant plants were tested against biotype D. F-2 segregation deviated significantly from 3 resistant : 1 susceptible and h families from resistant F-2 plants deviated significantly from 1 resistant : 2 segregating for both crosses involving H10 and H12. Thus, monosomic analyses provided additional evidence that genes H10 and H12 are Likely on chromosome 5A. Linkage between these genes would not seriously Limit efforts to pyramid them in breeding for resistance to the Hessian By because the linkage values are more than 20 centimorgans. [References: 23].

478 Paniagua, C.; Schvartzman, J.; Kohli, M.M. (Direccion de Investigacion Agricola (DIA)) (1994) **[Three new varieties of wheat of high field : IAN 8 - Pirapo; Itapua 35 - Aperea; Itapua 40 - Obligado]. Tres nuevas variedades de trigo de alto rendimiento : IAN 8 - Pirapo; Itapua 35 - Aperea; Itapua 40 - Obligado.** Ministerio de Agricultura y Ganaderia, Asuncion (Paraguay). Direccion de Investigacion Agricola (DIA). *Boletin de divulgacion (Paraguay); no. 34 10 p.* DIA. Spanish. (AGRIS 95-151276).

479 Panozzo, J.F.; McCormick, K.M.; Martin, P.J. (Victorian Dept. of Agriculture, Horsham (Australia). Inst. for Dryland Agriculture) (1993) **Late maturity alpha-amylase variation during grain filling [wheat].** [Conference paper]. 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 510.* Abstract only. English. (AGRIS 95-131335).

480 Parkhomenko, A.I.; Krupnov, V.A. (1994) **[Yielding capacity of red and white common spring wheat lines grown on Zavolzhye chestnut soils [Russian Federation]]. Produktivnost' krasno- i belozernykh izolinij yarovoj myagkoj pshenitsy na kashtanovykh pochvakh Zavolzh'ya.** *Doklady Rossijskoj akademii sel'skokhozyajstvennykh nauk (Russian Federation) (no.6) p. 5-7.* Russian. (AGRIS 95-151659).

The study of ten pairs of red and white wheat lines grown on the boghara and under irrigation has shown that the genes, controlling the grain colour, insignificantly influenced the duration of the growth period, the plant height, the yield, and other properties. Red sibs substantially surpassed white lines in the resistance to the preharvest germination. White lines also reliably varied by this property.

481 Pauk, J.; Kertesz, Z.; Beke, B.; Bona, L.; Csosz, M.; Matuz, J. (1995) **NEW WINTER WHEAT VARIETY - GK DELIBAB DEVELOPED VIA COMBINING CONVENTIONAL BREEDING AND IN VITRO ANDROGENESIS.** *Cereal Research Communications:* 23(3):251-256. English. [CEREAL RES INST DEPT WHEAT GENET & BREEDING POB 391 H-6701 SZEGED HUNGARY].

Wheat (Triticum aestivum L.) cultivar 'GK Delibab' was improved and released in 9 yeats combining conventional breeding steps and plant biotechnology methods. 'GK Delibab' is derived from a multiple cross made in 1984. After F-2 selection, haploids were induced from F-3 generation in anther culture. Fertile doubled haploid (DH) seeds and lines obtained via colchicine treatment were multiplied and tested further in nursery. After three years of official tests at National Institute for Agricultural Quality Control (NIAQC) for registration 'GK Delibab' was registered and released as a winter wheat variety in Hungary. The major agronomical advantages of 'GK Delibab' are its excellent winterhardiness, premium bread making quality and earliness. The performance of 'GK Delibab' suggests that for breeding lines originating from DH plants may be as valuable as lines originating from traditional breeding sources.

482 Pavlovic, M.; Kuburovic, M.; Knezevic, D. (Institut za istrazivanja u poljoprivredi "Srbija", Kragujevac (Yugoslavia). Centar za strna zita) (1994) **[Genetic analysis for kernel weight per primary spike in wheat (Triticum aestivum L.)]. Geneticka analiza mase zrna po primarnom klasu *psenice* (Triticum aestivum L.).** Prvi jugoslovenski naucno-strucni simpozijum iz selekcije i semenarstva (1. JUSEM); Vrnjacka Banja (Yugoslavia); 25-28 May 1994. *Selekcija i semenarstvo (Yugoslavia) v. 1(1) p. 107-110.* 4 tables; 10 ref. Serbian. (AGRIS 95-131740).

The diallel cross excluding reciprocals of four divergent wheat was performed and F1 and F2 hybrids were derived. These four cultivars and F1 and F2 hybrids were studied to evaluate the mode of inheritance, gene effects and combining ability for kernel weight per primary spike in wheat plants. The obtained results showed different *modes* of inheritance for kernel weight (intermediate, partial dominance, dominance and overdominance).

Analysis of variance of combining ability indicated significant differences for this trait. The best general combiner for kernel weight was KG-75 cultivar while KG-75 x NS-322 was best specific combiner.

483 Pedersen, C. (1995) **The relationship between physical and genetic distances on the barley chromosomes studies by in situ hybridization [including 6 appendices].** Kongelige Veterinaer- og Landbohoejskole, Copenhagen (Denmark). KVL. 28 ill., 12 tables; 36 ref. 131 p. English. *(AGRIS 95-131407).*

484 Penrose, L.J. (New South Wales Agriculture, Orange (Australia)) (1993) **Overseas travel: visit to ICARDA [wheat breeding].** New South Wales Agriculture. 4 fig., 8 tables. 44 p. English. (AGRIS 95-151462).

Discusses wheat research breeding objectives and methodologies investigated during a study visit to the International Centre for Agricultural Research in Dry Areas in Syria. The Australian wheat industry can benefit considerably financially through the development of varieties with increased yields and wider adaptation than those currently available and it is these aspects of genetic improvement which are detailed in the report.

485 Petrasovits, L.A.; Muradov, A.; Mackinnon, G.; Simpson, R.S.; Scott, K.J. (Queensland Univ., St Lucia (Australia). Dept. of Biochemistry) (1992) **A gene encoding a basic pathogenesis-related (PR-like) protein from barley. [Conference paper].** Abstracts of the Australian Society of Plant Physiologists (Australia) p. P59. Australian Society of Plant Physiologists. p. P59. English. (AGRIS 95-131392).

486 Phillippe, B.; Cammue, BPA.; Thevissen, K.; Hendriks, M.; Eggermont, K.; Goderis, IJ.; Proost, P.; Vandamme, J.; Osborn, RW.; Guerbette, F.; Kader, JC.; Broekaert, WF. (1995) **A POTENT ANTIMICROBIAL PROTEIN FROM ONION SEEDS SHOWING SEQUENCE HOMOLOGY TO PLANT LIPID TRANSFER PROTEINS.** *Plant Physiology. 109(2):445-455.* English. [KATHOLIEKE UNIV LEUVEN FA JANSSENS LAB GENET WILLEM DE CROYLAAN 42 B-3001 HEVERLEE BELGIUM].

An antimicrobial protein of about 10 kD, called Ace-AMP1, was isolated from onion (Allium cepa L.) seeds. Based on the near-complete amino acid sequence of this protein, oligonucleotides were designed for polymerase chain reaction-based cloning of the corresponding cDNA. The mature protein is homologous to plant nonspecific lipid transfer proteins (nsLTPs), but it shares only 76% of the residues that are conserved among all known plant nsLTPs and is unusually rich in arginine. Ace-AMP1 inhibits all 12 tested plant pathogenic fungi at concentrations below 10 mu g mL(-1). Its antifungal activity is either not at all or is weakly affected by the presence of different cations at concentrations approximating physiological ionic strength conditions. Ace-AMP1 is also active on two Gram-positive bacteria but is apparently not toxic for Cram-negative bacteria and cultured human cells. In contrast to nsLTPs such as those isolated from radish or maize seeds, Ace-AMP1 was unable to transfer phospholipids from liposomes to mitochondria. On the other hand, lipid transfer proteins from wheat and maize seeds showed little or no antimicrobial activity, whereas the radish lipid transfer protein displayed antifungal activity only in media with low cation concentrations. The relevance of these findings with regard to the function of nsLTPs is discussed. [References: 49].

487 Polanco, C.; Delavega, MP. (1995) **LENGTH POLYMORPHISM IN THE RIBOSOMAL DNA INTERGENIC SPACER OF RYE AND SLENDER WILD OATS.** *Journal of Heredity. 86(5):402-407.* English. [UNIV LEON FAC BIOL DEPT GENET E-24071 LEON SPAIN].

Variation in ribosomal DNA spacer length was analyzed in nine populations of three species of grasses by restriction fragment length polymorphism analysis using non radioactive labeling. Three populations of rye. Secale cereale, four of the tetraploid slender wild oat, Avena barbata, and two of its diploid ancestor A. hirtula were analyzed. Extensive spacer length polymer phism, attributed to the differences in number of spacer subrepeats within rDNA arrays, existed in the three species. The fragment lengths generated by EcoRI in the two oat species ranged from 2.2 to 3.2 kb, while the fragments generated by BamHI in rye ranged from 4.7 to 6.2 kb. The phenotypic variability observed agrees with the expectations from the different mating types and number of rDNA loci of these three species. In the two oats species, the most frequent spacer length variants were shared for both oat species and were present in all the populations; likewise, frequent spacer length variants were present in the three rye populations. The results are compared with previous data on rDNA polymorphism in rye and in slender oats populations and on genetic variability for isozyme loci in the same populations of both oats and rye. [References: 26].

488 Pretorius, Z.A. (Orange Free State Univ., Bloemfontein (South Africa). Dept. of Plant Pathology); Marais, G.F.; Smith, J.; Le Roux, J.; Kloppers, F.J. (1994) **Absence of the 1BL/1RS chromosome translocation in the Kavkaz-derived wheat cultivar Tugela.** *South African Journal of Plant and Soil (South Africa) v. 11(3) p. 130-133.* 3 fig. English. (AGRIS 95-131742).

489 Pretorius, Z.A.; Van Niekerk, B.D.; Kloppers, F.J.; Vorster, A.L. (Orange Free State Univ., Bloemfontein (South Africa). Dept. of Plant Pathology) (1995) **Managing certain recently named Lr genes in breeding wheat for resistance to Puccinia recondita f. sp. tritici in South Africa.** *South African Journal of Plant and Soil (South Africa) v. 12(1) p. 32-37.* English. (AGRIS 95-131743).

490 Procunier, J.D.; Townley Smith, T.F.; Prashar, S.; Gray, M.; Kim, W.K.; Czarnecki, E.; Dyck, P.L. (Manitoba Univ., Winnipeg (Canada)); Fox, S. (Minnesota Univ., St. Paul (USA). Dept. of Agronomy and Plant Genetics) (1995) **[PCR-based RAPD/DGGE markers linked to leaf rust resistance genes Lr29 and Lr25 in wheat (Triticum aestivum L.) [RAPD/DGGE, random amplified polymorphic DNA/denaturing gradient gel electrophoresis; PCR, polymerase chain reaction]]. Marcatori RAPD/DGGE basati su PCR connessi con i geni per la resistenza alla ruggine della foglia Lr29 e Lr25 nel grano (Triticum aestivum L.) [RAPD/DGGE, DNA polimorfico amplificato a caso/elettroforesi su gel a gradiente denaturante; PCR, reazione a catena della polimerasi].** *Journal of Genetics and Breeding (Italy) v. 49(1) p. 87-92.* 1 table; 23 ref. English. (AGRIS 95-131716).

Near-isogenic lines (NILs) carrying leaf rust resistance genes Lr29 and Lr25 were screened for molecular markers that showed linkage to the Lr genes. By combining the RAPD (random amplified polymorphic DNA) technique with the DGGE (denaturing gradient gel electrophoresis) method of fragment separation, two tightly linked DNA markers to Lr29 and one to Lr25 were identified. These results demonstrated the feasibility of using RAPD markers to monitor introgressed alien DNA in the complex cereal, wheat. The rapid pyramiding of these genes and other PCR-marked leaf rust resistance genes into cultivars is possible in wheat breeding programs.

491 Przulj, N.; Momcilovic, V.; Mikic, K.; Malesevic, M. (Poljoprivredni fakultet, Novi Sad (Yugoslavia). Institut za ratarstvo i povrtarstvo) (1995) **[Characteristics of new cultivars of six-rowed and two-rowed barleys developed at the Institute of Field and Vegetable Crops in Novi Sad . [Yugoslavia]]. Karakateristike novijih sorti viseredog i dvoredog jecma stvorenih u Institutu za ratarstvo i povrtarstvo, Novi Sad [Jugoslavija].** 29. seminar agronoma; Vrnjacka Banja (Yugoslavia); 30 Jan - 4 Feb 1995. *Zbornik radova - Poljoprivredni fakultet u Novom Sadu, Institut za ratarstvo i povrtarstvo (Yugoslavia) (no. 23) p. 153-167.* 10 tables; 10 ref. Serbian. (AGRIS 95-131426).

Applying the method of hybridization of divergent genotypes, so far 13 forage and 28 malting barley cultivars have been in the Institute of Field and Vegetable Crops in Novi Sad, Yugoslavia. Several cultivars of forage and malting barleys have been approved which have better characteristics than already existing cultivars. Six-rowed winter forage barley Galeb had average yield at five locations 1130 kg/ha higher than standard cultivar Partizan. Two rowed spring barley Lazar is less favourable for malting due to high protein content, and should be therefore used as forage barley. The cultivars Pek and Vihor have high values for Hartong number and can be applied in the process of exploitation of non-malted starch raw materials.

492 Rafiq, M. (1992) **Heritability and genetic advance for some morphophysiological traits in spring wheat.** University of Agriculture, Faisalabad (Pakistan). Dept. of Plant Breeding and Genetics. UAF. 11 tables, 22 ref. 78 p. English. (AGRIS 95-131728).

493 Rahman, S.; Hogie, L.; Appels, R. (Commonwealth Scientific and Industrial Research Organisation, Canberra (Australia). Div. of Plant Industry) (1993) **Molecular analysis of starch synthesis in Triticum tauschii. [Conference paper].** 43. Royal Australian Chemical Institute Cereal

Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 511.* Abstract only. English. (AGRIS 95-131688).

494 Ramzan, M.; Chowdhry, M.A.; Khaliq, I. (University of Agriculture, Faisalabad (Pakistan). Dept. of Plant Breeding and Genetics) (1994) **Correlation between wheat grain yield and its components.** *Journal of Agricultural Research (Pakistan) v. 32(2) p. 223-226.* 3 tables, 9 ref. English. (AGRIS 95-151656).

495 Roelfs, A.P. (Minnesota Univ., St. Paul (USA). USDA, ARS. Dept. of Plant Pathology. Cereal Rust Lab.) (1992) **Resistance in Hordeum species to Puccinia graminis f. sp. tritici race Pgt-QCC.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 188-190.* 1 table; 3 ref. English. (AGRIS 95-131406).

496 Ross, AH.; Manners, JM.; Birch, RG. (1995) **MOLECULAR CLONING AND CHARACTERISATION OF PEROXIDASES FROM BUFFEL GRASS (CENCHRUS CILIARIS L).** *Plant Science. 110(1):95-103.* English. [UNIV QUEENSLAND DEPT BOT BRISBANE QLD 4072 AUSTRALIA].

Buffel grass (Cenchrus ciliaris L.) peroxidase cDNAs were isolated by hybridisation to an oligonucleotide from a conserved region of all plant peroxidases and a peroxidase cDNA clone from wheat, The 36 clones isolated were classified into one homogenous and three apparently heterogenous groups by cross-hybridisation and sequence homologies. Nine cDNAs were subcloned, partially sequenced and identified as peroxidase homologues by the presence of conserved sequences. Two full-length clones (PX7 and PX18) were completely sequenced and the deduced protein sequences revealed between 38% and 77% homology to other plant peroxidases. The mRNAs corresponding to five peroxidase cDNAs were analysed by northern analysis, to test for tissue specific or wound inducible expression. The peroxidases encoded by three clones, including PX7 and PX18, were expressed preferentially in leaves. The other two clones showed a marked wound response in leaves. No clone was strongly expressed in stems. Southern blot analysis indicated that PX18 is coded for by a single copy gene, whereas PX7 is represented in the buffel grass genome by five or six copies. This indicates the complexity of the buffel grass peroxidase gene family with respect to identification of peroxidase genes implicated in defence or developmental lignification. [References: 42].

497 Ruan Yili; Zou Wanhe (Zhejiang Academy of Agricultural Sciences, Hangzhou (China). Virology Lab.); Shi Cen; Chen He (1994) **The resistance and susceptibility reactions of barley varieties of Japan and west-Europe to Chinese barley yellow mosaic virus.** *Acta Phytophylacica Sinica (China) v. 21(3) p. 239-242.* 1 table; 5 ref. Chinese. (AGRIS 95-131396).

498 Sadiq, M. (Atomic Energy Agricultural Research Centre, Tandojam (Pakistan). Plant Genetics Division) (1993) **Improvement of hexaploid triticale for grain yield and its components [Triticales; Triticum; Hordeum vulgare; Triticum aestivum].** *RACHIS (ICARDA); Barley and Wheat Newsletter : 12(1-2) p. 56-59.* 3 tables; 4 ref. English. (AGRIS 95-151517).

Segregating lines of triticale (x Triticosecale Wittm. ex A. Camus) produced by hybridization at the Atomic Energy Agricultural Research Centre, Tandojam, Pakistan, were screened in yield trials in the 1985-87 seasons. Advanced line NIAB-T-598 gave highest grain yield (4500 kg/ha) in the first year, significantly higher than the wheats (Triticum spp.) and barley (Hordeum vulgare L. ssp. vulgare) cultivars included in the trial. In the second season, this line again out-yielded the bread wheat controls and also gave the highest 1000-kernel weight. NIAB-T-598 also showed increased kernel hardness over earlier triticale lines, to an acceptable level.

499 Scheeren, PL.; Decarvalho, FIF.; Federizzi, LC. (1995) **COMBINING ABILITY OF SIX AGRONOMIC TRAITS IN WHEAT (TRITICUM AESTIVUM L).** *Pesquisa Agropecuaria Brasileira. 30(6):831-846.* Portuguese. [EMBRAPA CTR NACL PESQUISA TRIGO CAIXA POSTAL 569 BR-99001970 PASSO FUNDO RS BRAZIL].

The experiment was carried out in the field at the Estacao Experimental Agronomica of Universidade Federal do Rio Grande do Sul, EEA-UFRGS, in Eldorado do Sul, Rio Grande do Sul, Brazil, in 1987. The objective of the experiment was to analyze the combining ability involving six traits in ten wheat genotypes. When the genetic aspects involved in the traits assessed were analyzed, it was observed that the additive effects had significant influence on the expression of the following traits: plant stature, peduncle length, number of fertile tillers per plant, number of fertile spikelets per spike, grain weight per plant, and maximum grain number per spikelet. Significant non-additive effects for the traits peduncle length, number of fertile spikelets per spike and maximum grain number per spikelet were also identified.

500 Schueller, C.M.E. (Technische Univ. Muenchen, Freising (Germany). Lehrstuhl fuer Pflanzenbau und Pflanzenzuechtung); Fischbeck, G.; Jahoor, A. (1992) **Structure analysis of the Mla linked RFLP marker.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 41-43.* 1 graph; 7 ref. English. (AGRIS 95-131403).

501 Schulzschaeffer, J.; Stallknecht, GF.; Wesenberg, DM.; Gilbertson, KM. (1995) **KARYOLOGICAL CHARACTERIZATION OF A HIGH YIELDING EMMER WHEAT (TRITICUM DICOCCUM L) LINE WITH TWO RECIPROCAL HOMOZYGOUS T4BS-CENTER-DOT-5AL AND T5AS-CENTER-DOT-4BL TRANSLOCATION CHROMOSOME PAIRS.** *Biologisches Zentralblatt. 114(3):266-272.* English. [MONTANA STATE UNIV DEPT PLANT SOIL & ENVIRONM SCI LEON JOHNSON HALL BOZEMAN, MT 59717 USA].

A Leishman-C-banded karyotype of PI 254148 emmer wheat (Triticum dicoccum L.) was analyzed. PI 254148 is a high yielding line. It was compared with 'Lewis' barley, 'Otana' oats, and 9 other emmer wheat lines in a 5-year yield trial. It ranked second after Lewis barley, yielding 2.46 MT/ha outyielding other emmer lines in this trial. It outyielded the standard variety North Dakota emmer by 102% in 1989. The PI 254148 C-banding karyotype shows a reciprocal homozygous translocation (T4BS . 5AL/T5AS . 4BL). The banding patterns show that the translocation breakpoints are located within the centromere regions of the chromosomes involved. As to our knowledge, this is the first report of a 5A/4B chromosome translocation in wheat. The authors believe it is possible that the constant high yield of PI 254148 is facilitated by the chromosome translocation which may have caused a position effect. [References: 11].

502 Sears, R.G. (Cooperative Extension Service, Manhattan, KS.); Martin, T.J.; Shroyer, J.P. (1993) **Arlin hard white wheat.** *Kansas State University. Cooperative Extension Service (USA); no. 882 2 p.* English. (AGRIS 95-151642).

503 Sears, R.G. (Cooperative Extension Service, Manhattan, KS.); Martin, T.J.; Shroyer, J.P. (1993) **Karl 92 wheat.** *Kansas State University. Cooperative Extension Service (USA); no. 881 2 p.* English. (AGRIS 95-151643).

504 Seifers, DL.; Martin, TJ.; Harvey, TL.; Gill, BS. (1995) **TEMPERATURE SENSITIVITY AND EFFICACY OF WHEAT STREAK MOSAIC VIRUS RESISTANCE DERIVED FROM AGROPYRON INTERMEDIUM.** *Plant Disease. 79(11):1104-1106.* English. [KANSAS STATE UNIV AGR & APPL SCI AGR RES CTR HAYS HAYS, KS 67601 USA].

Agronomically promising wheat (Triticum aestivum) Lines are now available that have the short arm of chromosome 4Ai-2 from Agropyron intermedium translocated onto the long arm of wheat chromosome 4D. This translocation confers a high level of resistance to wheat streak mosaic virus (WSMV). In growth chamber tests, we demonstrated that, when the translocation is present, the resistance is effective at 20 but not at 25 degrees C. Lines with the entire Ai-2 chromosome remained symptom-free at both temperatures. In field tests, both naturally infested and mechanically inoculated lines carrying the 4Ai2-S translocation were WSMV symptom free, and grain yields, test weights, and plant height were not reduced by WSMV. The grain yields of WSMV-susceptible cultivars were reduced by 21 to 45% in the same test. Although the WSMV resistance carried on the translocation is high-temperature sensitive, it was effective in the field and continues to be a very promising source for the development of WSMV-resistant cultivars. [References: 19].

505 Shafey, A.S.; Yassien, H.E. (Azhar Univ., Cairo (Egypt). Faculty of Agriculture); Abd El Moneim, A.M. (1993) **Genetic analysis of some plant characters, yield and its components in three wheat crosses.** *Annals of*

Agricultural Science, Moshtohor (Egypt) v. 31(4) p. 1889-1904. 6 tables; 22 ref. English. (AGRIS 95-131707).

506 Shahid, M.A. (1993) **Heritable variation for some morpho-genetic characters in F3 populations of spring wheat.** University of Agriculture, Faisalabad (Pakistan). Dept. of Plant Breeding and Genetics. UAF. 11 tables, 122 ref. 77 p. English. (AGRIS 95-131731).

507 Sharma, SN.; Sharma, RK.; Bhatnagar, SM.; Bhatnagar, VK. (1995) **GENETIC ARCHITECTURE OF GRAIN YIELD IN DURUM WHEAT UNDER DIFFERENT ENVIRONMENTS.** *Cereal Research Communications. 23(3):257-261.* English. [RAJASTHAN AGR UNIV AGR RES STN WHEAT BREEDING SCHEME JAIPUR 302018 RAJASTHAN INDIA].

Twelve basic generations, namely, P-1, P-2, F-1, F-2, B-1, B-2, B-1s, B-2s, B-11, B-12, B-21, and B-22 of three crosses involving six diverse cultivars of drum wheat were studied under normal and sown conditions to understand the nature of gene effects for grain yield. The 10-parameter model was adequate in most of the cases to account for the variability in generation means under both the environments. Of the epistatic effects, trigenic interactions were invariably more important than other effects in the genetic control of yielding ability in wheat. Additive X additive X dominance (x) and dominance X dominance X dominance (z) epistatic effects were contributed maximum than other effects towards significant heterosis. The non-allelic interactions particularly at three gene level were predominant for this trait. Thus, a breeding method that can mop-up the genes to form superior gene constellations interacting in a favourable manner would be more suitable to accelerate the pace of its genetic improvement.

508 Shen Yinzhu; Liu Zhiyi; Huang Zhanjing (Hebei Normal Univ., Shijiazhuang (China). Dept. of Biology) (1994) **Isoelectrofocusing electrophoretic analysis on soluble protein of germinated embryos and young shoots from different cytoplasmic male sterile lines and their maintainers in wheat.** *Acta Botanica Sinica (China) v. 36(4) p. 283-288.* 3 tables; 3 ill., 7 ref. Chinese. (AGRIS 95-131692).

509 Sherman, JD.; Fenwick, AL.; Namuth, DM.; Lapitan, NLV. (1995) **A BARLEY RFLP MAP - ALIGNMENT OF THREE BARLEY MAPS AND COMPARISONS TO GRAMINEAE SPECIES.** *Theoretical & Applied Genetics. 91(4):681-690.* English. [COLORADO STATE UNIV DEPT CROP & SOIL SCI FT COLLINS, CO 80523 USA].

Several gene linkage maps have been produced for cultivated barley. We have produced a new linkage map for barley, based on a cross between Hordeum vulgar e subsp, spontaneum and Hordeum vulgare subsp. vulgare (Hvs x Hvv), having a higher level of polymorphism than most of the previous barley crosses used for RFLP mapping. Of 133 markers mapped in the Hvs x Hvv F-2 population, 69 were previously mapped on other barley maps, and 26 were mapped in rice, maize, or wheat. Two known gene clones were mapped as well as two morphological markers. The distributions of previously mapped markers were compared with their respective barley maps to align the different maps into one consensus map. The distributions of common markers among barley, wheat, rice and maize were also compared, indicating colinear linkage groups among these species. [References: 38].

510 Shewry, P.R.; Halford, N.G.; Napier, J.A.; Tatham, A.S. (Bristol Univ. (United Kingdom). Dept. of Agricultural Sciences) (1993) **Improvement of cereal protein quality by genetic engineering. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 495.* Abstract only. English. (AGRIS 95-131326).

511 Skinnes, H.; Bjornstad, A. (1995) **COMPARATIVE TRIALS WITH ANTHER CULTURE DERIVED DOUBLED HAPLOIDS AND SINGLE SEED DESCENT LINES IN WHEAT.** *Cereal Research Communications. 23(3):267-273.* English. [AGR UNIV NORWAY DEPT HORT & CROP SCI AS NORWAY].

The effect of the anther culture method on agronomic and quality characters has been investigated in 6 spring wheat crosses. Doubled haploids have been compared with single seed descent derived lines from the same crosses in one- or two-year trials. Maturity, plant height, resistance to mildew and yellow rust, biological yield, grain yield, Falling Number, seed protein and SDS sedimentation have been studied. Analyses of variance detected highly significant genetic variation among genotypes derived by either method in all cross/character combinations. The DHs were inferior to their SSD counterparts in height and yield characters in four of the crosses. Maturity, resistance to mildew, Falling Number and seed protein (%) were unaffected. Resistance to yellow rust was reduced in four crosses and SDS showed no consistent pattern. The results indicate that negative effects of anther culture occur, but their, presence and magnitude depend on the cross and character studied. It is suggested that the conflicting reports of anther culture effects on agronomic characters in wheat may be a reflection of the different genotypes studied.

512 Sohail, N. (1993) **A study of broad sense heritability for some morphological characters in spring wheat.** University of Agriculture, Faisalabad (Pakistan). Dept. of Plant Breeding and Genetics. UAF. 11 tables, 111 ref. 79 p. English. (AGRIS 95-131729).

513 Song, WN.; Henry, RJ. (1995) **MOLECULAR ANALYSIS OF THE DNA POLYMORPHISM OF WILD BARLEY (HORDEUM SPONTANEUM) GERMPLASM USING THE POLYMERASE CHAIN REACTION.** *Genetic Resources & Crop Evolution. 42(3):273-280.* English. [UNIV QUEENSLAND CTR AGR BIOTECHNOL GEHRMANN LABS BRISBANE QLD 4072 AUSTRALIA].

Hordeum spontaneum is the progenitor of cultivated barley (H. vulgare) and is an important source of genetic variation for barley breeding programs. The genetic diversity of H. spontaneum in the Australian germplasm collection was investigated using the polymerase chain reaction with random and semi-random primers. This approach was found to be robust in respect of reaction conditions. Genetic dissimilarity values between genotypes were used to produce a phenogram of the relationships among the accessions using the unweighted pair group method with arithmetic mean. The largest divergence was observed among Israeli accessions, whereas the Turkish and Iranian samples clustered as distinct subsets, each apparently related to portion of the Israeli material. The results indicate that the genetic diversity of the wild barleys is broadly correlated with geographic distribution. [References: 16].

514 Stacy, RAP.; Espelund, M.; Saeboelarssen, S.; Hollung, K.; Helliesen, E.; Jakobsen, KS. (1995) **EVOLUTION OF THE GROUP 1 LATE EMBRYOGENESIS ABUNDANT (LEA) GENES - ANALYSIS OF THE LEA B19 GENE FAMILY IN BARLEY.** *Plant Molecular Biology. 28(6):1039-1054.* English. [UNIV OSLO DIV GEN GENET POB 1031 N-0315 OSLO NORWAY].

The highly conserved Group 1 late embryogenesis abundant (Lea) genes are present in the genome of most plants as a gene family. Family members are conserved along the entire coding region, especially within the extremely hydrophilic internal 20 amino acid motif, which may be repeated. Cloning of Lea Group 1 genes from barley resulted in the characterization of four family members named B19.1, B19.1b, B19.3 and B19.4 after the presence of this motif 1, 1, 3 and 4 times in each gene, respectively. We present here the results of comparative and evolutionary analyses of the barley Group 1 Lea gene family (B19). The most important findings resulting from this work are (1) the tandem clustering of B19.3 and B19.4, (2) the spatial conservation of putative regulatory elements between the four B19 gene promoters, (3) the determination of the relative 'age' of the gene family members and (4) the 'chimeric' nature of B19.3 and B19.4, reflecting a cross-over or gene-conversion event in their common ancestor. We also show evidence for the presence of one or two additional expressed B19 genes in the barley genome. Based on our results, we present a model for the evolution of the family in barley, including the 20 amino acid motif. Comparisons of the relatedness between the barley family and all other known Group 1 Lea genes using maximum parsimony (PAUP) analysis provide evidence for the time of divergence between the barley genes containing the internal motif as a single copy and as a repeat. The PAUP analyses also provide evidence for independent duplications of Group 1 genes containing the internal motif as a repeat in both monocots and dicots. [References: 52].

515 Stanko, S.A. (1994) **[Intense interrupted white light as a factor of increased adaptive introduction]. Intensivnyj preryvistyj belyj svet kak faktor povysheniya adaptivnoj introduktsii i mutageneza pshenitsy.**

Izvestiya AN - Rossijskaya AN. Seriya biologicheskaya (Russian Federation) (no.5) p. 788-801. Bibliography p. 799-800. Russian. (AGRIS 95-151645).

Illumination of seeds and apical meristems of short-day dwarf wheat by intense interrupted white light changes the adaptive basis of their photoperiodic responsiveness and provides for adaptive introduction in regions with a long photoperiod. Light activates structural-metabolic, photoenergetic and mutation processes and induced photodestruction and photoinactivation of the endogenous inhibitors and favors formation of photoinduced free radicals. Some free radicals form peroxide and hydroxyl radicals in the aqueous phase of cells, which is a strong mutagen inducing point (genic) mutations. About 65 % of morphogenetically constant highly productive photomutant forms having an improved quality of grain and well adapted to a long photoperiod have been selected in the 2nd - 5th generations.

516 Steffenson, B.J. (North Dakota State Univ., Fargo (USA). Dept. of Plant Pathology); Jin, Y. (1992) **Evaluation of barley genotypes for differentiating pathotypes of Puccinia hordei.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 126-128.* 2 tables; 5 ref. English. (AGRIS 95-131405).

517 Stojanovic, S.; Stojanovic, J. (Institut za istrazivanja u poljoprivredi "Srbija", Kragujevac (Yugoslavia). Centar za strna zita) (1994) **[Results in wheat selection on resistance to powdery mildew]. Rezultati u selekciji psenice na otpornost prema prouzrokovacu pepelnice.** Prvi jugoslovenski naucno-strucni simpozijum iz selekcije i semenarstva (1. JUSEM); Vrnjacka Banja (Yugoslavia); 25-28 May 1994. *Selekcija i semenarstvo (Yugoslavia) v. 1(1) p. 85-87.* 1 table; 4 ref. Serbian. (AGRIS 95-131354).

Resistance of 969 new Yugoslav wheat lines to powdery mildew fungus was investigated in the period 1988-1992. The investigation showed that many wheat lines, distinguishing in order positive agronomic characteristics, possess high resistance to powdery mildew. The total number of immune lines was 232. In the first year of investigation the number of immune lines was 15 (7.65) and in last one 47 (32.42). This shows tendency of increasing resistance over years. Some of these wheat lines would be grown as varieties in future.

518 Stone, P.; Nicolas, M. (Melbourne Univ., Parkville (Australia). School of Agriculture and Forestry) (1992) **Genetic differences in tolerance of wheat to high temperature (above 35 deg. C) during grain filling. [Conference paper].** Abstracts of the Australian Society of Plant Physiologists (Australia) p. P14. Australian Society of Plant Physiologists. p. P14. English. (AGRIS 95-131340).

519 Suh, D.Y.; Park, H.S.; Suh, H.S. (Rural Development Administration, Milyang (Korea Republic). Yeongnam Crop Experiment Station) (1994) **Awn characteristics and inheritance of awn-brittleness in barley.** *Korean Journal of Breeding (Korea Republic) v. 26(2) p. 137-141.* 3 illus.; 7 tables; 10 ref. Korean. (AGRIS 95-131413).

520 Sutton, K.H.; Griffin, W.B. (New Zealand Inst. for Crop and Food Research, Christchurch) (1993) **A comparison of small scale early generation screening tests [wheat cultivars]. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 502.* Abstract only. English. (AGRIS 95-131331).

521 Talbert, LE.; Blake, NK.; Storlie, EW.; Lavin, M. (1995) **VARIABILITY IN WHEAT BASED ON LOW-COPY DNA SEQUENCE COMPARISONS.** *Genome. 38(5):951-957.* English. [MONTANA STATE UNIV DEPT PLANT SOIL & ENVIRONM SCI BOZEMAN, MT 59717 USA].

The chromosomes of the B genome of hexaploid wheat (AABBDD) do not pair completely with those of any of the diploid species with genomes similar to B. Various biochemical and molecular analyses have suggested that each of the five diploid species in section Sitopsis of Triticum are ancestral to B. These observations have led to the hypothesis that the B genome may be polyphyletic, descending from more than one diploid ancestor. This hypothesis may account for differences between the wheat B genome and the diploids and also for variability that currently exists among different wheat accessions. In this study, we cloned and compared nucleotide sequences for three low-copy DNA fragments from the B and D genomes of several wheat accessions and from diploid relatives of the B and D genomes. Our results suggested that the amount of DNA sequence variability in wheat is low, although somewhat more variability existed in the B genome than in the D genome. The B genome of wheat was significantly diverged from all the Sitopsis diploid species, and Triticum speltoides was closer to B than to other members of this section. The D genome of wheat was very similar to that of its progenitor, Triticum tauschii. No evidence for a polyphyletic origin of the B genome was found. A more parsimonious hypothesis is that the wheat B genome diverged from its diploid ance-' or after the original hybridization event occurred. [References: 38].

522 Thakur, J.R.; Sethi, G.S.; Sharma, J.J. (Himachal Pradesh Krishi Vishva Vidyalaya, Bajaura (India). Regional Research Station) (1995) **Barley variety HBL 316 (Gopi) for the hills of Himachal Pradesh.** *Indian Farming (India) v. 44(11) p. 5-6.* 4 tables; English. (AGRIS 95-131410).

523 Tian Xiaoming; Mu Tingwen; Wu Yuzhen (Xinjiang Academy of Land Reclamation, Shihezi (China). Inst. of Crops) (1994) **Genetic study on fertility restoration of the Qian-type male sterile line of wheat in Guizhou [China].** *Xinjiang Agricultural Sciences (China) (no. 2) p. 60-61.* 2 tables; 3 ref. Chinese. (AGRIS 95-131342).

524 Tohver, M. (1994) **[Analysis of productivity and quality in chemically induced mutant wheat lines]. Keemilise mutageneesi meetodil saadud suvi- ja talinisu mutantsete liinide produktiivsuse ja kvaliteedi analueues.** Academical Agricultural Society, Tartu (Estonia). *[Agrarian Science] (Estonia); Journal of Agricultural Science v. 5(3) p. 333-344.* 2 fig., 6 tables; 16 ref. Estonian. (AGRIS 95-131344).

In wheat breeding programmes major emphasis is usually given to factors that affect grain yield. Since wheat is an important source of vegetable protein for people and cattle, improving its feeding and bread-making quality is also important. The purpose is to obtain wheat cultivars with a minimum 13 per cent of grain protein and 25 per cent gluten, Falling Number 240.250 sec and grain yield potential 5.7 t/ha. In this article 78 spring and winter mutant lines were tested for agronomic data and protein content and quality at Harku in the period of 1989.1992. On the grounds of these experiments five mutant lines (three spring and two winter wheat) were provided for the state trials.

525 Tomar, S.M.S. (Indian Agricultural Research Institute, New Delhi (India). Division of Genetics); Vari, A.K.; Kochumadhavan, M. (Indian Agricultural Research Institute, New Delhi (India). Division of Seed Technology) (1995) **Meiotic studies in an intergeneric hybrid between Triticum aestivum L. and Thinopyrum bessarabicum and their backcross progenies.** *Indian Journal of Genetics and Plant Breeding (India) v. 55(2) p. 154-159.* 1 table; 13 ref. English. (AGRIS 95-151653).

526 Tsenov, N.; Doncheva, I.; Iliev, I.; Stoyanov, I.; Mikhova, S.; Malinski, K.; Atanasova, I. (Institut po Pshenitsata i Sl"nchogleda "Dobrudzha", General Toshevo (Bulgaria)) (1994) **[New high poductive winter common wheat lines with high complex resistance to rusts and powdery mildew]. Novi visokoproduktivni linii zimna obiknovena pshenitsa s visoka kompleksna ustojchivost na r"zhdi i brashnesta mana.** Selskostopanska Akademiya, Sofia (Bulgaria). *Rasteniev"dni Nauki (Bulgaria); Plant Science v. 31(7-10) p. 153-157.* 1 ill., 1 table; 7 ref. English. (AGRIS 95-151464).

527 Turner, M.; Sharp, P. (Sydney Univ., Cobbitty (Australia). Plant Research Inst.); Rahman, S.; Appels, R. (Commonwealth Scientific and Industrial Research Organisation, Canberra (Australia). Div. of Plant Industry) (1993) **The grain softness protein-1 locus in Triticum tauschii. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 511.* Abstract only. English. (AGRIS 95-131687).

528 Vanhintum, TJL.; Visser, DL. (1995) **DUPLICATION WITHIN AND BETWEEN GERMPLASM COLLECTIONS .2. DUPLICATION IN FOUR EUROPEAN BARLEY COLLECTIONS.** *Genetic Resources & Crop Evolution 42(2):135-145.* English. [DLO CTR PLANT BREEDING & REPROD RES

CTR GENET RESOURCES POB 16 6700 AA WAGENINGEN NETHERLANDS].

The extent of duplication within and between barley genebank collections has been determined from a comparative analysis of four European barley collections. These collections were those of the Centre for Genetic Resources, the Netherlands, the Institute of Plant Genetics and Crop Plant Research and the Braunschweig Genetic Resources Centre, both in Germany, and finally that of the John Innes Institute in the United Kingdom. These collections comprise over thirty thousand accessions. A random set of 100 accessions from the CGN barley collections was matched with all four collections to identify probable duplication, resulting in 61% of the accessions being matched. Passport data were used to identify probable duplicates. This was hindered by the low quality of these data; simple perfect matches were rare. The probable duplication, excluding parental duplication, involved 144 other accessions. Using seed traits, field observations and electrophoretic markers, it could be shown that more than three quarters of the matched accessions in the random set, excluding parental duplication, were completely duplicated in the others and one fifth were more or less duplicated in other matched accessions. If individual comparisons between accessions from the random set and the matched accessions were made, about one fifth of the probable duplicates were shown not to be duplicates at all. One half were identical duplicates, and the rest were common or partial duplicates. [References: 18].

529 Vansanford, DA.; Utomo, H. (1995) **INHERITANCE OF TILLERING IN A WINTER WHEAT POPULATION.** *Crop Science. 35(6):1566-1569.* English. [UNIV KENTUCKY DEPT AGRON LEXINGTON, KY 40546 USA].

Tillers are an important component of wheat (Triticum aestivum L. emend. Thell.) grain yield, yet there is uncertainty in the literature about improving yield be selecting for tiller number. The objectives of this study were to estimate the heritability of tiller number, to quantify genotype x environment (G x E) interaction, and to assess tiller number as an indirect selection criterion. We measured tiller number at five growth stages, grain yield, and kernel size in 92 soft red winter wheat F-4 lines in 1987 and in their bulk F-5 progeny at two planting dates in 1988. Heritability (h(2)) of tiller number at Feekes growth stages, 2, 4, 7, 10.1, and 11.2 in a single environment ranged from 0.05 to 0.60. When G x E interaction was accounted for in a combined analysis, however, heritability estimates were much lower, ranging from -0.14 to 0.19. Genotype rank changes were common among pairs of environments, though in certain cases, scale differences predominated. Tiller number at growth stage 10.1 was highly correlated with yield ($r = 0.58$, $P < 0.01$) and had a higher heritability (h(2) = 0.19) than yield (h(2) = 0.05), and thus, we predict a higher response (36%) to indirect selection than to direct selection for yield itself. Indirect selection for tiller number with visual keys would be most appropriate in early generations when direct yield assessment is difficult, followed by direct selection for yield in later generations. [References: 21].

530 Vasil, V.; Marcotte, WR.; Rosenkrans, L.; Cocciolone, SM.; Vasil, IK.; Quatrano, RS.; Mccarty, DR. (1995) **OVERLAP OF VIVIPAROUS1 (VP1) AND ABSCISIC ACID RESPONSE ELEMENTS IN THE EM PROMOTER - G-BOX ELEMENTS ARE SUFFICIENT BUT NOT NECESSARY FOR VP1 TRANSACTIVATION.** *Plant Cell. 7(9):1511-1518.* English. [UNIV FLORIDA INST FOOD & AGR SCI DEPT HORT SCI PROGRAM PLANT MOLEC & CELLULAR BIOL GAINESVILLE, FL 32611 USA].

The relationship between promoter sequencs that mediate Viviparous1 (VP1) transactivation and regulation by abscisic acid (ABA) in the wheat Em promoter was investigated using deletion analysis and directed mutagenesis. The Em1a G-box is strongly coupled to VP1 transactivation as well as to ABA regulation; however, the Em promoter includes additional components that can support VP1 transactivation without ABA responsiveness or synergism. Oligonucleotide tetramers of several G-box sequences, including Em1a, Em1b, and the dyad G-box element from the UV light-regulated parsley chalcone synthase gene, were sufficient to confer VP1 transactivation and the synergistic interaction with ABA to the -45 cauliflower mosaic virus 35S core promoter. These data suggest that VP1 can activate transcription through at least two classes of cis-acting sequences, including the G-box elements and the Sph regulatory motif found in the C1 promoter. The contrasting roles of these motifs in the Em and C1 promoters suggest a basis for the differential *regulation of* the corresponding genes by VP1. [References: 36].

531 Vonbothmer, R.; Salomon, B.; Lindelaursen, I. (1995) **VARIATION FOR CROSSABILITY IN A RECIPROCAL, INTERSPECIFIC CROSS INVOLVING HORDEUM VULGARE AND H-LECHLERI.** *Euphytica. 84(3):183-187.* English. [SWEDISH UNIV AGR SCI DEPT CROP BREEDING RES S-26831 SVALOV SWEDEN].

Several crossing series including the hexaploid (2n = 6x = 42), South American species Hordeum lechleri and diploid (2n = 2x = 14) cultivated barley (H, vulgare) were performed. Barley functioned better as the paternal than as the maternal parent in all cases. Viable offspring were only obtained from one hybrid combination when barley was used as the maternal parent. There was an environmental influence on the success of crosses. A high seed set was counteracted by a lower germination frequency. The outcome is that different crossing series give similar results. As a result of chromosome elimination and in a few cases duplication of especially the barley chromosomes, the chromosome numbers of the offspring (239 plants) varied from 2n = 21 (trihaploids of H, lechleri) to 2n = 30. Fifty-five % of the plants were euploid with the number expected for a hybrid (2n = 28). The frequency of hyperploids, euploids, hypoploids (2n = 22-27) and trihaploids varied by year, locality, type (winter/spring) of barley, H. lechleri population, and crossing direction. [References: 22].

532 Walden, R.; Wingender, R. (1995) **GENE-TRANSFER AND PLANT-REGENERATION TECHNIQUES.** *Trends in Biotechnology. 13(9):324-331.* English. [MAX PLANCK INST ZUCHTUNGSFORSCH GENET GRUNDLAGEN ZUCHTUNG ABT CARL VON LINNE WEG 10 D-50829 COLOGNE GERMANY].

The production of transgenic plants depends on the stable introduction of foreign DNA into the plant genome, followed by regeneration to produce intact plants, and the subsequent expression of the introduced gene(s). A Variety of transformation methods have been developed, and this has allowed many of the world's important crop plants to be transformed. Transformation mediated by Agrobacterium has provided a reliable means of creating transgenics in a wide variety of species that are amenable to tissue culture and regeneration. Vectorless gene-transfer systems include particle bombardment (biolistics), electroporation and membrane permeabilization using chemicals. Of these, biolistics has proved to be particularly successful with plants that are less amenable to tissue culture, such as cereals and legumes. [References: 55].

533 Walmsley, A.M.; Henry, R.J. (Queensland Agricultural Biotechnology Centre, St Lucia (Australia)); Birch, R.G. (Queensland Univ., St Lucia (Australia). Dept. of Botany) (1993) **Studies of barley transformation using a visible marker gene. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 507.* Abstract only. English. (AGRIS 95-131391).

534 Wang, G.; Hyne, V.; Chao, S.; Henry, Y.; Debuyser, J.; Gale, MD.; Snape, JW. (1995) **A COMPARISON OF MALE AND FEMALE RECOMBINATION FREQUENCY IN WHEAT USING RFLP MAPS OF HOMOEOLOGOUS GROUP 6 AND 7 CHROMOSOMES.** *Theoretical & Applied Genetics. 91(5):744-746.* English. [JOHN INNES CTR PLANT SCI RES NORWICH RES PK NORWICH NR4 7UJ NORFOLK ENGLAND].

A novel approach was used to compare male and female recombination rates in wheat. Doubled haploid lines were developed from an F-1 using two distinct approaches: the anther-culture technique and the Hordeum bulbosum system, from which sets of lines were developed from "male" and "female" meioses, respectively. The genotype of the lines was established at RFLP and isozyme markers polymorphic on chromosomes of homoeologous groups 6 and 7, and "male" and "female" linkage maps were calculated using this information. The markers in one segment of chromosome 6B exhibited disturbed segregation frequencies in the anther-culture population. The "male" and "female" maps differed significantly in recombination frequency between some markers on two chromosomes, and these were consistent in direction within chromosomes and inconsistent in direction between chromosomes. In two of the four chromosomes studied the "male" map was much longer than the "female" map. These results suggest that significant differences may exist in male and female recombination frequencies in bread wheat which are specific to certain chromosomal segments but are inconsistent in direction between chromosomes. Other factors, such as

environmental influences, may also be important in creating differences. [References: 15].

535 Wanous, MK.; Goicoechea, PG.; Gustafson, JP. (1995) **RFLP MAPS OF RYE CHROMOSOMES 6R AND 7R INCLUDING TERMINAL C-BANDS.** *Genome. 38(5):999-1004.* English. [UNIV MISSOURI USDA ARS PLANT SCI UNIT PLANT GENET RES UNIT CURTIS HALL COLUMBIA, MO 65211 USA].

A F-2 mapping population was created from a cross between 'UC-90' and E-line ryes (Secale cereale L.), two lines that showed polymorphism for eight C-band loci. Clones from rye, as well as other grasses, were used as probes. RFLP maps of rye chromosomes 6R and 7R were generated that include the 6RS and 6RL terminal C-bands and the 7RS terminal C-band. The 6R map spans 230 cM and includes 9 loci. The 7R map covers 225 cM and includes 21 loci. Segregation distortion was detected for several chromosomal regions. Heterochromatic C-bands did not appear to be responsible for the distortion. [References: 39].

536 Wanous, MK.; Gustafson, JP. (1995) **A GENETIC MAP OF RYE CHROMOSOME 1R INTEGRATING RFLP AND CYTOGENETIC LOCI.** *Theoretical & Applied Genetics. 91(5):720-726.* English. [UNIV MISSOURI DIV BIOL SCI TUCKER HALL COLUMBIA, MO 65211 USA].

A genetic map of rye, Secale cereale L., chromosome 1R covering 247 cM was constructed utilizing 27 RFLP and four C-band markers, including terminal C-bands. Genetic mapping of C-bands and the centromere, and in situ hybridization of three RFLP clones, allowed for the integration of the genetic and cytological maps. Eight contact points between the genetic and cytological maps revealed variation in the recombination distance to cytological distance ratio ranging between 0.25 and 1.95, a 7.8-fold difference. Recombination was found to be highest in the satellite region of 1RS and lowest in the most distal region of 1RL. [References: 58].

537 Winfield, MO.; Schmitt, M.; Lorz, H.; Davey, MR.; Karp, A. (1995) **NONRANDOM CHROMOSOME VARIATION AND MORPHOGENIC POTENTIAL IN CELL LINES OF BREAD WHEAT (TRITICUM AESTIVUM L).** *Genome. 38(5):869-878.* English. [UNIV BRISTOL INST ARABLE CROPS RES DEPT AGR SCI LONG ASHTON RES STN BRISTOL BS18 9AF AVON ENGLAND].

A cytogenetical analysis of 18 cell lines, 9 microspore derived, 6 anther derived, and 3 immature-embryo derived, of bread wheat (Triticum aestivum L.) varying in their morphogenic potential was undertaken. Chromosome variation, both structural and numerical, was detected in all lines studied. Variation was present and, in some cases quite extensive, in the earliest samples taken (only 12 weeks after initiation of the suspensions). Within any culture, the pattern and extent of variation changed throughout the course of the study and cells with a euploid constitution generally decreased in frequency with culture age. Among the nine microspore-derived suspensions, morphogenic lines generally showed a more restricted range of chromosome numbers and higher proportions of euploid cells than nonmorphogenic lines. The patterns of distribution of chromosome numbers among the anther-derived cultures were similar to those of the microspore-derived lines but the correspondence between instability and regenerative capacity was less. The immature embryo derived lines, which were neither regenerable nor morphogenic, were all unstable. The anther-derived lines were sampled over several months to determine whether loss of morphogenic potential was related to changes in chromosome instability of specific lines. Analysis of the "elite" line F1.7, initially capable of regenerating green plants, showed that substantial decreases in the frequencies of normal euploid cells (from 45 to 5%) occurred over the period when morphogenic capacity was lost. However, whether the chromosome instability resulted in loss of morphogenicity or vice versa was not clarified. C-banding analyses of lines F1.7 and C82d indicated that instability was not random with respect to the three genomes (A, B, and D) of wheat nor to the different chromosomes within the genomes. Chromosomes of the B genome were most often lost or involved in rearrangements, with breakpoints located at, or near, the heterochromatic blocks. Because of the heterogeneity of the cell lines, extensive analyses of large numbers of cells would be required before it would be possible to determine whether loss of morphogenic potential arises as a result of specific chromosome loss(es). [References: 29].

538 Worku, T. (1995) **WATER-RETENTION CAPABILITY AS A SELECTION CRITERIA FOR DROUGHT RESISTANCE IN WHEAT.** *Journal of Plant Nutrition. 18(10):2105-2109.* English. [ESSENTIAL OILS RES CTR POB 5747 ADDIS ABABA ETHIOPIA].

Four durum wheat cultivars (Triticum turgidum spp. durum Desf.) from different countries of origin (Austria, Ethiopia, and Italy) were investigated. Plants were grown in pots under glasshouse conditions. Immediately after the full development of the flag leaves, these leaves were detached for the screening. Distinct differences in water-retention capabilty among the cultivars was observed. The drought-resistant (hardy) types, Valgerardo and Boohai, showed better water retention capabilty than the drought-sensitive ones, such as D2-04-688. Poor yielding cultivars under field conditions were also found to be poor in water-retention capability and vice versa. The applied method is simple and inexpensive. It adds another procedure when screening for drought resistance. However, it needs further confirmation by cultivars covering a broader range of genetic diversity. [References: 4].

539 Wu Zhenlu (Xinjiang Academy of Agricultural Sciences, Urumqi (China). Inst. of Nucleus and Biological Technology) (1994) **Development of a super-high yielding spring wheat variety Xinchun No. 6 in Xinjiang [China].** *Xinjiang Agricultural Sciences (China) (no. 2) p. 57-59.* 5 ref. Chinese. (AGRIS 95-131297).

540 Xiang Qijun; Wu Lanpei (Beijing Agricultural Univ. (China). Dept. of Agronomy) (1994) **Meiotic analysis of the regenerated plants derived from a young spike of octoploid triticale X Secale cereale F1 hybrid.** *Acta Botanica Sinica (China) v. 36(2) p. 99-104.* 2 tables; 6 ill., 24 ref. Chinese. (AGRIS 95-131662).

541 Xu Abing; Zhu Muyuan; Zhao Zhangxin (Hangzhou Univ. (China). Dept.of Biological Sciences and Biotechnology); Ma Junhu (1994) **Study on allelism of barley yellow mosaic virus (BaYMV) resistant genes in five barley varieties.** *Acta Agriculturae Shanghai (China) v. 10(3) p. 18-21.* 3 tables; 8 ref. Chinese. (AGRIS 95-131393).

542 Yamamori, M.; Nakamura, T.; Nagamine, T. (1995) **INHERITANCE OF WAXY ENDOSPERM CHARACTER IN A COMMON WHEAT LACKING THREE WX PROTEINS.** *Breeding Science. 45(3):377-379.* English. [JAPAN INT RES CTR AGR SCI OKINAWA SUBTROP STN OKINAWA 907 JAPAN].

The endosperm of a common wheat produced by genetic elimination of waxy (Wx) protein turned red-brown by iodine staining in F-3 and F-4 generations, indicating the presence of a waxy phenotype. Measurement with an autoanalyzer revealed that the F-3 and F-4 generations of variant wheat contained 0.6 - 0.7% amylose in the endosperm starch, values comparable to those of a waxy rice variety (0% amylose), suggesting that the waxy phenotype is inherited in a stable manner, In the waxy common wheat, both lambda max and the blue value of endosperm starch indicated a marked reduction in the content of amylose, These results confirmed that wheat deficient in the Wx proteins lacked amylose. The production of a waxy wheat may be a significant step toward genetic modification of starch composition in wheat flour.

543 Yin Liping; Chai Xiaoqing; Liu Xianglin (Capital Normal Univ., Beijing (China). Dept. of Biology) (1994) **Influence of chloroplast development and light on the gene expression of glutamine synthetase in wheat leaves.** *Acta Botanica Sinica (China) v. 36(8) p. 597-602.* 12 ill., 13 ref. Chinese. (AGRIS 95-131693).

544 Yoshigi, N.; Okada, Y.; Sahara, H.; Tamaki, T. (1995) **A STRUCTURAL GENE ENCODING BETA-AMYLASE OF BARLEY.** *Bioscience Biotechnology & Biochemistry. 59(10):1991-1993.* English. [SAPPORO BREWERIES LTD BREWING RES LABS 10 OKATOHME YAIZU SHIZUOKA 425 JAPAN].

A structural gene encoding the P-amylase that is abundant in the starchy endosperm of ungerminated barley seeds was isolated and characterized. It was 3825 bp in length. In the sequence of the structural gene, a sequence identical to that of the cDNA was found to contain seven exons and six introns. [References: 10].

545 Yu, MQ.; Jahier, J.; Persondedryver, F. (1995) **CHROMOSOMAL LOCATION OF A GENE (RKN-MNL) FOR RESISTANCE TO THE**

ROOT-KNOT NEMATODE TRANSFERRED INTO WHEAT FROM AEGILOPS VARIABILIS. *Plant Breeding-Zeitschrift fur Pflanzenzuchtung. 114(4):358-360.* English. [INRA PLANT BREEDING STN BP 29 LE RHEU FRANCE].

Root-knot nematode is a significant root-parasite of common wheat. A dominant gene Rkn-mnl for resistance was transferred into wheat from Aegilops variabilis. This gene was shown to be on chromosome 3B. Further analysis indicated that it is on the long arm of this chromosome and independent of the centromere. [References: 12].

546 Zhang Yufang; Yuan Miaobao; Guan Zhengyu (Hangzhou Univ. Zhejiang(China). Dept. of Biological Sciences and Biotechnology) (1994) **Identification of translocation heterozygosity of barley from somaclonal variation.** *Acta Agriculturae Universitatis Jiangxiensis (China) v. 16(1) p. 15-19.* 2 ill., 3 ref. Chinese. (AGRIS 95-131394).

547 Zhang, J.; Friebe, B.; Gill, BS. (1995) **DETECTION OF MAIZE DNA SEQUENCES AMPLIFIED IN WHEAT.** *Genome. 38(5):946-950.* English. [KANSAS STATE UNIV AGR & APPL SCI DEPT PLANT PATHOL MANHATTAN, KS 66506 USA].

Genomic in situ hybridization to somatic metaphase chromosomes of hexaploid wheat cv. Chinese Spring using biotinylated maize genomic DNA as a probe revealed the existence of amplified maize DNA sequences in five pairs of chromosomes. The in situ hybridization sites were located on chromosomes 1A, 7A, 2B, 3B, and 7B. One pair of in situ hybridization sites was also observed in hexaploid oat. The locations and sizes of in situ hybridization sites varied among progenitor species. [References: 12].

548 Zhong, GY.; Dvorak, J. (1995) **EVIDENCE FOR COMMON GENETIC MECHANISMS CONTROLLING THE TOLERANCE OF SUDDEN SALT STRESS IN THE TRIBE TRITICEAE.** *Plant Breeding-Zeitschrift fur Pflanzenzuchtung. 114(4):297-302.* English. [UNIV CALIF DAVIS DEPT AGRON & RANGE SCI DAVIS, CA 95616 USA].

Previous studies in several Triticeae species have suggested that salt tolerance is a polygenic trait, but that genes on some chromosomes confer better tolerance to salt stress than others. This suggests an intriguing possibility that there may be a similar basis for salt tolerance in the species of the tribe Triticeae. In this study, chromosomal control of the tolerance to sudden salt stress, measured as the mean rate of leaf elongation in solution cultures with a single increment of 200 mM NaCl, was investigated in the genomes of cultivated barley (Hordeum vulgare L.), rye (Secale cereate L.), and Dasypyrum villosum (L.) Candargy by using disomic addition lines of individual pairs of chromosomes or chromosome arms of each of the three species in the 'Chinese Spring' wheat genetic background. It was observed that the chromosomes of homoeologous groups 3, 4, and 5 in barley, 5 and 7 in rye, and 4 and 6 in D. villosum carry loci with significant positive effects on salt tolerance. Increased doses of chromosomes of group 2, however, reduce or do not increase the tolerance to salt stress. These results are in agreement with a previous study of the tolerance of this salt stress regime in wheat and wheatgrass Lophopyrum elongatum. A ranking analysis of the chromosomal effects within each genome of the five Triticeae species investigated in this and previous studies revealed that the chromosomes of homoeologous groups 3 and 5 consistently confer large positive effects on the tolerance of sudden salt stress, while the chromosomes of homoeologous group 2 in increased dose have no or negative effects on the tolerance. This strongly suggests that species of the tribe Triticeae share some common genetic mechanisms of tolerance of sudden salt stress. The findings in this study give credence to the proposal that wild relatives can be exploited in the development of wheat cultivars with greater tolerance to salt stress. [References: 32].

549 Zhou, JH.; Kilian, A.; Warner, RL.; Kleinhofs, A. (1995) **VARIATION OF NITRATE REDUCTASE GENES IN SELECTED GRASS SPECIES.** *Genome. 38(5):919-927.* English. [WASHINGTON STATE UNIV DEPT CROP & SOIL SCI PULLMAN, WA 99164 USA].

In order to study the variation of nitrate reductase (NR) genes among grass species, gene number, intron size and number, and the heme-hinge fragment sequence of 25 grass species were compared. Genomic DNA cut with six restriction enzymes and hybridized with the barley NAD(P)H and NADH NR gene probes revealed a single NAD(P)H NR gene copy and two or more NADH NR gene copies per haploid genome in most of the species examined. Major exceptions were Hordeum vulgare, H. vulgare ssp. spontaneum, and Avena strigosa, which appeared to have a single NADH NR gene copy. The NADH NR gene intron number and lengths were examined by polymerase chain reaction amplification. Introns I and III appeared to be absent in at least one of the NADH NR genes in the grass species, while intron II varied from 0.8 to 2.4 kilobases in length. The NADH NR gene heme-hinge regions were amplified and sequenced. The estimated average overall nucleotide substitution rate in the sequenced region was 7.8 x 10(-10) substitutions/site per year. The synonymous substitution rate was 2.11 x 10(-9) substitutions/synonymous site per year and the nonsynonymous substitution rate was 4.10 x 10(-10) substitutions/nonsynonymous site per year. Phylogenetic analyses showed that all of the wild Hordeum species examined clustered in a group separate from H. vulgare and H. vulgare ssp. spontaneum. [References: 40].

F40 PLANT ECOLOGY

550 Galant, H. (University of Agriculture, Lublin (Poland). Chair of Agrometeorology) (1994) **Yield of some crop plants versus meteorological conditions in Czeslawice in the years 1986-90.** Zeszyty Problemowe Postepow Nauk Rolniczych (Poland); no. 405 p. 77-80. Instytut Agrofizyki. 5 fig.; 8 ref. p. 77-80. English. (AGRIS 95-152341).

It was found that the mean yearly air temperature had an effect on such cereals as winter and spring wheat, and that the sum of temperatures and the length of the vegetation period affected the yield of potatoes. No effect of precipitation on the yield of the plants under study was observed.

551 Honar Nejad, R. (1993) **The effect of culture conditions on embryogenesis of barley microspores (Hordum vulgare L.).** Gillan Univ. (Iran Islamic Republic). College of Agricultural Sciences. *Iranian Journal of Agricultural Sciences (Iran Islamic Republic) v. 24(3, 4) p. 15-28.* 5 tables, 1 fig., 28 ref. Persian. (AGRIS 95-132708).

The application of four groups of culture media, each with three variations (Tab. 1), for embryogenesis and formation of green plants from microspores of F1 hybrid of barley (Hordeum vulgare L.) led to significant differences in plant response, in particular among genotypes. In the first group of media (high levels of Zeatin- riboside and Ficoll) highest frequency of embryo formation from microspores was observed by 1 mg/l cytokinine and 300 g/l Ficoll with genotype b2 (TR 484/ FR 926). Using the second group of media (60 g/l maltose and 300 g/l Ficoll or 30 g/l maltose and 400 g/l ficoll) resulted in the highest frequency of green plants with the same genotype. The response of genotypes to third group of culture media (2 mg/l cytokinine, different amount of maltose and sucrose, 200-400 g/l Ficoll) was not favorable and in the fourth group of media (10 g/l starch, 2.5- 5.0 mg/l Aminooxyacetic) which is an inhibitor of ethylene production by callus was no plant formation observed.

552 Salinger, MJ.; Jamieson, PD.; Johnstone, JV. (1995) **CLIMATE VARIABILITY AND WHEAT BAKING QUALITY.** *New Zealand Journal of Crop & Horticultural Science. 23(3):289-298.* English. [NATL INST WATER & ATMOSPHER RES BOX 28 841 AUCKLAND NEW ZEALAND].

The influence of climatic factors on the baking quality of bread wheat was explored by establishing relationships between Mechanical Dough Development (MDD) bake scores and monthly temperature and rainfall from November to January. Wheat quality data for Triticum aestivum L. cultivars 'Rongotea', 'Oroua', and 'Otane' were collated from recommended list trials in Hawke's Bay, Manawatu, Canterbury, south Otago, and Southland, New Zealand, over the seasons 1974/75-1991/92. Only weak relationships were established between autumn sown wheat quality and climatic factors. In contrast, there were strong influences of temperature (positive) and rainfall (negative) on the quality of spring sown wheat. The baking quality of 'Oroua' and 'Otane' were affected by January temperatures and December-January rainfall. For 'Rongotea', November-December mean temperature and December rainfall were the most important climate factors. The models indicated that central Marlborough and north Canterbury have the best climates for high quality bread wheat. However, analysis of the Lincoln climate record from 1864 to 1994 showed that climate factors alone could cause 'Otane' MDD bake scores to vary over a range of 19-29. The analysis highlighted that useful relationships exist between climate and wheat quality, which can be used to assess the impacts of both spatial and temporal climate variability and change. [References: 19].

F50 PLANT STRUCTURE

553 Zhang Fengxue (Hebei Forestry Coll., Baoding (China)) (1994) **Cytological stability of barley-wheat addition lines.** *Journal of Hebei Forestry College (China) v. 9(3) p. 200-204.* 2 tables; 1 ill., 9 ref. Chinese. (AGRIS 95-132841).

F60 PLANT PHYSIOLOGY AND BIOCHEMISTRY

554 Agenbag, G.A. (Stellenbosch Univ. (South Africa). Dept. of Agronomy and Pastures); De Villiers, O.T. (1995) **Physiological response of spring wheat cultivars to post-anthesis water stress intensity.** *South African Journal of Plant and Soil (South Africa) v. 12(1) p. 27-31.* English. (AGRIS 95-133068).

555 Ahmed, S.; Yusuf, Y.; Ali, HA. (1995) **DIFFERENCES IN PROTEIN CONTENT IN LEAVES OF RESISTANT AND SUSCEPTIBLE VARIETIES OF WHEAT (TRITICUM AESTIVUM) AFTER INFECTION WITH BROWN RUST FUNGUS (PUCCINIA RECONDITA).** *Pakistan Journal of Botany. 27(1):187-191.* English. [UNIV KARACHI DEPT BOT KARACHI 75270 PAKISTAN].

Protein content in 8 different varieties of wheat after infection with Puccinia recondita, the brown rust fungus was examined. Protein content showed an increase in resistant and moderately resistant varieties upto 3 days which later declined. In susceptible and moderately susceptible varieties no significant change in protein-content was observed after 3 days, which later increased and showed maximum increase after 5 days, with a sharp decline after 7 days interval. Resistant Varieties were significantly different in protein content as compared to susceptible varieties.

556 Bariana, H.S.; Vidal, M.; MacRitchie, F. (Commonwealth Scientific and Industrial Research Organisation, North Ryde (Australia). Div. of Plant Industry); Hare, R.A. (New South Wales Agriculture, Tamworth (Australia) Agricultural Research Centre) (1993) **Protein composition and quality analysis of some high protein lines [wheat]. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 501.* Abstract only. English. (AGRIS 95-133078).

557 Barna, B. (Hungarian Academy of Sciences, Budapest (Hungary). Plant Protection Inst.); Heitefuss, R. (1992) **Intercellular sugar content and the resistance of wheat to yellow rust.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 7.* English. (AGRIS 95-133192).

The soluble sugars in the intercellular washing fluids (IWFs) from the first, fifth and flag leaves of spring wheat cultivars were investigated. After precipitation of the high molecular mass compounds by cold ethanol, sugars in the IWFs were purified by ion exchange chromatography. The neutral fractions were freeze dried, silylated and sugars were determined by GLC analysis. The fructose, glucose but especially the sucrose content was much higher in the flag leaves as compared to the first leaves. Although practically the same sugars can be found in IWFs as in leaf homogenates, some unidentified compounds were detected by GLC, especially in IWFs from first leaves. The amount of major sugars was lower in cultivars with higher degree of adult plant resistance. This tendency correlated with the slower senescence measured by chlorophyll content and ion leakage tests. After infection with yellow rust (Puccinia striiformis West.) the most characteristic change in sugar composition of the IWFs is the appearance of arabitol and mannitol. The amount of these sugar alcohols of fungal origin was much less in IWFs from leaves with resistant reaction to rust infection, than in compatible combinations. The possible role of soluble sugars in susceptibility and resistance of wheat to yellow rust is discussed.

558 Batey, I.L.; Mueller, B.M. (Commonwealth Scientific and Industrial Research Organisation, North Ryde (Australia). Div. of Plant Industry); Brown, I. (Goodman Fielder Ingredients Ltd, Tamworth (Australia). Research and Analytical Lab.); Morris, C. (Western Wheat Quality Lab., Pullman (USA)) (1993) **Residual alpha-amylase and the viscosity of water-washed wheat starch. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 500.* Abstract only. English. (AGRIS 95-133077).

559 Ben Naceur, M.B. (Faculte des Sciences Agronomiques de Gembloux (Belgique). Unite de Biologie Vegetale); Paul, R.; Portelle, D.; Impens, R. (1994) **[Characteristics of leaf acid phosphatases activity in water-stressed barley]. Caracteristiques des phosphatases acides de l'orge en condition de stress hydrique.** *Cahiers d'Etudes et de Recherches Francophones Agricultures (France) v. 3(4) p. 231-236.* 12 ref. French. (AGRIS 95-152731).

560 Blumenthal, C.; Wrigley, C.W.; Batey, I.L.; Wardlaw, I.F.; Rawson, H.; Conroy, J.; Barlow, E.W.R. (Commonwealth Scientific and Industrial Research Organisation, North Ryde (Australia). Div. of Plant Industry) (1993) **Heat stress and high CO2: changes in grain quality and composition (protein and starch). [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 504.* Abstract only. English. (AGRIS 95-133081).

561 Camvan, N.; Bielawski, W.; Kaczkowski, J. (1995) **PEPTIDASE ACTIVITY CHANGES IN MATURING TRITICALE GRAINS SUSCEPTIBLE AND RESISTANT TO PRE-HARVEST SPROUTING.** *Acta Physiologiae Plantarum. 17(3):241-248.* English. [AGR UNIV WARSAW DEPT BIOCHEM SGGW RAKOWIECKA 26-30 PL-02528 WARSAW POLAND].

The investigations included the total endopeptidase activity changes, and those of aspartyl, cysteine and serine ones, as well as carboxypeptidase in the developing Triticale grain of the Lasko cultivar - resistant to pre-harvest sprouting and Malno, the susceptible one. Besides, the mentioned enzymes in the seed, also their distribution in three fractions of grain of those cultivars, namely the seed coat, aleurone layer and endosperm was investigated at three chosen stages of development (18, 27 and 39 dap). It has been demonstrated that the initial significant activity of total endopeptidases and their three particular types decreased during the grain development until 38 dap and then became stabilized. On the other hand the initially low carboxypeptidase activity increased slowly until 31 dap and then was stabilized. Out of the investigated fractions the highest total endopeptidase activities were observed in the seed coat and about twice smaller in the aleurone layer and they decreased during the grain development. Similar behaviour was observed for particular types of endopeptidases, the smallest significance of which was thought to he the serine enzyme and in the endosperm and aleurone layer there was the dominance of the cysteine endopeptidase. Contrary to them the highest carboxypeptidase activity occurred in the endosperm increasing during the development. The activity of that enzyme only showed a clear predominance in Malno as compared to Lasko.

562 Cornford, C.A.; Hill, R.D. (Department of Plant Biology and Biotechnology, Massey University, Palmerston North (New Zealand)) (1994) **alpha-Amylase isoenzymes and BASI-like proteins in seed of different grass species.** *Seed Science Research (United Kingdom) v. 4(3) p. 285-291.* 30 ref. English. (AGRIS 95-132945).

563 Dakheel, A.J.; Peacock, J.M.; Naji, I.; Acevedo, E. (ICARDA, PO Box 5466, Aleppo (Syria)) (1994) **Carbon isotope discrimination and water use efficiency in barley under field conditions.** Efficiency of water use in crop systems; Reading (United Kingdom); 6-8 Jul 1994. *Aspects of Applied Biology (United Kingdom) (no.38) p. 173-183.* 18 ref. English. (AGRIS 95-152742).

564 Edelmann, HG. (1995) **WATER POTENTIAL MODULATES EXTENSIBILITY OF RYE COLEOPTILE CELL WALLS.** *Botanica Acta. 108(4):374-380.* English. [UNIV BONN INST BOT VENUSBERGWEG 22 D-53115 BONN GERMANY].

Extensibility of walls of frozen/thawed rye (Secale cereale) coleoptile segments as a function of the water potential of the incubation solution (Psi(0)) was analyzed employing the creep test method. Negative Psi(0) exerts an inhibiting effect on extension of isolated walls. The lower the Psi(0) of polyethylene glycol 6000 (PEG), the less the walls of frozen/thawed segments extended under load. This inhibiting effect of Psi(0) on wall creep was reversible and independent of the preincubation temperature of the segments. An increase in Psi(0) resulted in increased extension rate within 2-

4 min, whereas a decrease in Psi(0) resulted in gradually decreasing extension rate after 8-12 min. This finding implies that wall extension changes during growth induced by changes of Psi(0) in vivo are not only due to changes of turgor pressure but also due to a direct influence by negative Psi(0) on physical wall properties. The results are discussed with respect to the regulation of extension growth during conditions of water stress. [References: 51].

565 Ehdaie, B. (1995) **VARIATION IN WATER-USE EFFICIENCY AND ITS COMPONENTS IN WHEAT .2. POT AND FIELD EXPERIMENTS.** *Crop Science. 35(6):1617-1626.* English. [UNIV CALIF RIVERSIDE DEPT BOT & PLANT SCI RIVERSIDE, CA 92521 USA].

Two models have been suggested to facilitate the study of genetic variation for seasonal water-use efficiency (WUE) and its components in spring bread wheat (Triticum aestivum L.). These models were used to estimate the contribution of each component trait to variation in WUE, Eight diverse bread wheat cultivars were grown in replicated pot and field experiments under well-watered and droughted conditions. Significant genotypic variation was observed for WUE (ratio of grain yield to water used), evapotranspiration efficiency (ETE, ratio of total dry matter to water used), and harvest index (HI, ratio of grain yield to total dry matter), Modern short cultivars, on average, had higher WUE than old tall cultivars in well-watered (1.225 vs. 0.984 g kg(-1)) and droughted (1.198 vs. 0.860 g kg(-1)) pot conditions, due mainly to higher HI. Two old tall cultivars exhibited highest values for ETE, Harvest index and ETE accounted for 85 and 15% and for 81 and 19% of variation in WUE in web-watered and droughted conditions, respectively. Harvest index had a higher direct effect and was more highly associated with WUE than ETE, The negative correlation between HI and ETE was not significant, Carbon isotope discrimination (Delta) showed negative correlation with ETE in well-watered (-0.82) and droughted (-0.68) treatments, Grain yield and HI of modern short cultivars, on average, were higher than those of old tall cultivars under field conditions, Mean Delta was lower in droughted (17.9 parts per thousand) than in well-watered (18.9 parts per thousand) held conditions, Plant growth rates estimated at boot stage and at anthesis were negatively associated with a drought susceptibility index based on grain yield, Drought susceptibility index was not correlated with Delta. Water-use efficiency in wheat could be improved by improving either transpiration efficiency or ETE. [References: 28].

566 Gaber, A.M.A. (Ministry of Agriculture, Cairo (Egypt). Desert Research Centre) (1993) **Evapotranspiration and growth of barley as affected by soil moisture depletion and phosphorus fertilization.** *Zagazig Journal of Agricultural Research (Egypt) v. 20(4) p. 1385-1397.* 1 ill. 6 tables; 26 ref. English. (AGRIS 95-133120).

567 Gate, P. (Institut Technique des Cereales et des Fourrages, Paris (France)) (1995) **[Effect of nitrogen on protein content of wheat grain]. Le role de l'azote sur.l'elaboration de la teneur en proteines du grain.** *Perspectives Agricoles (France) (no 203) p. 44-48.* French. (AGRIS 95-133109).

568 Gupta, R.B. (Commonwealth Scientific and Industrial Research Organisation, Canberra (Australia). Div. of Plant Industry); Vidal, M.; Bariana, H.S.; MacRitchie, F. (Commonwealth Scientific and Industrial Research Organisation, North Ryde (Australia). Div. of Plant Industry); Ellison, F.W. (Sydney Univ., Narrabri (Australia). Plant Breeding Inst.); The, D. (Sydney Univ., Cobbitty (Australia). Plant Breeding Inst.) (1993) **Biochemical and technological characterization of wheat lines carrying 1AL.1RS or 1BL.1RS translocations. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 503.* Abstract only. English. (AGRIS 95-133080).

569 Jiang Jiyan; Zhang Linsheng (Northwestern Agricultural Univ., Yangling, Shaanxi (China). Dept. of Agronomy) (1994) **Study on formation pattern of amino acids of grains in winter wheat and its regulation.** *Acta Universitatis Agriculturalis Boreali-Occidentalis (China) v. 22(4) p. 1-5.* 3 tables; 4 ill., 9 ref. Chinese. (AGRIS 95-133092).

570 Mares, D.J.; Mrva, K. (Sydney Univ., Narrabri (Australia). Plant Breeding Inst.) (1993) **High alpha-amylase in wheat without sprouting.** *Chemistry in Australia (Australia) v. 60(9) p. 486.* 2 fig., 2 ref. English. (AGRIS 95-133076).

571 Martin, D.J.; Stewart, B.G. (Queensland Dept. of Primary Industries, Toowoomba (Australia). Queensland Wheat Research Inst.) (1993) **Variation in FY sedimentation values across seasons [wheat]. [Conference paper].** 43 Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 511.* Abstract only. English. (AGRIS 95-133083).

572 McKenzie, E.A.; Hare, R.A.; Murrie, J.L. (New South Wales Agriculture, Tamworth (Australia). Tamworth Agricultural Research Centre) (1993) **Identification of new wheat cultivars for plant variety rights registration: HPLC techniques. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 510-511.* Abstract only. English. (AGRIS 95-133187).

573 Mellado Z, Mario; Matus T, Ivan (Instituto de Investigaciones Agropecuarias, Chillan (Chile). Estacion Experimental Quilamapu) (1993) **[Comparison of wheats and triticales under soil water stress conditions]. Comparacion de trigos y triticales en condiciones de deficit hidrico del suelo.** 42. Congreso Agronomico; Chillan (Chile); 12-14 Nov 1991. *Simiente (Chile) v. 63(4) p. 191-198.* 7 ref. Spanish. (AGRIS 95-152534).

574 Menconi, M.; Sgherri, CLM.; Pinzino, C.; Navariizzo, F. (1995) **ACTIVATED OXYGEN PRODUCTION AND DETOXIFICATION IN WHEAT PLANTS SUBJECTED TO A WATER DEFICIT PROGRAMME.** *Journal of Experimental Botany. 46(290):1123-1130.* English. [UNIV PISA IST CHIM AGR VIA S MICHELE SCALZI 2 I-56124 PISA ITALY].

Wheat plants (Trificum durum L. cv. Ofanto) were grown in a controlled environment. In one set, control plants were regularly watered; the other set of plants was subjected to two water deficit periods obtained by withholding water and rewatering to field capacity at the end of the first period. After both periods of stress, water potential (Psi(w)), pressure potential (Psi(p)) and relative water content (RWC) decreased; osmotic potential (Psi(pi)) decreased by 0.3 MPa only after the second period of stress. In both treatments no osmoregulation mechanism occurred, however, an elastic adjustment took place and turgor was maintained at positive levels. Following the first treatment the good functionality of the ascorbate/glutathione cycle allowed the plants to maintain hydrogen peroxide to the control level despite a greater capacity of the thylakoid membranes to leak electrons towards oxygen; moreover, the ascorbate (AsA)/dehydroascorbate (DHA) ratio was unchanged while reduced glutathione (GSH)/oxidized glutathione (GSSG) increased in comparison with the control. Following the second period of stress, the decreased enzyme defence activities of the glutathione reductase (GR), dehydroascorbate reductase (DHAR) and ascorbate peroxidase (AsAP) together with a minor glutathione content might be a consequence of a reduced rate of activated oxygen production. [References: 32].

575 Modi, A.T.; Cairns, A.L.P. (Department of Agronomy, University of Natal, Private Bag X01, Scottsville 3209 (South Africa)) (1994) **Molybdenum deficiency in wheat results in lower dormancy levels via reduced ABA.** *Seed Science Research (United Kingdom) v. 4(3) p. 329-333.* 16 ref. English. (AGRIS 95-133186).

576 Morgan, J.M. (New South Wales Agriculture, Tamworth (Australia)) (1992) **Genetics and physiology of drought tolerance in wheat.** New South Wales Agriculture. 1 fig., 2 tables, 6 ref. 6 p. English. (AGRIS 95-152712).

Gives an overview of a project to determine the inheritance of osmoregulation and to improve understanding of the chemistry of the process, so that the trait may be applied to plant breeding programs. Identification of a controlling gene for the trait, and of substances involved in osmoregulation have been completed, and the search for genetic markers for the gene are being undertaken.

577 Mugford, D.C.; Walker, A.R.; Quail, K.J. (Bread Research Inst. of Australia Inc., North Ryde) (1993) **The effect of variety and growing conditions on the dietary fibre contents of wheat and oats. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry

Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 505.* Abstract only. English. (AGRIS 95-133164).

578 Ntonga Mimbe, J. (Institut National de la Recherche Agronomique, Clermont Ferrand (France). Centre de Clermont Ferrand Theix, Agronomie et Mycologie); Lafarge, M. (1995) **[Nitrogen and reduced irradiance effects on ear fertility in winter wheat]. [Azote et effets d'un eclairement reduit sur la fertilite de l'epi chez le ble d'hiver].** *European Journal of Agronomy (France) v. 4(1) p. 135-142.* 24 ref., 6 tableaux, 7 graph. English. (AGRIS 95-133182).

579 Odogherty, MJ.; Huber, JA.; Dyson, J.; Marshall, CJ. (1995) **A STUDY OF THE PHYSICAL AND MECHANICAL PROPERTIES OF WHEAT STRAW.** *Journal of Agricultural Engineering Research. 62(2):133-142.* English. [CRANFIELD UNIV SILSOE COLL SILSOE MK45 4DT BEDS ENGLAND].

A series of experiments was conducted to measure the physical properties, tensile and shear strengths and elastic moduli of stem between nodes of wheat straw (var Mercia). These stems are referred to subsequently as "stem internodes". Apparatus is described for the measurements of physical properties, strength and elastic moduli. Young's modulus was measured by applying four point loading transversely to the stem; the rigidity modulus was found by subjecting a stem to torque. The principal variables investigated were (a) the effects of four stages of plant maturity for the third stem internode position, (b) position of the stem internode measured downwards from the ear for the fourth stage of plant maturity and (c) stem moisture in the range 8 to 22% w.b., for the third stem internode position at the fourth stage of plant maturity. There was in increase in stem diameter and wall cross-sectional area from the first to the fourth stem internode from the plant ear. Tensile strength was in the range 21.2 to 31.2 MPa and shear strength in the range 4.91 to 7.26 MPa. Young's modulus was between 4.76 and 6.58 GPa and the rigidity modulus in the range 267 to 547 MPa. Plant maturity had some significant effects on shear strength, which was highest for the first stage of maturity and for Young's modulus which increased with maturity, but had no effect on rigidity modulus. The stem internode position for the fourth stage of maturity had some significant effects on both the strengths and elastic moduli, but consistent trends were not evident. Moisture content for the fourth stage of maturity, at the third stem internode position, affected both shear strength which increased and rigidity modulus which decreased with increasing moisture content. It had no effect on Young's modulus, however, or any consistent influence on tensile strength. Stem conservation by freezing at -20 degrees C had a significant effect on strength and elastic moduli. Young's modulus was larger for samples which had been frozen and shear strength and rigidity modulus were smaller. Storage of stems for 3 months had no significant effect on the elastic moduli. (C) 1995 Silsoe Research Institute [References: 16].

580 Omran, M.S.; El Kholei, M.S. (Monoufia Univ., Shebin El Kom (Egypt). Faculty of Agriculture); Awad, Y.H.; El Basioni, S.M. (1992) **Effect of organic materials on wheat in salt affected soils. 1.- dry matter and yield.** *Annals of Agricultural Science, Moshtohor (Egypt) v. 30(4) p. 2117-2131.* 8 tables; 15 ref. English. (AGRIS 95-152805).

581 Peumans, WJ.; Vandamme, EJM. (1995) **LECTINS AS PLANT DEFENSE PROTEINS.** *Plant Physiology. 109(2):347-352.* English. [KATHOLIEKE UNIV LEUVEN PHYTOPATHOL & PLANT PROTECT LAB WILLEM DE CROYLAAN 42 B-3001 LOUVAIN BELGIUM].

582 Prabucka, B.; Bartoszewicz, K.; Bielawski, W.; Kaczkowski, J. (1995) **DYNAMICS OF ACTIVITY CHANGES OF ALPHA-AMYLASE AND 1-3, 1-4-BETA-ENDOGLUCANASE IN THE MILLING FRACTIONS OF GRAINS OF MALNO AND LASKO TRITICALE CULTIVARS DURING GERMINATION.** *Acta Physiologiae Plantarum. 17(3):255-260.* English. [AGR UNIV WARSAW DEPT BIOCHEM RAKOWIECKA 26-30 PL-02528 WARSAW POLAND].

The dynamics of activity changes of beta-glucanase and alpha-amylase were investigated on two Triticale cultivars of different pre-harvest sprouting resistance. Five milling fractions earlier described were used for the investigations and the alpha-amylase activity was determined on two substrates: primary and soluble starch. There was demonstrated the 2.6 times higher affinity to the first as compared with the second when alpha-amylase with a high-isoelectric point (high-pI) (Sigma) was used being the main enzyme degrading starch during germination. The beta-endoglucanase activity was the highest in the embryos, particularly in Malno, in 24 and 48 h and the lowest, but higher than in Malno, in the internal endosperm (by 50% in 48 h and 14% in 72 h). Particularly high differences, in favour of Malno, were also observed in the aleurone fraction (40-41% from 0 to 48 h and 14% in 72 h). Those differences can point to the higher effectiveness of the cell wall degradation inside the grains of the susceptible Malno cultivar which is connected with the possibility of the easier transport of metabolites at the time of starch degradation. In the susceptible Malno cultivar the alpha-amylase synthesis with the high degree of affinity to the native starch took place earlier and in a more intensive way than in the resistant Lasko cultivar with the exception of both fractions of the endosperm to which that form was transferred from the scutellum and the aleurone layer only in 24 h in Malno and 48 h in Lasko. Such conclusions were based on the gradual increase of the ratio of the activity determined on the native starch to that determined on the soluble starch thus testifying to the increase of the share of alpha-amylase with a high affinity to the first one. The compared results of the alpha-amylase determinations on both substrates points to varied affinities to starch of different isoforms of that enzyme that should be considered while drawing conclusions as to the activity of the total alpha-amylase.

583 Rhodes, D.I.; Stone, B.A. (La Trobe Univ., Bundoora (Australia). Dept. of Biochemistry) (1993) **A glycine-rich protein in wheat aleurone cell walls and a soluble protein from developing wheat grains that cross-reacts with an antiserum against a glycine-rich protein. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 501-502.* Abstract only. English. (AGRIS 95-133079).

584 Ronalds, J.A.; May, M. (Commonwealth Scientific and Industrial Research Organisation, North Ryde (Australia). Div. of Plant Industry); Rose, B. (Prime Wheat Assoc. Ltd, Narrabri (Australia)) (1993) **Seasonal variations in NIT wheat protein and moisture calibrations. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 512.* Abstract only. English. (AGRIS 95-133084).

585 Rosbrook, P.; Nicolas, M.; Halloran, G. (Melbourne Univ., Parkville (Australia). School of Agriculture and Forestry) (1992) **Are stem carbohydrate reserves important in maintaining grain size and malting quality of Australian barley?. [Conference paper].** Abstracts of the Australian Society of Plant Physiologists (Australia) p. P9. Australian Society of Plant Physiologists. p. P9. English. (AGRIS 95-133119).

586 Rostami, M.A.; O'Brien, L. (Sydney Univ., Narrabri (Australia). Plant Breeding Inst.) (1993) **The relationship between shoot fructan and nitrogen content in a range of wheat genotypes. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 510.* Abstract only. English. (AGRIS 95-133082).

587 Ruhland, M. (Bayerische Landesanstalt fuer Ernaehrung, Muenchen (Germany)); Engelhardt, G.; Wallnoefer, P.R.; Schaefer, W. (1994) **Transformation of the mycotoxin ochratoxin A in wheat and maize cell suspension cultures.** *Naturwissenschaften (Germany) v. 81(10) p. 453-454.* 1 ill.; 12 ref. English. (AGRIS 95-152802).

588 Sabry, S.R.S.; Smith, L.T. (California Univ., Davis (USA). Dept. of Agronomy and Range Science); Smith, G.M. (California Univ., Davis (USA). Dept. of Food Science and Technology) (1995) **[Osmoregulation in spring wheat under drought and salinity stress]. Osmoregolazione nel grano primaverile in condizioni di stress idrico e salino.** *Journal of Genetics and Breeding (Italy) v. 49(1) p. 55-60.* 3 tables; 1 graph; 13 ref. English. (AGRIS 95-133194).

The major solutes accumulated by osmotically stressed wheat (Triticum aestivum L.) seedlings were identified and quantitated by natural abundance **C(13) nuclear magnetic resonance spectroscopy and by amino acid analysis. Under either drought stress (imposed by withholding irrigation for three days) or salinity stress (imposed by irrigating with 200 mM NaCl for 10 days), wheat seedlings accumulated sucrose, glycine betaine, proline,

asparagine, glutamine, and valine. During drought stress the levels of most of the other amino acids, though not as abundant as those listed above, also increased. Interestingly, proline was the predominant osmolyte observed in drought-stressed plants, but glycine, betaine and sucrose were the leading osmolytes in salt-stressed plants. Significant variation was observed in the levels of many of these osmolytes in the six cultivars tested. This observation may be useful in the development of drought and salinity tolerance.

589 Shakirova, FM.; Bezrukova, MV.; Shayakhmetov, IF. (1995) **THE EFFECT OF HEAT SHOCK ON THE ACCUMULATION OF ABA AND LECTIN IN WHEAT CALLUS CELLS.** *Russian Journal of Plant Physiology. 42(5):621-623.* English. [RUSSIAN ACAD SCI BASHKIR SCI CTR DEPT BIOCHEM & CYTOL PR OKTYABRYA 69 UFA 450054 RUSSIA].

The patterns of ABA and lectin levels in the callus culture of Triticum durum Desf. at 24 degrees C (untreated tissues) and 40 degrees (heat shock) were studied using enzyme immunoassay. Callus heating yielded a pronounced increase in the levels of both ABA and lectin. ABA accumulation was transient and preceded lectin accumulation. Heat-shock-induced ABA accumulation is supposed to induce lectin synthesis, which can contribute to plant cell defense responses. [References: 23].

590 Shi Jianzhong; Wang Tianduo (Academia Sinica, Shanghai (China). Shanghai Inst. of Plant Physiology) (1994) **Experimental study and mathematical simulation of water use efficiency in wheat leaves affected by some environmental factors.** *Acta Botanica Sinica (China) v. 36(12) p. 940-946.* 6 ill., 16 ref. Chinese. (AGRIS 95-133188).

591 U, Z.K. (Cheju National University, Cheju (Korea Republic). Department of Agricultural Chemistry); Han, H.R. (Cheju National University, Cheju (Korea Republic). Department of Horticultural Science); Moon, D.Y.; Kim, C.M.; Lim, H.C.; Moon, D.K. (Rural Development Administration, Cheju (Korea Republic). Cheju Citrus Research Institute); Song, S.J. (Cheju National University, Cheju (Korea Republic). Cheju Applied Radioisotope Research Institute) (1994) **Development of K-bioassay for the efficient potassium fertilization of citrus tree.** *Agricultural Chemistry and Biotechnology (Korea Republic) v. 37(3) p. 182-188.* 8 illus.; 1 table; 22 ref. Korean. (AGRIS 95-133266).

592 Vandebroek, A.; Vanderleyden, J. (1995) **GENETICS OF THE AZOSPIRILLUM-PLANT ROOT ASSOCIATION - REVIEW [Review].** *Critical Reviews in Plant Sciences. 14(5):445-466.* English. [FA JANSSENS LAB GENET W DE CROYLAAN 42 B-3001 HEVERLEE BELGIUM].

Recent advances in four aspects of the Azospririllum-plant root association, namely, the biosynthesis of phytohormones, nitrogen fixation, the mechanisms of plant root attachment, and genetic analysis of Azospirillum brasilense megaplasmids, are presented. At least three biosynthetic pathways are involved in indole-3-acetic acid (IAA) production in A. brasilense, that is, two Trp-dependent pathways identified as the indole-3-acetamide (IAM) pathway, the indole-3-pyruvic acid (IPyA) pathway, and a third as-yet unidentified pathway not using Trp as a precursor. So far, Azospirillum is the only bacterium for which a non-Trp-dependent route for IAA biosynthesis has been reported. The gene encoding the key enzyme in the IPyA pathway, indole-3-pyruvate decarboxylase, has been characterized recently. Azospirillum fixes atmospheric dinitrogen only at low oxygen tensions in media devoid of a combined nitrogen source. Both the synthesis and the activity of the nitrogenase enzyme are regulated according to these environmental conditions. The A. brasilense PII protein, encoded by the glnB gene, has been shown to play a central role in the regulation of nifHDK expression in response to the cellular nitrogen status by controlling the activity of the transcriptional activator protein, NifA. Posttranslational control of nitrogenase activity in response to ammonia and anaerobiosis involves the reversible ADP ribosylation of dinitrogenase reductase, mediated by the enzymes DraT and DraG, similar to what has been described for the photosynthetic bacterium Rhodospirillum rubrum. The structural genes draT and draC of A. brasilense and A. lipoferum have been cloned and sequenced. Mutational analysis of draT and draG has confirmed their roles in the regulation of nitrogenase activity. Attachment of Azospirillum to plant roots occurs in two distinct phases. The first, the adsorption phase, consists of a weak binding of the bacteria to the roots. In the second, or anchoring phase, the bacteria become irreversibly bound to the root surface. An as yet uncharacterized calcofluor-binding surface polysaccharide was found to be responsible for the anchoring of the bacteria to the roots, whereas the adsorption step is thought to be mediated by the polar flagellum. Detailed genetic analysis of the p90 megaplasmid of A. brasilense revealed, among other genes, the presence of numerous genes involved in the flagellation of Azospirillum. [References: 132].

593 Vasakova, L.; Hradecka, D.; Jankovsky, M. (1995) **THE EFFECT OF SOME NATURAL BIOLOGICALLY ACTIVE PREPARATIONS ON WINTER WHEAT YIELD FORMATION AND ACTIVITY OF GLUTAMATE KINASE [Slovak].** *Rostlinna Vyroba. 41(11):529-532.* Slovak. [CESKA ZEMEDELSKA UNIV 6 SUCHDOL CR-16521 PRAGUE CZECH REPUBLIC].

In investigating the effect of pressed spinach juice and alginate preparation manufactured by BIO-ALGEEN (Hamburg, Germany), formulated from algae Ascophyllum nodosum, on the yield and yield components of winter wheat and activity of glutamate kinase [E.C.2.7.2.11] in their leaves, a positive action of both natural preparations was found. Trials were carried out on the school plot in three replications. The seed was activated by spinach extract prepared from frozen spinach by manual pressing; 400 ml of diluted pressed juice was applied for 2.3 kg seed. Stands were sprayed with alginate preparation at the stage of five right leaves at a rate of 1.35 g alginate diluted in 1 l water per one experimental plot what corresponds to spraying of a rate 3 l.ha(-1) Plant material (leaves) for investigation of the activity of glutamate kinase was taken at the stage of five right leaves what corresponded to seven days after spraying by alginate preparation. In evaluation of yield and yield components the length of spike, grain number per spike, 1 000-kernel weight, number of plants per 1 m2 and yield. As alginate, as its combination with spinach juice increased grain number in spike on average by 5 (11.3%). 1 000-kernel weight (TKW), too, was higher by 1.43 in alginate (10.31%), in using both preparations by 1.51 g (10.33%). The highest increase in TKW value was attained in activation of the seed by spinach juice (by 2.8 g, i.e. by 19.2%). Average length of spike increased only as a result of alginate or combination of both preparations, that is by 1 cm. Marked increase in the yield was manifested only in combination of both substances, the yield was higher by 11.52% compared with the control (Tab. II). Activity of glutamate kinase was determined by the methodology which consisted in isolation of acetone powder from plant material and its extraction by buffer with subsequent centrifugation. A fraction, containing tested enzyme, was achieved from supernatant after salting out of (NH4)(2)SO4 and subsequent purification. Its activity was determined by hydraxamate method after Y o s h i n a g a et al. (1975). While application of spinach juice increased activity of enzyme by 11.25%, action of alginate was more marked (increase by 67.5%), synergic effect of parallel action of both preparations was not shown (increase by 65%) as can be seen in Pig. 1. Both preparations used have positive - stimulating effect on winter wheat.

594 Xi Gang; Fu Zhidong; Jia Ling (Northwestern Agricultural Univ., Yangling, Shaanxi (China)) (1994) **Change of peroxidase activity in wheat seedlings induced by magnetic field and its response under dehydration condition.** *Acta Botanica Sinica (China) v. 36(suppl.) p. 113-118.* 7 ill., 19 ref. Chinese. (AGRIS 95-133189).

595 Yaduraju, NT.; Ahuja, KN. (1995) **2, 4-DICHLOROPHENOXY ACETIC ACID-INDUCED EAR DEFORMITY IN WHEAT (TRITICUM AESTIVUM) IN RELATION TO ITS TIME OF PLANTING.** *Indian Journal of Agronomy. 40(2):298-300.* English. [INDIAN AGR RES INST DIV AGRON NEW DELHI 110012 INDIA].

596 Yaneva, IA.; Vunkovaradeva, RV.; Stefanov, KL.; Tsenov, AS.; Petrova, TP.; Petkov, GO. (1995) **CHANGES IN LIPID COMPOSITION OF WINTER WHEAT LEAVES UNDER LOW TEMPERATURE STRESS - EFFECT OF MOLYBDENUM SUPPLY.** *Biologia Plantarum. 37(4):561-566.* English. [BULGARIAN ACAD SCI INST PLANT PHYSIOL BU-1113 SOFIA BULGARIA].

Molybdenum applied in vivo to winter wheat (Triticum aestivum L., cv. Sadovo 1) grown on acid soil had cryoprotective effect. In Mo-treated plants the amount of digalactosyl diacylglycerol in the leaves increased during cold acclimation and that of monogalactosyl diacylglycerol remained relatively unchanged. An opposite tendency was observed in untreated plants. The most pronounced effect of freezing temperature on lipid changes was

observed with respect to the different rate of phospholipid degradation in both kinds of plants. The amount of phospholipids at -5 degrees C in Mo-treated plants increased while in untreated ones it significantly decreased. In general, the changes observed in Mo-treated plants corresponded to those shown for first resistant plants.

597 Zhang, JX.; Kirkham, MB. (1995) **WATER RELATIONS OF WATER-STRESSED, SPLIT-ROOT C-4 (SORGHUM BICOLOR POACEAE) AND C-3 (HELIANTHUS ANNUUS ASTERACEAE) PLANTS.** *American Journal of Botany. 82(10):1220-1229.* English. [KANSAS STATE UNIV DEPT AGRON EVAPOTRANSPIRAT LAB THROCKMORTON HALL MANHATTAN, KS 66506 USA].

Sorghum [Sorghum bicolor (L.) Moench] and sunflower (Helianthus annuus L.) were grown in a greenhouse with roots divided between sand irrigated with nutrient solution (-0.097 MPa) or nutrient solution containing polyethylene glycol (PEG) (-0.570 MPa) to compare the effect of unequal root zone stress on plant water relations of a C-4 (sorghum) and a C-3 (sunflower) plant. Roots also were divided between two pots of sand irrigated only with nutrient solution (controls) or only with PEG in nutrient solution. In addition to plant water-status measurements, photosynthetic rate, growth (height, root, and shoot dry weights), and evolution of ethylene (a gaseous hormone indicative of stress) were measured. Under all three split-root treatments, sunflower had a lower leaf water potential and produced more ethylene than sorghum. Sunflower was able to survive the PEG stress if half of its root system was under nonstressed conditions. Sunflower with half its root system irrigated with PEG usually had values of leaf water potential, osmotic potential, stomatal resistance, transpiration rate, photosynthetic rate, ethylene evolution, height, and dry weights that were close to those of the control plants. Sunflower with all roots exposed to PEG was wilted severely. Sorghum was little affected by PEG stress applied either to half or all the root system. Growth of sorghum was the same under all treatments. Apparently because stomata of sorghum were more closed in the partial stress test than those of sunflower, sorghum conserved water and had a higher leaf water potential, which might have permitted growth with stress. [References: 35].

598 Zheng Hailei (Xiamen Univ., Fujian (China). Dept. of Biology) (1994) **A simplified mechanistic model of carbon assimilation and biomass accumulation of spring wheat with and without water limitation.** *Acta Botanica Sinica (China) v. 36(3) p. 226-232.* 1 table; 5 ill., 14 ref. Chinese. (AGRIS 95-133067).

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599 Agenbag, G.A. (Stellenbosch Univ. (South Africa). Dept. of Agronomy and Pastures); De Villiers, O.T. (1995) **Quality response of spring wheat cultivars to post-anthesis water stress intensity.** *South African Journal of Plant and Soil (South Africa) v. 12(2) p. 45-49.* 6 fig. English. (AGRIS 95-133589).

600 Barneix, AJ.; Suarez, EY. (1995) **GRAIN NITROGEN CONCENTRATION AND FLAG LEAF FREE AMINO ACIDS IN WHEAT.** *Cereal Research Communications. 23(3):291-297.* English. [UNIV BUENOS AIRES FAC AGRON CATEDRA MICROBIOL AGR AV SAN MARTIN 4453 RA-1417 BUENOS AIRES DF ARGENTINA].

Wheat (Triticum aestivum L.) plants cv. Maringa and its isogenic lines carrying either the Rht(1), Rht(2) or Kht(1) + Rht(2) alleles for dwarfism were grown in the field under two N levels (0 Kg N/ha or 100 Kg N/ha at sowing plus 100 Kg N/ha after ear emergence) in order to determine if in field grown plants it is possible to establish a relation between the amino acids pool in the flag leaf and the final grain nitrogen concentration, or not. The isogenic lines carrying any one (Rht(1) or Rht(2)) of the alleles showed higher grain yield and N accumulation than the normal genotype, mainly due to the presence of more ears and more but smaller grains per ear. The line carrying the Rht(1) + Rht(2) alleles yielded less biomass, ears and N amount and showed smaller ears than the other genotypes, with the same number of ;grains per ear as the other Rht isolines, but with a marked decrease in grain size. The fertilization treatment increased the grain N yield and concentration, but not the biomass, grain yield or number of ears. In the no-fertilizer treatment the small grains of the Rht(1) + Rht(2) isoline showed a higher protein concentration than in the other genotypes, while under high N conditions, the normal and the Rht(1) and Rht(2) isolines increased their concentration up to these same level, showing no differences among the four genotypes. Seven days after flowering the flag leaf had the same total N and soluble sugar concentration in the four isolines, with no effect on the N fertilizer addition, although they showed different concentrations of Free amino acids. This free amino acid concentration showed a positive correlation with the grain N concentration.

601 Batten, G.D.; Marr, K.M. (New South Wales Agriculture, Yanco (Australia). Yanco Agricultural Inst.) (1993) **Does phosphorus determine the concentration of nitrogen, sulfur, calcium, potassium, or magnesium in wheat grain?. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 509.* Abstract only. English. (AGRIS 95-133590).

602 Carlin, S.; Greenway, H. (Western Australia Univ., Nedlands. Crop and Pasture Sciences) (1992) **The effect of anoxia on the cell membranes of rice and wheat. [Conference paper].** Abstracts of the Australian Society of Plant Physiologists (Australia) p. 30. Australian Society of Plant Physiologists. p. 30. English. (AGRIS 95-133626).

603 Datta, KS.; Kumar, A.; Varma, SK.; Angrish, R. (1995) **DIFFERENTIATION OF CHLORIDE AND SULPHATE SALINITY ON THE BASIS OF IONIC DISTRIBUTION IN GENETICALLY DIVERSE CULTIVARS OF WHEAT.** *Journal of Plant Nutrition. 18(10):2199-2212.* English. [HARYANA AGR UNIV CCS DEPT BOT HISAR 125004 HARYANA INDIA].

Sulphate (SO4) salinity, in general, was found to be more injurious than chloride (Cl) salinity in all the four genetically diverse wheat cultivars - Triticum monococcum (C1), T. aestivum cv. chinese spring (C2), T. turgidum cv. langdon (C3) and amphidiploid (C4) obtained by a cross between T. aestivum cir. chinese spring x Thinopyrum bessarabicum grown in hydroponic cultures containing iso-osmotic saline treatments T1 (90 mM NaCl), T2 (45 mM NaCl+22.5 mM Na2SO4), T3 (15 mM NaCl + 37.5 mM Na2SO4), and T4 (45 mM Na2SO4). Among the cultivars, C4 followed by C2 and C3 appeared to be more salt resistant and C1 the most salt sensitive as far as various observations on osmotic potential and internal ion accumulation were concerned. Salt resistance could be ascribed to more exclusion of Na and C1 ions. Sulphate injury might be due to less effective sequestration or mobility of this ion towards some innocuous centres of plant tissues. Most of the interactive effects of cultivar versus salinity were prominently higher in cultivar C4 in treatment T1. [References: 23].

604 Debel, K. (Universitaet Hannover (Allemagne). Institut fuer Botanik); Eberhard, D.; Kloppstech, K. (1995) **[Accumulation of HSP 23 in Chenopodium rubrum and of plastid HSP 25 in barley is controlled posttranslationally by light]. [L'accumulation de HSP 23 chez Chenopodium rubrum et de plastidique HSP 25 chez l'orge est controlee posttranslationnellement par la lumiere].** Ecophysiology and photosynthetic in vitro cultures; Aix en Provence (France); 1-3 Dec 1993. *Ecophysiology and photosynthetic in vitro cultures. Proceedings of the international symposium. Aix en Provence (France) 1-3 December 1993. [Ecophysiologie et cultures in vitro photosynthetiques. Aix en Provence (France), 1-3 decembre 1993].* Commissariat a l'Energie Atomique, Saint Paul Lez Durance (France) p. 35-46. CEA. 25 ref., 8 graph. English. (AGRIS 95-133604).

605 Ehmele, F.P. (Hohenheim Univ., Stuttgart (Germany). Inst. fuer Pflanzenbau und Gruenland. Fachgebiet Spezieller Pflanzenbau) (1994) **[Nitrogen uptake of wheat and rye as affected by site]. Vergleich der Stickstoff-Nutzungseffizienz von Weizen und Roggen unter unterschiedlichen Standortbedingungen.** 38. Jahrestagung der Gesellschaft fuer Pflanzenbauwissenschaften; Halle/Saale (Germany); 29 Sep - 01 Oct 1994. *Mitteilungen der Gesellschaft fuer Pflanzenbauwissenschaften (Germany) v. 7 p. 93-94.* 1 graph; 2 ref. German. (AGRIS 95-133636).

606 Ekobena, FAP.; Solntsev, MK.; Yurina, TP. (1995) **DEPENDENCE OF WHEAT LEAF THERMOLUMINESCENCE ON THE CONTENT OF MINERAL SALTS IN THE SANDY MEDIUM.** *Izvestiia Akademii Nauk SSSR. Seriia Biologicheskaia. (5):538-544.* Russian. [MOSCOW MV LOMONOSOV STATE UNIV FAC PHYS VOROBEVY GORY MOSCOW 119899 RUSSIA].

The influence of mineral nutrient deficiencies on the storage and conversion of light energy in higher plants has been studied. Ten day seedlings of wheat varieties I, II, and nr were grown on soil (control) and on sand with various amounts of N, P and K as inorganic salts (experiment). The N, P and K deficiencies decreased the photosynthetic and respiratory activity. On the contrary, the peroxidase activity was increased. The intensity of thermoluminescence (TL) B-band of experimental samples increased as a result of addition of mineral nutrients, The TL peak A position in the *experimental samples* varied from -23 degrees C up to -13 degrees C for wheat varieties I and II, and from -18 degrees C up to -8 degrees C for variety III. The above data suggest that the N, P and K deficiencies induce the S-state redistribution and decrease the electron transport rate, as compared to the control, by increasing the trans-membrane pH in the thylacoid membranes. [References: 21].

607 Fisher, DB.; Wang, N. (1995) **SUCROSE CONCENTRATION GRADIENTS ALONG THE POST-PHLOEM TRANSPORT PATHWAY IN THE MATERNAL TISSUES OF DEVELOPING WHEAT GRAINS.** *Plant Physiology. 109(2):587-592.* English. [WASHINGTON STATE UNIV DEPT BOT PULLMAN, WA 99164 USA].

Sucrose concentrations were measured in serial frozen sections of the post-phloem transport pathway in developing wheat (Triticum aestivum L.) grains. In normally importing grains, there was an approximately linear concentration gradient along the pathway, with a difference between the ends of the pathway of about 180 mM. This indicates an unusually low resistance for cell-to-cell transport, due perhaps to the large size-exclusion limit for the pathway. However, the existence of concentration gradients raises presently unresolvable questions about the relative contributions of diffusion versus bulk flow to transport within the symplast. The concentration gradient disappeared when sucrose movement ceased (i.e. in excised grains or when endosperm cavities of attached grains were perfused with p-chloromercuribenzene sulfonate [PCMBS] or with 1660 mOsm sorbitol). PCMBS appeared to block solute release into the endosperm cavity, whereas the sorbitol treatment, previously shown to cause localized plasmolysis in the chalaza, appeared to block movement across the chalaza. Sieve element/companion cell unloading appears to be an important control point for assimilate import. The sucrose concentration gradient and, probably, turgor and osmotic gradients are extremely steep there. PCMBS blocked import without affecting the sucrose concentration in the vascular parenchyma around the phloem. Thus, blockage of unloading was more complex than a simple "backing up" of solutes in the vascular parenchyma. [References: 13].

608 Garnett, T.P.; Tester, M.A. (Adelaide Univ., Glen Osmond (Australia). Dept. of Botany); Nable, R.O. (Commonwealth Scientific and Industrial Research Organisation, Glen Osmond (Australia). Div. of Soils) (1992) **The control of boron accumulation by two varieties of wheat. [Conference paper].** Abstracts of the Australian Society of Plant Physiologists (Australia) p. 86. Australian Society of Plant Physiologists. p. 86. English. (AGRIS 95-133596).

609 Gede, I.; Adiputra, *K.; Anderson, J.W.* (La Trobe Univ., Bundoora (Australia). Botany Dept.) (1992) **Distribution and redistribution of sulphur in barley. [Conference paper].** Abstracts of the Australian Society of Plant Physiologists (Australia) p. 85. Australian Society of Plant Physiologists. p. 85. English. (AGRIS 95-133606).

610 Gorr, G.; Obst, G.; Doring, O.; Bottger, M. (1995) **LIGHT-DEPENDENT PROTON EXCRETION OF WHEAT (TRITICUM AESTIVUM L) AND MAIZE (ZEA MAYS L) ROOTS.** *Botanica Acta. 108(4):351-357.* English. [UNIV HAMBURG INST ALLGEMEINE BOT OHNHORSTSTR 18 D-22609 HAMBURG GERMANY].

We investigated the change of root net proton excretion of seedlings of Triticum aestivum L. and Zea mays L. with daily variation of illumination using a multi-channel pH-stat system. We found an increase of net proton excretion during darkness and a drop after the beginning of illumination. Inhibition of carotenoid biosynthesis by norflurazone and photooxidation of chlorophylls did not change the periodicity or its induction. The induction of diurnal periodicity was possible with blue, green and red light. After induction the oscillation of net proton excretion continued for at least two cycles under constant light. We conclude that net H+ excretion of wheat and maize roots may be regulated by an endogenous clock or by a signal from the leaves. The nature of such a hypothetical signal remains unknown. [References: 38].

611 Habash, DZ.; Paul, MJ.; Parry, MAJ.; Keys, AJ.; Lawlor, DW. (1995) **INCREASED CAPACITY FOR PHOTOSYNTHESIS IN WHEAT GROWN AT ELEVATED CO2 - THE RELATIONSHIP BETWEEN ELECTRON TRANSPORT AND CARBON METABOLISM.** *Planta. 197(3):482-489.* English. [AFRC INST ARABLE CROPS RES DEPT BIOCHEM & PHYSIOL HARPENDEN AL5 2JQ HERTS ENGLAND].

Spring wheat (Triticum aestivum L.) was grown under optimal nutrition . for six weeks at 700 and 350 mu mol . mol(-1) CO2 and simultaneous measurements of photosystem-II (PSII) chlorophyll fluorescence and gas exchange were conducted on intact attached leaves. Plants grown at elevated CO2 had double the concentration of CO2 at the carboxylation site (C-c) despite a lowered stomatal (g(s)) and mesophyll (g(m)) conductance compared with ambient-grown plants. Plants grown at elevated CO2 had a higher relative quantum yield of PSII electron transport (Phi(PSII)) and a higher relative quantum yield of CO2 fixation (Phi CO2). The higher Phi(PSII) was due to a larger proportion of open PSII centres, estimated by the coefficient of photochemical quenching of fluorescence (q(p)), with no change in the efficiency of light harvesting and energy transduction by open PSII centres (F'(v)/F'(m)). Analysis of the relationship between Phi(PSII) and Phi(CO2) conducted under various CO2 and O-2 concentrations showed that the higher Phi(CO2) for a given Phi(PSII) in leaves developed under elevated CO2 was similar to that obtained in leaves upon a partial reduction in photorespiration. Calculation of the allocation of photosynthetic electron-transport products to CO2 and O-2 showed that for leaves developed in elevated CO2, there was an increase in both total linear electron flow and electron flow to CO2 and a decrease in electron flow to O-2. Plants developed under elevated CO, showed positive acclimation manifested by a higher Phi(CO2) when measured under ambient CO2 and higher assimilation rates in A/C-i curves. Initial and to tal activity of ribulose-1, 5-bisphosphate carboxylase-oxygenase (Rubisco EC 4.1.1.39) measured in vitro increased by 16 and 15% respectively in leaves from plants grown in elevated CO2, which was in agreement with a 15% higher in vivo carboxylation efficiency. It is concluded that growth of spring wheat at elevated CO2 enhances photosynthesis due to a change in the balance of component processes manifested as an increased capacity for carbon fixation, total electron transport and Rubisco activity, and a concomitant partial reduction of photorespiration. [References: 22].

612 Hecht Buchholz, C. (Humboldt Universitaet, Berlin (Germany). Landwirtschaftlich Gaertnerische Fakultaet. Inst. fuer Grundlagen der Pflanzenbauwissenschaften. Fachgebiet Pflanzenernaehrung); Ortmann, U. (1994) **[Research of wheat grown in a field experiment with hydro-chlorophyll meter and with electron microscope in dependence on nitrogen fertilization]. Untersuchung von Weizen im Feldversuch mit dem Hydro-Chlorophyllmeter und dem Elektronenmikroskop bei unterschiedlichen Stickstoff-Duengungsstufen.** VDLUFA-Schriftenreihe (Germany); no. 38 p. 207-210. VDLUFA. 1 ill., 1 table; 5 ref. p. 207-210. German. (AGRIS 95-153607).

613 Hurry, VM.; Strand, A.; Tobiaeson, M.; Gardestrom, P.; Oquist, G. (1995) **COLD HARDENING OF SPRING AND WINTER WHEAT AND RAPE RESULTS IN DIFFERENTIAL EFFECTS ON GROWTH, CARBON METABOLISM, AND CARBOHYDRATE CONTENT.** *Plant Physiology. 109(2):697-706.* English. [AUSTRALIAN NATL UNIV COOPERAT RES CTR PLANT SCI GPO BOX 475 CANBERRA ACT 2601 AUSTRALIA].

The effect of long-term (months) exposure to low temperature (5 degrees C) on growth, photosynthesis, and carbon metabolism was studied in spring and winter cultivars of wheat (Triticum aestivum) and rape (Brassica napus). Cold-grown winter rape and winter wheat maintained higher net assimilation rates and higher in situ CO2 exchange rates than the respective cold-grown spring cultivars. In particular, the relative growth rate of spring rape declined over time at low temperature, and this was associated with a 92% loss in in situ CO2 exchange rates. Associated with the high photosynthetic rates of cold-grown winter cultivars was a P-fold increase per unit of protein in both stromal and cytosolic fructose-1, 6-bisphosphatase activity and a 1.5- to 2-fold increase in sucrose-phosphate synthase activity. Neither spring cultivar increased enzyme activity on a per unit of protein basis. We suggest that the recovery of photosynthetic capacity at low

temperature and the regulation of enzymatic activity represent acclimation in winter cultivars. This allows these overwintering herbaceous annuals to maximize the production of sugars with possible cryoprotective function and to accumulate sufficient carbohydrate storage reserves to support basal metabolism and regrowth in the spring. [References: 49].

614 Jeschke, W.D. (Wuerzburg Univ. (Germany). Lehrstuhl fuer Botanik I, Julius von Sachs Inst. for Biosciences); Klagges, S.; Bhatti, A.S. (1995) **Collection and composition of xylem sap and root structure in two halophytic species.** *Plant and Soil (Netherlands) v. 172(1) p. 97-106.* 32 ref. English. (AGRIS 95-133608).

615 Kanazawa, K.; Higuchi, K.; Nishizawa, NK.; Fushiya, S.; Mori, S. (1995) **DETECTION OF TWO DISTINCT ISOZYMES OF NICOTIANAMINE AMINOTRANSFERASE IN FE-DEFICIENT BARLEY ROOTS.** *Journal of Experimental Botany. 46(290):1241-1244.* English. [UNIV TOKYO DEPT APPL BIOL CHEM BUNKYO KU YAYOI 1-1 TOKYO 113 JAPAN].

Two isozymes of nicotianamine aminotransferase, involved in the biosynthesis of phytosiderophores, were detected in Fe-deficient barley roots. They showed different molecular masses and kinetic parameters. Furthermore, one of them was strongly induced by an Fe-deficiency treatment, whereas the other was not. [References: 14].

616 Komossa, D.; Sandermann, H. (1995) **PLANT METABOLIC STUDIES OF THE GROWTH REGULATOR MALEIC HYDRAZIDE.** *Journal of Agricultural & Food Chemistry. 43(10):2713-2715.* English. [GSF FORSCHUNGSZENTRUM UNWELT & GESUNDHEIT GMBH INST BIOCHEM PFLANZENPATHOL D-85758 OBERSCHLEISSHEIM GERMANY].

The metabolism of maleic hydrazide has been studied in cell suspension cultures of soybean, wheat, and maize under standardized conditions (40 ml flasks, I ppm, 48 h). Maleic hydrazide was converted to its beta-D-glucoside as the predominant soluble metabolite in yields of between 2 and 15%. The latter was completely cleaved under simulated stomach conditions (pH 1, 37 degrees C, 24 h). In addition, up to 18% of the applied maleic hydrazide became associated with the nonextractable residue. The residue from soybean cells was solubilized only to a low degree (similar to 3%) under simulated stomach conditions. The lignin and hemicellulose components appeared to contain most of the radioactivity in the nonextractable residue from soybean cells. It is concluded that metabolism in Cultured plant cells resembled that in whole plants and that the beta-D-glucoside of maleic hydrazide belongs to the small group of acid-labile pesticidal conjugates. [References: 20].

617 Kumar, A.; Sharma, DK.; Sharma, HC. (1995) **NITROGEN UPTAKE, RECOVERY AND N-USE EFFICIENCY IN WHEAT (TRITICUM AESTIVUM) AS INFLUENCED BY NITROGEN AND IRRIGATION LEVELS IN SEMI-RECLAIMED SODIC SOILS.** *Indian Journal of Agronomy. 40(2):198-203.* English. [INDIAN AGR RES INST DIV AGRON NEW DELHI 110012 INDIA].

A 2-year field experiment was conducted with wheat (Triticum aestivum L. emend. Fiori & Paol.) variety 'HD 2285' in semi-reclaimed sodic soil of Karnal, comprising 4 levels each of nitrogen and irrigation. Scheduling irrigation at 1.2 irrigation water: cumulative pan evaporation (IW : CPE) ratio was better than other irrigation schedules in terms of grain yield. With each increment of N level from 60 to 180 kg/ha, there was a significant increase in the grain yield as well as N uptake. Response to N of grain production at 1.2 IW : CPE ratio was significantly more than that at 0.6 and 0.9 IW : CPE ratios. The N content in shoot at spike-initiation stage was higher in irrigated than in unirrigated treatment, but reverse was true for N content in grain and straw at maturity. The N uptake through grain and straw was higher when irrigation was given at 1.2 IW : CPE ratio. Recovery of applied N and N-use efficiency were maximum when irrigation was given at 1.2 IW : CPE ratio along with 60 kg N/ha.

618 Lakkineni, KC.; Sivasankar, A.; Kumar, PA.; Nair, TVR.; Abrol, YP. (1995) **CARBON DIOXIDE ASSIMILATION IN UREA-TREATED WHEAT LEAVES.** *Journal of Plant Nutrition. 18(10):2213-2217.* English. [INDIAN AGR RES INST DEPT PLANT PHYSIOL NEW DELHI 110012 INDIA].

Application of 10 mM urea to the flag leaf of wheat plants enhanced in vivo urease activity severalfold. Photosynthetic rate was also increased considerably. There were significant differences in the leaf internal carbon dioxide (CO_2) concentrations between the urea-treated and untreated leaves. The finding that carbon (C-14) was detected in the ethanol extract of the leaves fed with C-14-urea suggests that CO_2 released from urea is re-fixed by the leaves. [References: 13].

619 Lal, R.; Hooda, IS.; Dahiya, DR. (1995) **EFFECT OF NUTRIENT MANAGEMENT ON GROWTH AND GRAIN YIELD OF PEARLMILLET (PENNISETUM GLAUCUM) IN PEARLMILLET-WHEAT (TRITICUM AESTIVUM) CROPPING SYSTEM.** *Indian Journal of Agronomy. 40(2):269-271.* English. [CHAUDHARY CHARAN SINGH HARYANA AGR UNIV DEPT AGRON HISAR 125004 HARYANA INDIA].

620 Ma Tongsheng (Nanjing Agricultural Univ. (China)) (1994) **Regularity of silicon uptake at the growth stage of rice and wheat crops and silicon fertilizer application.** *Plant Nutrition and Fertilizer Science (China) (no. 1) p. 104-108.* 3 tables; 3 ill., 8 ref. Chinese. (AGRIS 95-133622).

621 Merbach, W. (Zentrum fuer Agrarlandschafts und Landnutzungsforschung, Muencheberg (Germany). Inst. fuer Oekophysiologie der Primaerproduktion); Reining, E.; Knof, G. (1994) **[Quantification and characterization of particles of (15)N compounds in the soil investigated in Triticum aestivum L.]. Quantifizierung und Teilchencharakterisierung wurzelbuertiger (15)N- Verbindungen im Boden, untersucht am Beispiel von Triticum aestivum L.** 10. Jahrestagung Gesellschaft fuer Mineralstoffe und Spurenelemente e.V., 14. Arbeitstagung Mengen- und Spurenelemente; Jena (Germany); 25-26 Nov 1994. *(Deficits and surpluses on macro and trace elements in the nutrition). Anke, M.; Meissner, D.; Bergmann, H.; Bitsch, R.; Dorn, W.; Flachowsky, G.; Groppel, B.; Guertler, H.; Lombeck, I.; Luckas, B.; Merbach, W.; Schneider, H.J. p. 485-490.* Schubert. 2 tables; 16 ref. German. (AGRIS 95-133634).

622 Mietkowski, C. (Hannover Univ. (Germany). Inst. fuer Pflanzenernaehrung); Horst, W.J. (1994) **[Nitrogen dynamics and use of nitrogen supply of soil through following crops after green fallow-breaking]. N-Dynamik und Nutzung des N-Angebots des Bodens durch Folgekulturen nach Gruenbrache-Umbruch.** VDLUFA-Schriftenreihe (Germany); no. 38 p. 135-138. VDLUFA. 3 tables; 2 ref. p. 135-138. German. (AGRIS 95-153764).

623 Mishra, NP.; Fatma, T.; Singhal, GS. (1995) **DEVELOPMENT OF ANTIOXIDATIVE DEFENSE SYSTEM OF WHEAT SEEDLINGS IN RESPONSE TO HIGH LIGHT.** *Physiologia Plantarum. 95(1):77-82.* English. [JAWAHARLAL NEHRU UNIV SCH LIFE SCI NEW DELHI 110067 INDIA].

Changes in the activities of enzymes involved in the detoxification of reactive oxygen species in wheat seedlings (Triticum aestivum L.) in response to variations in the light environment were studied. Activities of ascorbate peroxidase, superoxide dismutase, monodehydroascorbate reductase, dehydroascorbate reductase, glutathione reductase and catalase were much lower in seedlings grown under low-light conditions than in those grown under high-light conditions. Activities of all these enzymes significantly increased within 24 h of transfer of the low-light-grown seedlings to the high-light regime. The results suggest that the increase in enzyme activities was an adaptive response of the plants to higher amounts of active oxygen species generated at higher light intensities. An accumulation of glutathione was also observed which could also be a part of the defense strategy to meet the increased generation of active oxygen species upon transfer of low-light-grown plants to high-light conditions. [References: 24].

624 Naver, H.; Scott, MP.; Andersen, B.; Moller, BL.; Scheller, HV. (1995) **RECONSTITUTION OF BARLEY PHOTOSYSTEM I REVEALS THAT THE N-TERMINUS OF THE PSI-D SUBUNIT IS ESSENTIAL FOR TIGHT BINDING OF PSI-C.** *Physiologia Plantarum. 95(1):19-26.* English. [ROYAL VET & AGR UNIV DEPT PLANT BIOL 40 THORVALDSENSVEJ DK-1871 FREDERIKSBERG C DENMARK].

Removal of the peripheral subunits PSI-C, -D and -E from the photosystem I (PSI) complex of barley requires a urea treatment much

harsher than required to remove the similar subunits from cyanobacterial PSI. The resulting PSI barley core was reconstituted by addition of the E. coli expressed subunits PSI-C and -D, and PSI-E isolated from barley. Western blotting, flash photolysis and NADP(+) photoreduction measurements demonstrated complete and specific removal of the three subunits from the core and efficient reconstitution of the complex after addition of PSI-C, -D and -E. Flash photolysis reveals that PSI-D is essential for binding of functional PSI-C to the PSI core. An N-terminally truncated barley PSI-D lacking 24 amino acid residues and thus being without the N-terminal extension characteristic for higher plant PSI-D proteins reconstitutes the PSI core to 50% of the level obtained with intact PSI-D as demonstrated by flash photolysis and NADP(+) photoreduction measurements. Cyanobacterial PSI-D is functionally equivalent to truncated barley PSI-D with respect to its activity to reconstitute the PSI core. This shows that the N-terminal extension of plant PSI-D plays a key role in binding PSI-C to the core. The plant-specific N-terminus of PSI-D is hypothesized to execute its function through interaction with a plant-specific PSI subunit, possibly PSI-H. An anchoring function of the N-terminus of PSI-D would also explain the harsh treatment needed to obtain a plant PSI core. PSI-E is important for efficient NADP(+) reduction but does not influence electron transfer to iron-sulphur centres A/B nor binding of PSI-C. The enhancing effect of PSI-E on NADP reduction is independent of the presence of the N-terminus of PSI-D. [References: 36].

625 Niziolek, S. (1995) **CHANGES IN PHYTIC ACID, PHYTASE ACTIVITY AND INORGANIC PHOSPHORUS DURING MATURATION OF TRITICALE VARIETIES RESISTANT AND SUSCEPTIBLE TO PRE-HARVEST SPROUTING.** *Acta Physiologiae Plantarum. 17(3):269-274.* English. [AGR UNIV WARSAW DEPT BIOCHEM RAKOWIECKA 26-30 PL-02528 WARSAW POLAND].

Changes in phytase activity, phytic acid and inorganic phosphorus levels were examined in the grain of five triticale varieties during maturation. Only low phytase activity was found until the 16th dap (day after pollination), and then a rapid rise in activity was observed with the maximum at the 30-37th day, followed by a continuous decline until full maturity. The variety Malno, most susceptible to pre-harvest sprouting, showed higher phytase activity through maturation compared with other varieties. It seems that selection against susceptibility to pre-harvest sprouting should take this positive relationship into account. Phytic acid was detected as early as on the 9th dap. It was accumulated rapidly from about the 23th day onwards and its level increased until the end of vegetation period. On the other hand, the P-i level was the highest after 9 dap and then decreased along with the grain development and phytic acid accumulation. In mature grain the P-i level was 8-13-fold lower that on the 9th dap. The rapid rise in phytate content and decrease in phytase activity through the later period of triticale grain development may be involved in control of P-i concentration. The phytic acid and P-i level in the grain of triticales assayed during maturation, showed no direct relation to the pre-harvest sprouting resistance.

626 Omran, M.S.; El Kholei, M.S. (Monoufia Univ., Shebin El Kom (Egypt). *Faculty of* Agriculture); Hussein, L.A.; El Basioni, S.M. (1992) **Effect of organic materials on wheat *in salt-affected soils.* 2.- nitrogen, phosphorus, iron and manganese uptake.** *Annals of Agricultural Science, Moshtohor (Egypt) v. 30(4) p.* 2133-2143. 4 tables; 23 ref. English. (AGRIS 95-153654).

627 Parnik, T.; Keerberg, O. (1995) **DECARBOXYLATION OF PRIMARY AND END PRODUCTS OF PHOTOSYNTHESIS AT DIFFERENT OXYGEN CONCENTRATIONS.** *Journal of Experimental Botany. 46(Special Issue SI):*1439-1447. English. [ESTONIAN ACAD SCI INST EXPTL BIOL KHARKU 3051 ESTONIA].

A *radiogasometric* method for the determination of the rates of intracellular decarboxylation of primary and end products of steady-state photosynthesis in the light has been worked out. On the basis of oxygen dependence of the CO2 evolution, two types of decarboxylation, oxygenase (photorespiration) and oxidase (dark respiration), have been distinguished. Oxygenase decarboxylation is linearly dependent on O-2 concentration in the range from 0 to 210 mmoi mol(-1), which is characteristic of the oxygenation of RuBP, the rate-limiting reaction of the glycolate cycle. Oxidase decarboxylation is saturated at relatively low O-2 concentration (of about 15 mmol mol(-1)), similar to the oxidative reactions associated with glycolysis and the Krebs cycle. In the C-3 plants (tobacco, wheat, barley) we have studied, primary products were decarboxylated predominantly via the oxygenase mechanism; the oxidase component was 3-15% of the total rate of the decarboxylation of primary photosynthates in the light. The oxygenase mechanism was also involved in the decarboxylation of end products of photosynthesis. The rate of this component exceeded by 3 to 5 times the rate of oxidase decarboxylation of end products in the light. It has been suggested that compounds derived from the degradation of end products of photosynthesis are incorporated into the reductive pentose phosphate cycle and, via the cycle, into the glycolate cycle where they are decarboxylated. In this way, four components of plant leaf respiration in the light may be distinguished according to the substrates and mechanisms of decarboxylation. In the dark, only one of them, oxidase decarboxylation of end products, is functioning. The rate of this component has been shown to be partially suppressed by light. [References: 33].

628 Patel, DM.; Patel, SK.; Karelia, GN. (1995) **INTEGRATED NUTRIENT MANAGEMENT IN PEARLMILLET (PENNISETUM GLAUCUM)-WHEAT (TRITICUM AESTIVUM) CROPPING SYSTEM.** *Indian Journal of Agronomy. 40(2):266-268.* English. [GUJARAT AGR UNIV CP COLL AGR DEPT AGR CHEM SARDAR KRUSHINAGAR 385506 INDIA].

629 Popova, TN.; Igamberdiev, AU.; Velichko, YI. (1995) **EFFECT OF ELECTRON TRANSPORT INHIBITORS AND SOME METABOLITES ON [6-C-14] CITRATE CONVERSIONS IN PLANTS.** *Russian Journal of Plant Physiology. 42(5):680-686.* English. [VORONEZH STATE UNIV FAC BIOL & SOIL SCI DEPT PLANT PHYSIOL & BIOCHEM UNIV SKAYA PL 1 VORONEZH 394693 RUSSIA].

Metabolization of [6-C-14] citrate in the leaves of maize (Zea mays L.) and wheat (Triticum aestivum L.) was studied in the presence of electron transport inhibitors and some metabolites involved in tricarboxylic acid cycle, photorespiration pathways, and ascorbate oxidase system. Release of (CO2)-C-14, which was measured after infiltrating leaf segments with [6-C-14] citrate, was suppressed by KCN and salicylhydroxamic acid and was stimulated by rotenone. The main route of [6-C-14] citrate utilization was through the isocitrate dehydrogenase reaction, as indicated by strong suppression of (CO2)-C-14 release after synergistic inhibition of isocitrate dehydrogenase with, glyoxylate and oxaloacetate, and after retroinhibition of the enzyme activity by 2-oxoglutarate. The addition of ascorbate with glutathione stimulated oxidation of [6-C-14] citrate; this phenomenon was caused by activation of NADP-isocitrate dehydrogenase and by coupling of this enzyme activity with operation of NAD(P)H-oxidizing ascorbate oxidase system. Utilization of [6-C-14] citrate was suppressed by succinate and glyoxylate, presumably as a result of activated isocitrate synthesis by extraglyoxysomal isocitrate lyase. Inhibition of cyanide-sensitive and cyanide-resistant electron transport stimulated utilization of citrate in the reactions of gamma-aminobutyric pathway shunting, the tricarboxylic acid cycle. It is concluded that intermediates of tricarboxylic acid cycle and photorespiration (succinate, glyoxylate, glycine, etc.) play an important role in the regulation of citrate conversion pathways. The coupling of citrate metabolism with essential cellular processes and various electron transport chains allows effective control of metabolic conversions of citrate according to the requirements of the plant organism. [References: 23].

630 Pukhal'skaya, N.V. (1994) **[Effect of increased CO2 concentration in air on wheat yielding capacity under changed level of nitrogenous nutrition]. Vliyanie povyshennoj kontsentratsii SO2 v atmosfere na produktivnost' pshenitsy pri izmenenii urovnya azotnogo pitaniya.** *Doklady Rossijskoj akademii sel'skokhozyajstvennykh nauk (Russian Federation) (no.6) p. 9-10.* 11 ref. Russian. (AGRIS 95-153655).

It has been shown that the high level of nitrogenous nutrition of the wheat, grown in the phytotron at increased CO2 concentration significantly affected donor-acceptor relations during the nitrogen redistribution in plant in the process of grain filling and was necessary for the formation of high grain yield, causing no deleterious effect on the grain quality.

631 Rahman, S.; Kosarhashemi, B.; Samuel, MS.; Hill, A.; Abbott, DC.; Skerritt, JH.; Preiss, J.; Appels, R.; Morell, MK. (1995) **THE MAJOR PROTEINS OF WHEAT ENDOSPERM STARCH GR[illegible]ULES.** *Australian Journal of Plant Physiology. 22(5):793-803.* English. [COOPERAT RES CTR PLANT SCI GPO BOX 475 CANBERRA ACT 0200 AUSTRALIA].

Wheat starch contains two classes of associated proteins: proteins which are embedded within the granule and loosely associated surface proteins.

The characterisation of the major proteins that are embedded in the granule are described. Gel electrophoresis on the basis of size resolved these proteins into five bands of molecular weights 60, 75, 85, 100 and 105 kDa. These polypeptides were demonstrated to be within the granule by their resistance to proteinase K digestion when granules were ungelatinised. The N-terminal sequences of these polypeptides are reported. The most prominent polypeptide is the 60 kDa granule-bound starch synthase. The N-terminal sequence obtained from the 75 kDa polypeptide shows homology to rice soluble starch synthase. The 85 kDa band was resolved into at least two types of polypeptides, one of which reacted with polyclonal antiserum to the maize branching enzyme IIb. The 100 and 105 kDa polypeptides were located only in the granule and are related, on the basis of N-terminal sequence similarity and cross-reactivity to monoclonal antibodies. SDS-PAGE and monoclonal antibody cross-reactivity experiments suggest that the 100 and 105 kDa polypeptides are absent from starch granules from all other species examined, including other cereals. It is speculated that all the major granule proteins are involved in starch biosynthesis. [References: 45].

632 Rao, MV.; Hale, BA.; Ormrod, DP. (1995) **AMELIORATION OF OZONE-INDUCED OXIDATIVE DAMAGE IN WHEAT PLANTS GROWN UNDER HIGH CARBON DIOXIDE - ROLE OF ANTIOXIDANT ENZYMES.** *Plant Physiology. 109(2):421-432.* English. [UNIV GUELPH DEPT HORT SCI GUELPH ON N1G 2W1 CANADA].

O-3-induced changes in growth, oxidative damage to protein, and specific activities of certain antioxidant enzymes were investigated in wheat plants (Triticum aestivum L. cv Roblin) grown under ambient or high CO2. High CO2 enhanced shoot biomass of wheat plants, whereas O-3 exposure decreased shoot biomass. The shoot biomass was relatively unaffected in plants grown under a combination of high CO2 and O-3. O-3 exposure under ambient CO2 decreased photosynthetic pigments, soluble proteins, and ribulose-1, 5-bisphosphate carboxylase/oxygenase protein and enhanced oxidative damage to proteins, but these effects were not observed in plants exposed to O-3 under high CO2. O-3 exposure initially enhanced the specific activities of superoxide dismutase, peroxidase, glutathione reductase, and ascorbate peroxidase irrespective of growth in ambient or high CO2. However, the specific activities decreased in plants with prolonged exposure to O-3 under ambient CO2 but not in plants exposed to O-3 under high CO2. Native gels revealed preferential changes in the isoform composition of superoxide dismutase, peroxidases, and ascorbate peroxidase of plants grown under a combination of high CO2 and O-3. Furthermore, growth under high CO2 and O-3 led to the synthesis of one new isoform of glutathione reductase. This could explain why plants grown under a combination of high CO2 and O-3 are capable of resisting O-3-induced damage to growth and proteins compared to plants exposed to O-3 under ambient CO2. [References: 66].

633 Rengel, Z.; Graham, RD. (1995) **WHEAT GENOTYPES DIFFER IN ZN EFFICIENCY WHEN GROWN IN CHELATE-BUFFERED NUTRIENT SOLUTION.** *Plant & Soil. 176(2):307-316.* English. [UNIV ADELAIDE WAITE AGR RES INST DEPT PLANT SCI GLEN OSMOND SA 5064 AUSTRALIA].

Ten Triticum aestivum and two Triticum turgidum conv, durum genotypes were grown in chelate-buffered nutrient solution at Zn supplies ranging from deficient to sufficient (free Zn activities from 2 to 200 pM, pZn from 11.7 to 9.7). The critical level of Zn ion activity in solution for healthy growth of wheat plants was around 40 pM. Genotypes differed in the growth response: those classified as Zn-efficient suffered less reduction of shoot growth and did not change the rate of root growth at a Zn supply quite deficient for Zn-inefficient genotypes. Root growth of Zn-inefficient genotypes increased at deficient Zn supply. The shoot/root ratio was the most sensitive parameter of Zn efficiency; Zn-efficient genotypes showed less reduction in the ratio when grown at deficient compared to sufficient Zn supply. Classification of wheat genotypes into Zn-efficient and Zn-inefficient groups after screening in chelate-buffered nutrient solution corresponded well with classification obtained in field experiments on Zn-deficient soil. [References: 32].

634 Rengel, Z.; Graham, RD. (1995) **WHEAT GENOTYPES DIFFER IN ZN EFFICIENCY WHEN GROWN IN CHELATE-BUFFERED NUTRIENT SOLUTION .2. NUTRIENT UPTAKE.** *Plant & Soil. 176(2):317-324.* English. [UNIV ADELAIDE WAITE AGR RES INST DEPT PLANT SCI GLEN OSMOND SA 5064 AUSTRALIA].

Ten Triticum aestivum and two Triticum turgidum conv, durum genotypes differing in Zn efficiency were grown in chelate-buffered nutrient solution at Zn supplies ranging from deficient to sufficient (free Zn activities from 2 to 200 pM, pZn from 11.7 to 9.7). Correlation between the rate of Zn uptake and the Zn efficiency ranking was poor. Uptake of Zn by all genotypes increased linearly with an increase in solution Zn activities, with a slight saturation apparent at 200 pM. Relative amounts of Zn and Fe transported to shoots increased with duration of growth and at higher supply of Zn. With an increase in solution Zn activities, uptake rates of Fe, Mn and Cu dropped in Zn-efficient genotypes and increased in Zn-inefficient ones. While shoot concentrations of Fe did not differ between Zn-efficient and inefficient genotypes at greater than or equal to 10 pM Zn activity, root Fe concentrations were around 3-fold higher in Zn-efficient genotypes at 2 pM Zn activity. All genotypes accumulated high amounts of P in shoots after 22 d of growth at deficient Zn supply. It is concluded that nutrient interactions, especially at deficient Zn supply, may be influential in determining the level of Zn efficiency of wheat genotypes. [References: 32].

635 Rosche, I. (Halle Wittenberg Univ., Halle (Germany). Inst. fuer Allgemeinen Pflanzenbau, Ackerbau) (1994) **[Effect of metabolic products of lucerne on wheat growth]. Einfluss von Stoffwechselprodukten der Luzerne auf Weizen.** 38. Jahrestagung der Gesellschaft fuer Pflanzenbauwissenschaften; Halle/Saale (Germany); 29 Sep - 01 Oct 1994. *Mitteilungen der Gesellschaft fuer Pflanzenbauwissenschaften (Germany) v. 7 p. 69-72.* 2 tables; 3 ref. German. (AGRIS 95-133635).

636 Rufty, TW.; Mackown, CT.; Lazof, DB.; Carter, TE. (1995) **EFFECTS OF ALUMINIUM ON NITRATE UPTAKE AND ASSIMILATION.** *Plant Cell & Environment. 18(11):1325-1331.* English. [N CAROLINA STATE UNIV DEPT CROP SCI RALEIGH, NC 27695 USA].

A study was conducted to examine the hypothesis that the effects of external Al on NO3- uptake and assimilation depend upon the concentration of Al present, Young soybean seedlings [Glycine max (L.) Merrill, cv. Essex], growing under moderate acidity stress at pH 4.2, were exposed to a range of [Al3+] in solution for 3 d, and to labelled 99 atom % (NO3-)-N-15 during the final hour of Al exposure, Uptake of (15)NO(3)(-)g(-1) root dry weight was increased by about 28% in the presence of Al at [Al3+] below 10 mmol m(-3), and NO3- uptake was decreased by about 12 % when the [Al3+] increased to 44 mmol m(-3). The stimulation phase closely paralleled stimulation of root elongation, At higher [Al3+], the inhibition of root elongation was much more severe than that of NO3- uptake, There was no indication of a separate effect of Al on root (NO3-)-N-15 reduction in situ, as the accumulation of reduced N-15 in the root remained a similar percentage of (NO3-)-N-15 uptake at all [Al3+], At higher [Al3+], the atom % N-15 enrichment of the insoluble reduced-N (protein) fraction of root tips increased, This suggests that the Al inhibition of root elongation did not result from disruption of the N supply to the root apex. [References: 37].

637 Sanada, Y.; Ueda, H.; Kuribayashi, K.; Andoh, T.; Hayashi, F.; Tamai, N.; Wada, K. (1995) **NOVEL LIGHT-DARK CHANGE OF PROLINE LEVELS IN HALOPHYTE (MESEMBRYANTHEMUM CRYSTALLINUM L) AND GLYCOPHYTES (HORDEUM VULGARE L AND TRITICUM AESTIVUM L) LEAVES AND ROOTS UNDER SALT STRESS.** *Plant & Cell Physiology. 36(6):965-970.* English. [KANAZAWA UNIV FAC SCI DEPT BIOL KANAZAWA ISHIKAWA 92011 JAPAN].

Proline accumulation was determined in a facultative halophyte, Mesembryanthemum crystallinum and glycophytes, barley (Hordeum vulgare L.) and wheat (Triticum aestivum L.). Proline acccumulation preceded the shift of CAM in M. crystallinum and did not occur in the continuous darkness. The novel light-dark change of proline level (high in the light and low in the dark) was observed in leaves of all three plants. Proline levels of shoots in barley and wheat also showed the same light-dark change, suggesting that proline accumulated in the leaves in the light was not translocated to other tissues in the dark period. These results suggest that proline has a bifunctional role in the acclimation to high salt stress; an osmoregulant role in the light, and a substrate for dark respiration to supply energy to compartmentation of ions into vacuole in the dark. [References: 30].

638 Schellenberg, M.; Matile, P. (1995) **ASSOCIATION OF COMPONENTS OF THE CHLOROPHYLL CATABOLIC SYSTEM WITH PIGMENT-PROTEIN COMPLEXES FROM SOLUBILIZED CHLOROPLAST MEMBRANES.** *Journal of Plant Physiology. 146(5-6):604-608.* English. [UNIV ZURICH INST PLANT BIOL ZOLLIKERSTR 107 CH-8008 ZURICH SWITZERLAND].

Three enzymes responsible for catabolism of chlorophyll (Chl) into phytol, Mg and colourless derivatives of the porphyrin moiety, i.e. chlorophyllase *(Chl'ase),* Mg-dechelatase (Dech'ase) and pheophorbide a dioxygenase (Diox'ase), were studied with regard to their association with thylakoidal pigment-protein complexes. Presenescent and senescent primary leaves of barley were employed for the preparation of chloroplast membranes that were solubilized with Triton-X-100 and subjected to sucrose density gradient centrifugation. The distributions of enzyme activities in the gradients suggest that Chl'ase, Dech'ase and Diox'ase are associated with three distinct complexes. Dech'ase appears to be a component of complexes of photosystem I. Chl'ase had a similar distribution in the gradients as the light-harvesting complex of photosystem II (LHC II) but peaked at a lower density than LHC II. The purified LHC II was devoid of Chl'ase activity. When leaves were allowed to senesce under conditions causing the inhibition of Diox'ase, the chlorophyllides and pheophorbide a accumulated were partially present in the same complex as Chl'ase. Diox'ase was located in a zone of the gradients between LHC II and components of photosystem I. [References: 24].

639 Scott, P.; Lyne, RL.; Aprees, T. (1995) **METABOLISM OF MALTOSE AND SUCROSE BY MICROSPORES ISOLATED FROM BARLEY (HORDEUM VULGARE L).** *Planta. 197(3):435-441.* English. [UNIV CAMBRIDGE DEPT PLANT SCI DOWNING ST CAMBRIDGE CB2 3EA ENGLAND].

The aim of this work was to discover why barley (Hordeum vulgare L.) microspores die when cultured on media containing 40 mM sucrose but undergo embryogenesis on 40 mM maltose. Freshly isolated microspores were cultured for 6-24 h on media containing either [U-C-14] maltose or [U-C-14] sucrose at 40 mM, and the detailed distribution of C-14 was determined. The amounts of glycolytic intermediates, ATP, ADP and AMP, in microspores were also measured. Cultures on sucrose differed from those on maltose in that the initial rate of metabolism was faster but declined rapidly, less C-14 was recovered in polymers and more in alanine, there was extensive leakage of assimilated carbon, significant accumulation of ethanol and a lower adenylate energy charge. It is argued that microspores cultured on 40 mM sucrose die because they metabolize the sugar rapidly, become hypoxic and, as a result, accumulate large quantities of ethanol within the cells. Metabolism of maltose is slower and there is sufficient oxygen available to allow cells to survive in culture. Consequently some of the cultured cells undergo embryogenesis. [References: 31].

640 Tjus, SE.; Roobolboza, M.; Palsson, LO.; Andersson, B. (1995) **RAPID ISOLATION OF PHOTOSYSTEM I CHLOROPHYLL-BINDING PROTEINS BY ANION EXCHANGE PERFUSION CHROMATOGRAPHY.** *Photosynthesis Research. 45(1):41-49.* English. [UNIV STOCKHOLM ARRHENIUS LABS NAT SCI DEPT BIOCHEM S-10691 STOCKHOLM SWEDEN].

With the new method of anion exchange perfusion chromatography we have devised an extremely rapid technique to subfractionate spinach Photosystem I into its chlorophyll a containing core complex and various components of the Photosystem I light-harvesting antenna (LHC I). The isolation time for the LHC I subcomplexes following solubilisation of native Photosystem I was reduced from 50 h using traditional density centrifugation procedures down to only 10-25 min by perfusion chromatography. Within this very short period of isolation, LHC I has been obtained as subfractions highly enriched in Lhca2+3 (LHC I-680) and Lhcal+4 (LHCI-730). Moreover, other highly enriched subfractions of LHC I such as Lhca2, Lhca3 and Lhca1+2+4 were obtained where the later two populations have not previously been obtained in a soluble form and without the use of SDS. These various subfractions of the LHC I antenna have been characterised by absorption spectroscopy, 77 K fluorescence-spectroscopy and SDS-PAGE demonstrating their identities, functional intactness and purity. Furthermore, the analyses located a chlorophyll b pool to preferentially transfer its excitation energy to the low energy F735 chromophore, and located specifically the origin of the 730 nm fluorescence to the Lhca4 component. It was also revealed that Lhca2 and Lhca3 have identical light-harvesting properties. The isolated Photosystem I core complex showed high electron transport capacity (1535 mu moles O-2 mg Chl(-1) h(-1)) and low fluorescence yield (0.4%) demonstrating its high functional integrity. The very rapid isolation procedure based upon perfusion chromatography should in a significant way facilitate the subfractionation of Photosystem I proteins and thereby allow more accurate functional and structural studies of individual components. [References: 39].

641 Ugalde, D.; Nardella, N. (Victorian Dept. of Food and Agriculture, Tatural (Australia). Inst. for Sustainable Agriculture) (1992) **Amino acid supply and protein deposition in wheat endosperm. [Conference paper].** Abstracts of the Australian Society of Plant Physiologists (Australia) p. 62. Australian Society of Plant Physiologists. p. 62. English. (AGRIS 95-133595).

642 Vandenboogaard, R.; Kostadinova, S.; Veneklaas, E.; Lambers, H. (1995) **ASSOCIATION OF WATER USE EFFICIENCY AND NITROGEN USE EFFICIENCY WITH PHOTOSYNTHETIC CHARACTERISTICS OF TWO WHEAT CULTIVARS.** *Journal of Experimental Botany. 46(Special Issue SI):1429-1438.* English. [DANISH INST PLANT & SOIL SCI DEPT FRUIT & VEGETABLES KRISTINEBJERGVEJ 6 DK-5792 AARSLEV DENMARK].

We examined if higher plant water use efficiency is related to a higher investment of nitrogen in components of the photosynthetic apparatus and if this is associated with a less efficient use of nitrogen for photosynthesis or for growth, We also assessed the influence of a reduced supply of water and nitrogen on these relationships, For this purpose we used two Triticum aestivum cultivars, differing in whole plant water use efficiency, Differences in leaf water use efficiency (A/E) between cultivars or treatments were associated with differences in Rubisco activity or rate of electron transport and, in general, with differences in plant water use efficiency, They were not invariably related to a low photosynthetic nitrogen use efficiency (PNUE), A high A/E was associated with a low PNUE, e.g, when we compared cultivars at high irradiance. In this case, a high A/E and a high leaf nitrogen concentration were associated with a low stomatal conductance and an equal rate of photosynthesis, A high A/E was not associated with a low PNUE when differences in A/E were mainly caused by higher rates of photosynthesis associated with higher nitrogen concentrations, e, g, when we compared cultivars at low irradiance and high water and nitrogen supply. An increase in the proportion of total leaf nitrogen associated with the photosynthetic apparatus at low soil-nitrogen increased PNUE, without affecting A/E in the opposite way, We conclude that whole plant nitrogen use efficiency was low for the cultivars with a high plant water use efficiency. [References: 43].

643 Vnuk, L.; Lozek, O. (1995) **THE EFFECT OF NITROGEN NUTRITION ON WINTER WHEAT YIELD [Slovak].** *Rostlinna Vyroba. 41(11):517-520.* Slovak. [VYSOKA SKOLA POLNOHOSPODARSKA A HLINKU 2 NITRA 94976 SLOVAKIA].

In the years 1990 to 1993 in conditions of small-plot field trial was carried out on luvisol at Nitra-Horna Malanta to solve the problems of optimization of nitrogen rates on production and qualitative dressing of winter wheat (the Vlada variety) growing after pea based upon information on N-an content in soil and nitrogen taken by plant (I v an i c et al., 1990) on the basis of nitrogen concentration in plant referred to created quantity of above-ground biomass (M i c h a I ik, I, o z e k, 1989) and on the basis of ratio of nutrients in above-ground mass (B a i e r et al., 1988). During the growing season the uptake of nutrients by winter wheat stand was investigated and the need of different nutrients of the yield of 1 t grain and respective quantity of straw (30.0 kg N, 4.2 kg P, 16.5 kg K, 4.5 kg Ca, 1.7 kg Mg, 5.1 kg S, 0.69 kg Na, O.11 kg Mn, 0.07 kg Zn and 0.02 kg Cu). Differentiated nitrogen nutrition influenced the grain yield, crude protein and starch contents statistically significantly. Changes in wet gluten content were insignificant. Higher nitrogen rates raised crude protein content and reduced the starch content. In the given soil-climatic conditions positive economic effect from applied nitrogen nutrition was obtained only with the lowest nitrogen rates (32 or 38.4 kg.hd(-1), resp.). In these cases coefficient of economic effectiveness (K-ee) was 1.69 or 1.32, coefficient of natural effectiveness (K-ne) was 7.50 and 5.47, coefficient of energy effectiveness (K-emerge) was 8.6 and 5.41, profitability of nitrogen fertilization (R) was 68.7 % or 32.2 %, resp., and profit per 1 ha (Z) was 342 Sk or 179 Sk, resp. Phosphorus nutrition applied on average of three years (4.4 or 3.3 kg P.ha(-1), resp.) together with nitrogen nutrition on analogous treatments reduced economic result by 177 or 676

Sk.ha(-1), resp. Nitrogen rates of 98 and 130 kg.ha(-1) from the point of view of economic effectiveness, profitability of fertilization and profit per area unit were inefficient. The results obtained confirm that optimization of nitrogen rates based on diagnostic methods and information on N-an in soil and nutritive conditions of plant make possible to achieve positive financial effect per area unit and not to load the environment by nitrogen.

644 Wang, H.L.; Offler, C.E.; Patrick, J.W. (Newcastle Univ. (Australia). Dept. of Biological Sciences) (1992) **The cellular pathway of photosynthate unloading in the developing wheat grain. [Conference paper].** Abstracts of the Australian Society of Plant Physiologists (Australia) p. 17. Australian Society of Plant Physiologists. p. 17. English. (AGRIS 95-133591).

645 Wang, N.; Fisher, DB. (1995) **SUCROSE RELEASE INTO THE ENDOSPERM CAVITY OF WHEAT GRAINS APPARENTLY OCCURS BY FACILITATED DIFFUSION ACROSS THE NUCELLAR CELL MEMBRANES.** *Plant Physiology. 109(2):579-585.* English. [WASHINGTON STATE UNIV DEPT BOT PULLMAN, WA 99164 USA].

Nutrients required for the growth of the embryo and endosperm of developing wheat (Triticum aestivum L.) grains are released into the endosperm cavity from the maternal tissues across the nucellar cell plasma membranes. We followed the uptake and efflux of sugars into and out of the nucellus by slicing grains longitudinally through the endosperm cavity to expose the nucellar surface to experimental solutions. Sucrose uptake and efflux are passive processes. Neither was sensitive to metabolic inhibitors, pH, or potassium concentration. p-Chloromercuribenzene sulfonate, however, strongly inhibited both uptake and efflux, although not equally. Except for p-chloromercuribenzene sensitivity, these characteristics of efflux and the insensitivity of Suc movement to turgor pressure are similar to those of sucrose release from maize pedicels, but they contrast with legume seed coats. Although the evidence is incomplete, movement appears to be carrier mediated rather than channel mediated. In vitro rates of sucrose efflux were similar to or somewhat less than in vivo rates, suggesting that transport across the nucellar cell membranes could be a factor in the control of assimilate import into the grain. [References: 20].

646 Wheeler, DM.; Edmeades, DC. (1995) **EFFECT OF VARYING SOLUTION CALCIUM OR MAGNESIUM CONCENTRATIONS IN THE PRESENCE OR ABSENCE OF ALUMINUM ON YIELD AND PLANT CALCIUM OR MAGNESIUM CONCENTRATIONS IN WHEAT.** *Journal of Plant Nutrition. 18(10):2229-2245.* English. [NEW ZEALAND PASTORAL AGR RES INST LTD RUAKURA AGR CTR HAMILTON NEW ZEALAND].

The effect of varying solution calcium (Ca) and magnesium (Mg) concentrations in the absence or presence of 10 mu M aluminum (Al) was investigated in several experiments using a low ionic strength (2.7 x 10(-3) M) solution culture technique. Aluminium-tolerant and Al-sensitive lines of wheat (Triticum aestivum L.) were grown. In the absence of Al, top yields decreased when solution Ca concentrations were <50 mu M or plant Ca concentrations were <2.0 mg/g. Top and root yields decreased when solution Mg concentrations were <50 mu M or plant Mg concentrations were <1.5 mg/g. There were no differences between the lines in solution or plant concentrations at which yield declined. Increasing solution Ca concentrations decreased plant Mg concentrations in the tops (competitive ion effect) but increased plant Mg concentrations in the roots of wheat. This suggests that Ca is competing with Mg when Mg is transported from the roots. Increasing solution Mg concentrations decreased plant Ca concentrations in the tops and the roots (competitive ion effect). In the roots, increasing solution Mg concentrations decreased plant Ca concentrations at a lower solution Ca concentration in the Al-sensitive line than the Al-tolerant line. In the presence of Al, increasing solution Ca and Mg concentrations increased yield (Ca and Mg ameliorating Al toxicity). Yield increased until the sum of the solution concentrations of the divalent cations (Ca+Mg) was 2, 000 mu M for the Al-tolerant line or 4, 000 mu M for the Al-sensitive line. The exception was that yield decreased when solution Mg concentrations were >1, 500 mu M and the solution Ca concentration was 100 mu M (Mg exacerbating Al toxicity). The ameliorative effects of solution Ca or Mg on Al tolerance were not related to plant Ca or Mg concentrations per se. [References: 19].

647 Wiengweera, A.; Greenway, H. (Western Australia Univ., Nedlands. Crop and Pasture Sciences) (1992) **Nutrient uptake by seminal and nodal roots of wheat plants grown in stagnant nutrient solution (mimicking waterlogging). [Conference paper].** Abstracts of the Australian Society of Plant Physiologists (Australia) p. 31. Australian Society of Plant Physiologists. p. 31. English. (AGRIS 95-133594).

648 Willenbrink, J. (Koln Univ. (Germany). Botanical Inst.); Wardlaw, I. (Commonwealth Scientific and Industrial Research Organisation, Canberra (Australia). Div. of Plant Industry) (1992) **Sucrose synthase the key to carbohydrate storage in wheat stems. [Conference paper].** Abstracts of the Australian Society of Plant Physiologists (Australia) p. 20. Australian Society of Plant Physiologists. p. 20. English. (AGRIS 95-133592).

649 Wozny, A.; Schneider, J.; Gwozdz, EA. (1995) **THE EFFECTS OF LEAD AND KINETIN ON GREENING BARLEY LEAVES.** *Biologia Plantarum. 37(4):541-552.* English. [ADAM MICKIEWICZ UNIV POZNAN FAC BIOL INST EXPTL BIOL PL-61713 POZNAN POLAND].

The content of lead in greening etiolated barley leaves remained the same, regardless the time of incubation of excised leaves in the presence of lead ions (8 - 24 h). The lead deposits have not been detected within mesophyll cells, but were found in intercellular spaces of mesophyll, in guard cells and in cuticle covering stomata. This suggests that lead may be transported in the leaves via transpiration stream. Lead reduced the content of chlorophyll, especially chlorophyll b content and the average number of grana, whereas in the presence of kinetin the content of chlorophyll increased. In the combined treatment (lead + kinetin) kinetin diminished the inhibitory effect of lead on the chlorophyll content. The number of chloroplasts in mesophyll cells remained unchanged after lead treatment, whereas kinetin alone or applied together with lead increased the average chloroplasts number. The thylakoids system in chloroplasts of kinetin and kinetin + lead treated plants was similar to that observed in control, although the grana number was smaller. Both lead and kinetin increased the content of condensed chromatin in nuclei.

650 Wright, DP.; Baldwin, BC.; Shephard, MC.; *Scholes, JD.* (1995) **SOURCE-SINK RELATIONSHIPS IN WHEAT LEAVES INFECTED WITH POWDERY MILDEW .1. ALTERATIONS IN CARBOHYDRATE METABOLISM.** *Physiological & Molecular Plant Pathology. 47(4):237-253.* English. [UNIV SHEFFIELD ROBERT HILL INST DEPT ANIM & PLANT SCI SHEFFIELD S10 2TN S YORKSHIRE ENGLAND].

The effects of powdery mildew (Erysiphe graminis f. sp. tritici) on the carbohydrate metabolism of wheat leaves was studied during infection. During infection the triazole Fungicide hexaconazole (trade name ANVIL, Zeneca Agrochemicals) was applied to leaves to determine if removal of the fungal sink reversed any pathogen-induced alterations in host physiology. Five days after inoculation there was a large accumulation of sucrose, glucose, fructose and hexose-phosphates and an increased partitioning of current photosynthate into starch rather than sucrose in both mildewed leaves and those treated with fungicide 2 and 3 days after inoculation. Within 48 h of inoculation, acid invertase activity had doubled and this increase was maintained until 7 days after inoculation. Application of hexaconazole to a mildewed leaf caused a transient decline in invertase activity but over subsequent days activity increased again until it resembled thar observed in a mildewed leaf. Hexaconazole severely inhibited fungal development and hence the size of the fungal sink. This suggests that the enhanced invertase activity was triggered by a signal from the Fungus bur was not directly related to the size of the Fungal sink. These results suggest that (i) the stimulation of invertase activity in mildewed leaves altered the source-sink relationship of the leaf leading to an accumulation of soluble carbohydrates and a decrease in sucrose synthesis and (ii) that application of hexaconazole successfully prevented development of the fungus bur that the metabolic alterations which occurred following the initial infection Mere not reversible within the time scale studied. (C) 1995 Academic Press *Limited* [References: 43].

651 Wright, DP.; Baldwin, BC.; Shephard, MC.; Scholes, JD. (1995) **SOURCE-SINK RELATIONSHIPS IN WHEAT LEAVES INFECTED WITH POWDERY MILDEW .2. CHANGES IN THE REGULATION OF THE CALVIN CYCLE.** *Physiological & Molecular Plant Pathology. 47(4):255-267.* English. [UNIV SHEFFIELD ROBERT HILL INST DEPT ANIM & PLANT SCI SHEFFIELD S10 2TN S YORKSHIRE ENGLAND].

Alterations in the regulation oi the Calvin cycle were studied in wheat leaves infected with powdery mildew (Erysiphe graminis f. sp. tritici) during

disease development. During infection the triazole fungicide hexaconazole (trade name ANVIL, Zeneca Agrochemicals) was applied to leaves to determine if removal of the fungal sink reversed any pathogen-induced alterations in host physiology. In mildewed and fungicide treated leaves the rate of photosynthesis pet unit leaf area declined but was largely unchanged per unit chlorophyll. In addition, the proportion of excitation energy used photochemically (q(P)) decreased, the proportion dissipated non-photochemically (q(N)) increased and a loss of chlorophyll Tvas observed in these leaves. By five days after inoculation triose-phosphates and fructose-1, 6-bisphosphate had significantly increased while 3-phosphoglyceric acid, ribulose-1, 5-bisphosphate and the maximum extractable activity oi. ribulose-1, 5-bisphosphate carboxylase/oxygenase, NADP-glyceraldehyde-3-phosphate dehydrogenase and the stromal fructose-1, 6-bisphosphatase had decreased in mildewed leaves. In fungicide treated leaves the amount of specific metabolites and the activity of enzymes was generally intermediate between those in a mildewed, and a healthy leaf These data indicate a down-regulation of the Calvin cycle as a result of a decreased amount of Calvin cycle enzymes. It is suggested this caused an inhibition of the photosynthetic electron transfer chain and ultimately, the rate of photosynthesis in both mildewed and fungicide treated leaves. (C) Academic Press Limited [References: 36].

652 Zhang, W.; Tyerman, S.D. (Flinders Univ., Adelaide (Australia). School of Biological Sciences) (1992) **The response of wheat root cortical cells to low O2 [oxygen levels] - hydraulic and electrophysiological properties. [Conference paper].** Abstracts of the Australian Society of Plant Physiologists (Australia) p. 26. Australian Society of Plant Physiologists. p. 26. English. (AGRIS 95-133593).

653 Zorn, W. (Thueringer Landesanstalt fuer Landwirtschaft, Jena (Germany)) (1994) **[Effect of magnesium content and pH of sandy soils on magnesium content in rye, wheat and maize]. Der Einfluss von Mg-Gehalt und pH-Wert von Sandboeden auf den Mg-Gehalt von Roggen, Weizen und Mais.** VDLUFA-Schriftenreihe (Germany); no. 38 p. 765-768. VDLUFA. 3 ill., 2 tables. p. 765-768. German. (AGRIS 95-153639).

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654 Aach, H.; Bose, G.; Graebe, JE. (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. 197(2):333-342.* English. [UNIV GOTTINGEN INST PFLANZENPHYSIOL UNTERE KARSPULE 2 D-37073 GOTTINGEN GERMANY].

A cell-free system capable of converting [C-14]geranylgeranyl diphosphate to ent-[C-14]kaurene and to an unidentified acid-hydrolysable compound was obtained from the basal portions of 5-d-old shoots of wheat seedlings (Triticum aestivum L.). By means of marker enzyme activities, the synthesis of ent-kaurene and the unknown compound could be quantitatively assigned to a plastid fraction obtained by Percoll-gradient centrifugation of the homogenate. The enzyme activities were located within the plastids, probably in the stroma, because they withstood trypsin treatment of the intact plastids, and the plastids had to be broken to release the activity, which was then obtained in soluble form. Plastid membranes had no activity. Plastid stroma preparations obtained from pea (Pisum sativum L.) shoot tips and pumpkin (Cucurbita maxima L.) endosperm also yielded ent-kaurene synthetase activity, but did not form the unknown compound. The exact nature of the active plastids was not ascertained, but the use of methods for proplastid isolation was essential for full activity, and the active tissues are all known to contain high proportions of proplastids, developing chloroplasts or leucoplasts. We therefore believe that ent-kaurene synthesis may be limited to these categories. Mature chloroplasts from the wheat leaves did not contain ent-kaurene synthetase activity and did not yield the unknown component. Incorporation of [C-14]geranylgeranyl diphosphate into ent-[C-14]kaurene and the unknown component was assayed by high-performance liquid chromatography with on-line radiocounting. ent-[C-14]Kaurene was identified by Kovats retention index and full mass spectra obtained by combined gas chromatography-mass spectrometry. The unknown component was first believed to be copalyl diphosphate, because it yielded a compound on acid hydrolysis, which migrated like copalol on high-performance liquid chromatography and gave a mass spectrum very similar to that of authentic copalol. However, differences in the mass spectrum and in retention time on capillary gas chromatography excluded identity with copalol. Furthermore, the unhydrolysed compound was not converted to ent-kaurene by a cell-free system from C. maxima endosperm as copalyl diphosphate would have been. [References: 40].

655 Adak, M.S.; Eser, D. (Ankara Univ. (Turkey). Faculty of Agriculture) (1993) **Effect of fall growth and development on winter hardiness in barley.** *RACHIS (ICARDA); Barley and Wheat Newsletter v. 12(1-2) p. 11-14.* 3 tables; 3 ref. English. (AGRIS 95-153863).

In a study to determine the relationship among some morphological and physiological characters measured during the fall, and the relationship between these characters and the cold hardiness of barley, six released two-rowed barley (Hordeum vulgare L. ssp. vulgare) cultivars were grown under field conditions in the 1988-90 seasons. Observations were made on different traits including crown fresh weight, dry weight, water content, crown depth, root length, and number of roots, tillers and leaves. Years and cultivars had a significant influence on most of these variables. Positive and significant relations were found between cold hardiness and crown depth, root length, dry crown weight and number of tillers. Cold hardiness was negatively associated with seedling height and crown water content.

656 Amer, A.F.; El Hussani, W.; Abd El Rahman, L. (Ministry of Agriculture, Cairo (Egypt). Soils and Water Research Inst.) (1993) **Growth response and ionic composition of some wheat varieties irrigated with diluted sea water.** *Zagazig Journal of Agricultural Research (Egypt) v. 20(lB) p. 451-464.* 5 tables; 11 ref. English. (AGRIS 95-133908).

657 Benhammouda, M.; Kremer, RJ.; Minor, HC. (1995) **PHYTOTOXICITY OF EXTRACTS FROM SORGHUM PLANT COMPONENTS ON WHEAT SEEDLINGS.** *Crop Science. 35(6):1652-1656.* English. [USDA ARS CROPPING SYST & WATER QUAL RES UNIT COLUMBIA, MO 65211 USA].

Wheat (Triticum aestivum L.) yield Is depressed when the crop is grown after gain sorghum [Sorghum bicolor (L.) Moench], a known allelopathic species. Since little is known about the variability of allelopathic potential among sorghum hybrids on wheat, six sorghum hybrids were selected from a 1989-1990 sorghum-wheat sequence for further study. The range in yield depression observed was 16%. The sis hybrids were grown in 1991 and separated into plant parts at maturity. A bioassay using wheat seedlings to detect allelopathic potential was developed. Bioassays of water extracts From mature seeds, glumes, leaves, sterns, and roots of sorghum were conducted to (i) quantify the allelopathic potential of sorghum on wheat; (ii) compare allelopathic potential of individual sorghum hybrids; and (iii) identify the plant parts that are the most important sources of allelopathic substances. Wheat radicle growth response to water extracts revealed a highly allelopathic hybrid and two hybrids with low allelopathic potential, These were retained for study in 1992. All plant parts, regardless of hybrid, contained water-soluble materials inhibitory to wheat seedling growth. Stems, iea fes, and toots were the most inhibitory components of a sorghum plant, reducing wheat radicle elongation by 74.7, 68.5, 64.0%, respectively, Within a sorghum hybrid, an individual giant part was not consistently allelopathic at the same level across years, Bioassays can rapidly detect the differences In allelopathic potential that may occur within and among hybrids. These results have implications for using sorghum-wheat rotations where residues of certain sorghum hybrids might negatively influence growth and development of wheat, possibly resulting in decreased wheat yields. [References: 25].

658 Bindi, M. (Accademia dei Georgofili, Firenze (Italie). Centro di Studio per l'Applicazione dell'Informatica in Agricoltura); Porter, J.R.; Miglietta, F. (1995) **[Comparison of models to simulate leaf appearance in wheat]. [Comparaison de modeles pour simuler l'apparition de la feuille chez le ble].** *European Journal of Agronomy (France) v. 4(1) p. 15-25.* 39 ref. English. (AGRIS 95-133901).

659 Carlsson, M. (1994) **[Growth dynamics of spring barley as function of N and PK fertilization]. Vaarkornets tillvaextdynamik som funktion av goedsling med N och PK.** *Examensarbete - Sveriges Lantbruksuniversitet,*

Institutionen foer Markvetenskap, Avdelningen foer Vaextnaeringslaera (Sweden); no. 94 50 p. 36 ref. Swedish. (AGRIS 95-133870).

660 Christen, O. (Christian Albrechts University Kiel (Allemagne). Institute of Crop Science and Plant Breeding); Sieling, K.; Richter Harder, H.; Hanus, H. (1995) **[Effects of temporary water stress before anthesis on growth, development and grain yield of spring wheat]. [Effets d'un stress hydrique temporaire avant l'anthese sur la croissance, le developpement et le rendement en grains du ble de printemps].** *European Journal of Agronomy (France) v. 4(1) p. 27-36.* 37 ref., 8 tableaux. English. (AGRIS 95-133902).

661 Chung, D.H. (Rural Development Administration, Muan (Korea Republic). Crop Experiment Station, Mokpo Branch); Min, K.S. (Chonnam National University, Kwangju (Korea Republic). College of Agriculture); Chun, J.U. (Sunchon National University, Sunchon (Korea Republic). College of Agriculture) (1994) **Improvement of embryo development in hybridization between Hordeum vulgare and Hordeum bulbosum.** *Korean Journal of Breeding (Korea Republic) v. 26(1) p. 82-88.* 2 illus.; 5 tables; 21 ref. Korean. (AGRIS 95-133866).

662 Datta, KS.; Kumar, A.; Verma, SK. (1994) **VARIATIONS IN GROWTH AND PHYSIOLOGY OF BARLEY UNDER CHLORIDE AND SULPHATE SALINITY.** *Annals of Arid Zone. 33(4):303-307.* English. [HARYANA AGR UNIV CCS DEPT BOT HISAR 125004 HARYANA INDIA].

Sulphate salinity, in general, was found more detrimental than chloride salinity in all the four cultivars, 40048 Morocco '88', Sunbar, Maris mink and 6-Row of barley (Hordcum vulgare L.) grown in hydroponic cultures containing iso-osmotic chloride-, predominantly chloride- and sulphate-, and sulphate- salinity. Amongst the cultivars, 6-Row appeared to be more salt tolerant and Maris mink and Sunbar comparatively salt sensitive in respect of shoot/root length and their ratio, photosynthesis, transpiration, stomatal conductance to water vapour and sub- stomatal CO2 concentration (in 2nd leaf). Even interaction effects of cultivar versus treatment were prominent in cultivar 6-Row and chloride alone in the above mentioned parameters, thereby, indicating the resistance of 6-Row under chloride salinity as well.

663 Dell'Aquila, A. (Germplasm Institute, CNR, 70126 Bari (Italy)) (1994) **Wheat seed ageing and embryo protein degradation.** *Seed Science Research (United Kingdom) v. 4(3) p. 293-298.* 20 ref. English. (AGRIS 95-133904).

664 Delmolino, IMM.; Martinezcarrasco, R.; Perez, P.; Hernandez, L.; Morcuende, R.; Delapuente, LS. (1995) **INFLUENCE OF NITROGEN SUPPLY AND SINK STRENGTH ON CHANGES IN LEAF NITROGEN COMPOUNDS DURING SENESCENCE IN TWO WHEAT CULTIVARS.** *Physiologia Plantarum. 95(1):51-58.* English. [CSIC INST RECURSOS NAT & AGROBIOL APDO 257 E-37071 SALAMANCA SPAIN].

Changes in various nitrogen compounds during senescence of the fourth leaf were studied in two cultivars of spring wheat (Triticum aestivum L.). One of the cultivars (Yecora) was supplied with two N levels; the other (Tauro) was grown with the high N level and pruned above the fourth leaf, whereas the control was left intact. In both cultivars grown with high N supply, net nitrogen export from the fourth leaf did not occur until 35 days after sowing (DAS). Loss of leaf soluble proteins started earlier than that of chlorophylls, and coincided initially with an increase in insoluble protein. In N deficient plants the level of total N, soluble protein, and the activity of nitrate reductase (NRA, EC 1.6.6.1) started to decrease about 5 days earlier, and, along with chlorophyll, continued to decrease at a faster rate, than in high N plants. Also, with low N supply, the large subunit (LSU, 58 kDa) of ribulose-1, 5-bisphosphate carboxylase/oxygenase (Rubisco, EC 4.1.1.39) decreased in greater proportion than other soluble proteins, while with high N supply the decrease in Rubisco LSU was similar to that of other soluble proteins. Nitrogen deficiency caused a greater decrease in soluble proteins than in insoluble proteins, and NRA relative to soluble proteins. The faster senescing Tauro cultivar had lower levels of most parameters, especially NRA, soluble protein and, after 35 DAS, Rubisco LSU as a proportion of soluble protein. The decrease in sink strength due to shoot pruning did generally not affect the level of the various nitrogenous compounds until 35 DAS; thereafter the levels of most parameters, especially soluble protein, Rubisco LSU and, at late stages of senescence, insoluble protein, were higher in pruned than in control shoots. Thus, shoot pruning slows down senescence. The 56- and 78-kDa polypeptides increased, rather than decreased, with leaf age; the level of these two polypeptides showed a negative relationship with Rubisco LSU (r = -0.933 and r = -0.758, respectively). [References: 32].

665 Gent, MPN. (1995) **CANOPY LIGHT INTERCEPTION - GAS EXCHANGE, AND BIOMASS IN REDUCED HEIGHT ISOLINES OF WINTER WHEAT.** *Crop Science. 35(6):1636-1642.* English. [CONNECTICUT AGR EXPT STN DEPT HORT & FORESTRY POB 1106 NEW HAVEN, CT 06504 USA].

A reduction in stem height may reduce light interception and thus reduce canopy gas exchange and biomass accumulation of winter wheat. This hypothesis was tested with 16 reduced height isolines in a hard red winter wheat background (Triticum aestivum L. cv Itana). These isolines were grown in the field in Hamden, CT, in 1991, 1992, and 1993, and biomass accumulation, leaf area index, light interception, and canopy gas exchange were measured throughout plant development. Comparisons were made between the four height classes: dwarf (Rht1Rht2), semidwarf Rht1 (Rht1rht2), semidwarf Rht2 (rht1Rht2), and tall (rht1rht2). Biomass of tall isolines was more than 20% greater than that of dwarf isolines early in development in each year and at maturity in 1991. Light interception of tall isolines was 20% greater than that of dwarf isolines during stem elongation in 1992 and at boot stage in 1993. Canopy photosynthesis of tall isolines was also more than 20% greater than that of dwarf isolines early in stem elongation in 1991 and 1992. After spike emergence canopy light interception and photosynthesis did not differ among height classes. The low biomass of dwarf isolines was attributed to reduced light interception and canopy photosynthesis before spike emergence, compared with the taller isolines. Semidwarf isolines did not differ consistently from tall isolines in either biomass light interception, or canopy photosynthesis, hut semidwarf isolines had greater harvest index. Averaged across the three ears, wheat plants of semidwarf stature yielded more than those with either tall or dwarf stature. [References: 23].

666 Haberle, J.; Svoboda, P.; Blaha, L. (1995) **THE COMPARISON OF SHOOT AND ROOT PRODUCTION IN OLD AND NEW CULTIVARS OF WINTER CEREALS [Slovak].** *Rostlinna Vyroba. 41(11):511-516.* Slovak. [RES INST CROP PROD DRNOVSKA 507 6 RUZYNE CR-16106 PRAGUE CZECH REPUBLIC].

The root and shoot mass of twelve winter wheat cultivars, one of rye and one of triticale cultivars were compared in the three-year outside pot trial. The year of selection of wheat genotypes ranged from the start of the 20th century to the temporary varieties (the year of selection in brackets): rye - Rapid (1993) and triticale - Dagro (1985); new wheat cultivars - Viginta (1984), Vlada (1990), Hana (1985), Blava (1992), Pagode (1987), Charkovskaja 90 (1991); older and local cultivars - Bucianska cervenoklasa (1940), Slovenska 200 (1942), Bila od Dukovan (the start of 20th century), Slovenska intenzivna (1949), Kasticka osinatka (1951), Chlumecka 12 (1907). Rants were grown on two levels of nitrogen fertilization: high rate = 1.7 g N per pot (N2) a low rate = 0.28 g per pot (N1), divided and applied in eight subrates from tillering to heading. Both treatments had two (1992) or three (1993, 1994) replications. Plants were harvested at the end of anthesis. The results showed significant intervarietal differences in shoot, root and total dry mass and root/shoot ratio of wheat (Fig. 1). The maximum differences in shoot and root mass between wheat varieties were on an average of three years 32% and 39% (treatment N2), resp., and 37% and 59% (N1), resp. When averaged according to origin, the group of older and local varieties showed higher shoot production by 13.3% (N2) and 15.6% (N1), lower root mass by 8.7% (N2) and 1.3% (N1) and lower root/shoot ratio than the group of new varieties (Tab. I, Pig. 2). Intravarietal variability of wheat cultivars, expressed as coefficient of variability, was 8.9% (N2) and 12.3% (NI) in shoot mass, and 16.7% (N2) and 16.1% (N1) in root mass (Tab. II). A good relation of shoot and total plant mass of respective wheat cultivars was observed when compared data from pairs of experimental years. The relation of root production and values of root/shoot ratio among years were in poor correlation in the pairs of years. Increasing the dose of nitrogen fertilization from 0.28 g N per pot to 1.7, a N per pot resulted in the enhancement of both shoot and root growth of winter cereals. The ratio of plant weight under high and low nitrogen fertilization (N2/N1) were in wheats on average in the range of 1.61 to 2.03 (shoots), 1.38 to 2.08 (roots) and 1.62 to 2.03 (total plant biomass) (Pig. 3). Modern wheat cultivars showed higher values of the ratio N2/N1 for shoots and roots than older and local ones (Fig. 4). The results obtained are discussed in the context of the project carried out at Research

Institute of Crop Production, Praha-Ruzyne, aimed at screening of cereal cultivars with efficient utilization of lower nutrient supply in soil environment.

667 Kobayashi, M.; Gomi, M.; Agematsu, J.; Asami, T.; Yoshida, S.; Sakurai, A. (1995) **FLUCTUATION OF ENDOGENOUS GIBBERELLIN AND ABSCISIC ACID LEVELS IN GERMINATING SEEDS OF BARLEY.** *Bioscience Biotechnology & Biochemistry. 59(10):1969-1970.* English. [RIKEN INST PHYS & CHEM RES WAKO SAITAMA 35101 JAPAN].

The endogenous levels of gibberellins (GAs) and abscisic acid (ABA) were investigated during the germination of barley seeds, The level of GA(1) was highest on the second day of germination, while that of ABA was lowest on the first day. These results confirm the hypothesis that GA and ABA regulate the induction of a-amylase in barley seeds during germination. [References: 11].

668 Ma, YZ.; Mackown, CT.; Vansanford, DA. (1995) **KERNEL MASS AND ASSIMILATE ACCUMULATION OF WHEAT - CULTIVAR RESPONSES TO 50-PERCENT SPIKELET REMOVAL AT ANTHESIS.** *Field Crops Research. 42(2-3):93-99.* English. [USDA ARS NATL AGR WATER QUAL LAB POB 1430 DURANT, OK 74702 USA].

Removal of spikelets at anthesis from primary culms of soft red winter wheat (Triticum aestivum L.) decreased kernel number and induced a range of compensatory growth responses for kernels on the primary culm. Cultivars with kernels on the primary culm that failed to increase in mass were classified as nonresponsive to 50% spikelet removal (SR), while those that increased were classified as responsive. With SR from only the primary culm, differences in assimilate synthesis and export from the primary culm to tillers with intact spikes might explain differential compensatory growth responses for kernels on the primary culm. Consequently, effects were compared for SR from only the primary culm and/or all culms on assimilate levels and kernel mass of two nonresponsive and four responsive cultivars. For nonresponsive cultivars, growth of kernels on the primary culm and tillers was unaffected by either SR treatments. For responsive cultivars, growth of kernels on the primary culm was significantly increased (9 to 23%) to a similar extent for both SR treatments, but growth of tiller kernels increased (10 to 26%) only when all spikes received SR treatment. Apparently, growth of primary-culm kernels after SR was unaffected by the reproductive-sink size of tillers. At maturity, the total water soluble carbohydrate content of stem tissues from both nonresponsive and responsive cultivars was increased by SR, but the higher levels of assimilate were associated with greater kernel growth of only responsive cultivars. Enhanced availability of assimilates and differential kernel responses caused by SR indicate kernel growth of nonresponsive cultivars was sink-limited, while kernel growth of responsive cultivars was initially source-limited and later sink-limited once maximum kernel growth was reached. [References: 19].

669 Mercik, S. (Szkola Glowna Gospodarstwa Wiejskiego, Warszawa (Poland). Katedra Chemii Rolnej); Sommer, K.; Rossing, K. (Bonn University, (Germany). Inst. Chemii Rolnej) *(1993)* **[Standards of the content of nutrients and their ratios in particular growth phases of winter wheat required for estimation of the nutrition state of plants by the DRIS method]. Normy oceny stanu odzywiania pszenicy ozimej w roznych fazach rozwoju metoda DRIS.** *Roczniki Nauk Rolniczych. Seria A - Produkcja Roslinna (Poland); Polish Agricultural Annual. Series A - Plant Production v. 110(1-2) p.* 33-42. 3 tables; 10 ref. Polish. (AGRIS 95-133913).

Mean content of nutrient elements and their ratios in particular winter wheat growth phases were determined. The determination concerned only those treatments of the investigations carried out in Germany and Poland, in which very high yields were obtained. These values have been assumed as a standard, which can be used in estimation of nutrition state of plants by different methods within a long period of growth.

670 Mladenovski, T. (Zemjodelski institut, Skopje Macedonia (Yugoslavia)) (1994) **[Seed dormancy period of Triticum durum winter varieties]. Period mirovanja semena kod tvrdih sorti ozime psenice [Triticum durum].** Prvi jugoslovenski naucno-strucni simpozijum iz selekcije i semenarstva (1. JUSEM); Vrnjacka Banja (Yugoslavia); 25-28 May 1994. *Selekcija i semenarstvo (Yugoslavia) v. 1(1) p. 127-129.* 2 tables; 6 ref. Serbian. (AGRIS 95-133914).

Six winter triticum durum varieties were included in the research: Milenka, Iva, Skopska rana, Durumka, Tina and Taga. The longest dormancy period is shown by the varieties: Milenka - 77 days, then Iva, and Skopska rana - 63 days. All the varieties mentioned above have long dormancy period (more than 60 days). The varieties Durumka, Tina and Taga have dormancy period between 49 and 56 days and therefore they belong to the semi-long dormancy period group (10-60 days). None of the examined varieties have dormancy period shorter than 10 days. Achieved results show that examined varieties have different duration of dormancy period, which is determined by the inheritance factors of each examined variety.

671 Mosaad, M.G. (International Center for Agricultural Research in Dry Areas, Aleppo (Syria). Germplasm Program); Ortiz Ferrara, G.; Mahalakshmi, V.; Hamblin, J. (1995) **Leaf development and phenology of Triticum aestivum and T. durum under different moisture regimes.** *Plant and Soil (Netherlands) v. 170(2) p. 377-381.* 18 ref. English. (AGRIS 95-133909).

672 Nurminiemi, M. (Norge Landbrukdhoegskole, Aas (Norway). Inst. for Bioteknologifag) (1995) **[Environmental stability of Nordic barley materials]. Miljoemessig stabilitet hos Nordiske byggmaterialer.** Norges Landbrukshoegskole, Aas (Norway). *Agricultural University of Norway. Doctor Scientiarum Theses (Norway); no. 1995: 7 157 p.* Norges Landbrukshoegskole. tables, figures; ref. 3 papers are incl. in the theses. English. (AGRIS 95-133869).

673 Peltonen Sainio, P. (University of Helsinky (Finlande). Department of Plant Production, Section of Crop Husbandry); Peltonen, J. (1995) **[Floret set and abortion in oat and wheat under high and low regimes]. [Induction florale et avortement chez l'avoine et le ble lors de regimes fortement ou faiblement azotes].** *European Journal of Agronomy (France) v. 4(2) p. 253-262.* 24 ref., 5 graph. English. (AGRIS 95-133877).

674 Rigby, M.; Davies, W.J.; Quarrie, S.A. (Biological Sciences Division, Institute of Environmental and Biological Sciences, Lancaster University, Lancaster LA1 4YQ (United Kingdom)) (1994) **Genetic variation in abscisic acid accumulation in wheat roots and the possible implications of this for the response of root growth to drying soil.** Efficiency of water use in crop systems; Reading (United Kingdom); 6-8 Jul 1994. *Aspects of Applied Biology (United Kingdom) (no.38) p. 57-62.* 9 ref. English. (AGRIS 95-153890).

675 Semb, K. (Norsk Institutt for Planteforskning, Aas (Norway). Plantevernet) (1995) **[Effect of irradiance and temperature on early growth of spring barley (Hordeum vulgare L.) and selected weed species]. Virkning av lysintensitet og temperatur paa tidlig vekst av bygg (Hordeum vulgare L.) og utvalgte ugrasarter.** Norges Landbrukshoegskole, Aas (Norway). *Agricultural University of Norway. Doctor Scientiarum Theses (Norway); no. 1995: 3 76 p.* Norges Landbrukshoegskole. tables, figures; ref. 4 papers are incl. in the theses. English. (AGRIS 95-133868).

676 Smolders, E.; Shaw, G. (1995) **CHANGES IN RADIOCAESIUM UPTAKE AND DISTRIBUTION IN WHEAT DURING PLANT DEVELOPMENT - A SOLUTION CULTURE STUDY.** *Plant & Soil. 176(1):1-6.* English. [KATHOLIEKE UNIV LEUVEN SOIL FERTIL & SOIL BIOL LAB LOUVAIN BELGIUM].

Spring wheat plants were grown in a Cs-137 labelled nutrient solution, either in the presence or absence of NH4 as a secondary N source. Between 11 and 64 days after sowing (DAS), plants were harvested on nine occasions. The plants supplied with NH4 and NO3 had lower root Cs-137 Activity Concentrations (AC) than those supplied with NO3 only. Shoot AC were equal in both nutrition treatments. Shoot and root Cs-137 AC (dry weight basis) showed the same trends with plant age in both nutrition treatments. Shoot AC almost doubled between 11 and 28 DAS after which they gradually decreased concomitant with a similar decrease in K concentrations. Root AC were always higher than shoot AC and increased to a maximum at 35 DAS after which they fluctuated. Expressed on a tissue water basis, the Cs-137 AC varied less during plant age than did dry weight based AC. Furthermore, root and shoot AC expressed on a tissue water basis were almost equal. It is shown that the initial increase in Cs-137 AC in, both root and shoot can largely be explained by the initial dilution of absorbed Cs-137 in, the unlabelled seedling tissues. No correlation was found between K and

Cs-137 distribution among ears, leaves, stems and roots in 64 old wheat plants. NH4 as a secondary N source in a nitrate nutrient solution marginally affected Cs-137 distribution. [References: 10].

677 Tonkinson, CL.; Lyndon, RF.; Arnold, GM.; Lenton, JR. (1995) **EFFECT OF THE RHT3 DWARFING GENE ON DYNAMICS OF CELL EXTENSION IN WHEAT LEAVES, AND ITS MODIFICATION BY GIBBERELLIC ACID AND PACLOBUTRAZOL.** *Journal of Experimental Botany. 46(290):1085-1092.* English. [UNIV EDINBURGH INST CELL & MOLEC BIOL MAYFIELD RD EDINBURGH EH9 3JH MIDLOTHIAN SCOTLAND].

The second leaf of wheat was used as a model system to examine the effects of the Rht3 dwarfing gene on leaf growth. Compared to the rht3 wild type, the Rht3 allele decreased final leaf length, surface area and dry mass by reducing the maximum growth rates, but without affecting growth duration. Gibberellic acid (GA(3)) increased final leaf length and maximum growth rate in the rht3 wild type, but was without effect on the Rht3 mutant, which is generally regarded as being non-responsive to gibberellin (GA), Paclobutrazol, an inhibitor of GA biosynthesis, decreased final leaf length and maximum growth rate in the rht3 wild type to values similar to those in the untreated Rht3 mutant. Neither GA(3) nor paclobutrazol affected the duration of leaf growth. The decrease in leaf length was produced by reduction of cell length rather than cell number. The maximum relative elemental growth rate (REGR) for cell extension was essentially the same in all treatments, as was the time between the cells leaving the meristem and achieving maximum extension rate. The differences between the genotypes and treatments were all almost entirely due to differences in the time taken from the attainment of maximum REGR of cell extension to the cessation of extension. This was reflected in the length of the extension zone, which was approximately 6-8 per cent of final leaf length. The effects of the Rht3 allele, GA(3) and paclobutrazol all appear to be on the processes which promote the cessation of cell elongation. [References: 30].

678 Wang, YP.; Gifford, RM. (1995) **A MODEL OF WHEAT GRAIN GROWTH AND ITS APPLICATIONS TO DIFFERENT TEMPERATURE AND CARBON DIOXIDE LEVELS.** *Australian Journal of Plant Physiology. 22(5):843-855.* English. [CSIRO DIV ATMOSPHER RES PRIVATE BAG 1 MORDIALLOC VIC 3195 AUSTRALIA].

Kernel growth after anthesis is simulated as a function of the potential kernel growth rate, current photosynthate production and mobilisation of stored reserves. The potential growth rate of the kernel is simulated as two temperature-sensitive processes, cell production and cell growth. The difference between the potential and actual growth rates of the kernel depends on the carbon supply to the free space of the kernel endosperm, while the carbon supply is itself affected by the actual kernel growth rate. Sensitivity analysis showed that the growth rate of the grain per plant is most sensitive to the potential growth rate of the kernel and number of kernels per plant. This model is able to simulate the observed rates of grain growth and leaf senescence from anthesis to physiological maturity for wheat plants grown in two CO2 concentrations. The simulated temperature response of grain growth agrees well with the experimental observations. [References: 45].

679 Wilkinson, RE. (1995) **ERYTHROSINE B INFLUENCE ON SORGHUM ROOT CURVATURE AND WHEAT LEAF RUST GERMLING USE OF EXTRACELLULAR LIPIDS.** *Journal of Plant Nutrition. 18(10):2121-2126.* English. [UNIV GEORGIA AGR EXPT STN DEPT CROP & SOIL SCI GRIFFIN, GA 30223 USA].

Root curvature response to unilaterally applied calcium (Ca2+) in agar was inhibited 81% by erythrosine B (EB) (10 nM) in sorghum [Sorghum bicolor (L.) Moench.] cv Funk G522DR, 70% in cv SC283, and 11% in cv SC574. EB (10 nM) is reported to totally inhibit Ca2+-ATPase, while 10-50 mu M EB is required to inhibit H+-ATPase. Therefore, differences in relative concentrations of Ca2+-ATPase and H+-ATPase exist in the root plasma membranes (PM) of the three cultivars. Carbon dioxide ((14)CO2) production from glycerol-tri-(1-C-14)-palmitate by wheat (Triticum aestivum L.) leaf rust (Puccinia recondita Rob. ex Desm.) urediospore germlings was inhibited 85% by EB (10 nM). [References: 8].

680 Zhang Guoping (Zhejiang Agricultural Univ., Hangzhou (China). Dept. of Agronomy); Stanley, M. (1994) **Comparative studies on effect of delaying wheat leaf senescence by some chemicals.** *Acta Agriculturae Zhejiangensis (China) v. 6(2) p. 94-97.* 1 table; 3 ill., 6 ref. Chinese. (AGRIS 95-133905).

681 Zhao Yujie (Tianjin Municiple Inst. of Crops (China)) (1994) **Processes of seed filling up and grain formation of Jinying No. 8 durum wheat.** *Science and Technology of Tianjin Agriculture and Forestry (China) (no. 1) p. 12-13.* Chinese. (AGRIS 95-133906).

682 Zwer, PK.; Sombrero, A.; Rickman, RW.; Klepper, B. (1995) **CLUB AND COMMON WHEAT YIELD COMPONENT AND SPIKE DEVELOPMENT IN THE PACIFIC NORTHWEST.** *Crop Science. 35(6):1590-1597.* English. [OREGON STATE UNIV COLUMBIA BASIN AGR RES CTR DEPT CROP & SOIL SCI POB 370 PENDLETON, OR 97801 USA].

The superior end-use qualities and reputation for emergence in poor seed bed conditions has maintained club wheat (Triticum compactum Host) as an important, though small class, of a heat in the Pacific Northwest. Our objective were to determine yield component development in two agronomic zones representative of the fallow/wheat growing region of the pacific Northwest and to characterize and compare yield component and spike development in two club and two common wheat (Triticum aestivum L.) genotypes. The experiments were conducted at Moro and Pendleton, OR, in 1988 and 1989, where data were collected on yield components and on spike and kernel characters of identified culms. Yields were significantly higher at Pendleton than Moro. Lower floret fertility at Pendleton resulted in fewer and heavier seeds, Kernel weight was apparently the yield component associated with the yield advantage at Pendleton, Early tiller development at Pendleton also favored the development of spike with greater capacity for yield component compensation. Differences were identified for yield component development in the cultivars Tres, OR8218, Hill 81, and Stephens; however, total grain yield was not significantly different. Although club spikes were one-half !he Length of common spikes, spikelet number was not different between classes. Moreover, the number of fertile spikelets and the percentage of fertile spikelets per spike was significantly greater in club genotypes compared with common genotypes. The club genotypes produced more kernels in 1989 than the common genotypes. Kernel weight was consistently less for club lines, These differences were found in the mainstem and tillers T1 to T4. Kernel weight may play an important role in the early seedling establishment in regions where soil moisture is inadequate at planting. [References: 22].

F63 PLANT PHYSIOLOGY-REPRODUCTION

683 Matzk, F.; Meyer, HM.; Baumlein, H.; Balzer, HJ.; Schubert, I. (1995) **A NOVEL APPROACH TO THE ANALYSIS OF THE INITIATION OF EMBRYO DEVELOPMENT IN GRAMINEAE.** *Sexual Plant Reproduction. 8(5):266-272.* English. [INST PLANT GENET & CROP PLANT RES CORRENSSTR 3 D-06466 GATERSLEBEN GERMANY].

An in vivo model system to study the initiation of embryo development is presented. From the so-called Salmon system of wheat (alloplasmic lines with a 1BL-1RS chromosome translocation), three completely isogenic and homozygous lines were produced by selection for uniformity in about 20 selfing/backcross generations as well as between sublines of doubled haploids. The line (aestivum)-Salmon is male fertile and sexual. The lines (caudata)-Salmon and (kotschyi)-Salmon are male sterile and have a parthenogenetic capacity of about 90%. The expression of nuclear-cytoplasmic male sterility is different for the two parthenogenetic lines. The initiation of autonomous embryo development at defined developmental stages of the ovaries and the maximum degree of parthenogenesis are identical in both parthenogenetic lines as proved by the auxin test and progeny analyses. The protein patterns from ovary extracts of the three isogenic lines were identical for more than 200 spots of 2-D polyacrylamide gels, confirming their homogeneity. However, one protein (P 115.1) was found 3 days before and during anthesis only in ovaries of the parthenogenetic lines. It seems to be involved in the initiation of parthenogenesis. [References: 22].

684 Tian Guowei; Shen Jiaheng (Harbin Normal Univ., Heilongjiang (China). Dept. of Biology) (1994) **The ultracytochemical localization of acid phosphatase activity in wheat during fertilization.** *Acta Botanica Sinica (China) v. 36(4) p. 251-256.* 20 ill., 19 ref. Chinese. (AGRIS 95-134094).

F70 PLANT TAXONOMY AND GEOGRAPHY

685 Ball, T.B.; Brotherson, J.D.; Gardner, J.S. (1993) **A typologic and morphometric study of variation in phytoliths from einkorn wheat (Triticum monococcum).** *Canadian journal of botany = Journal canadien de botanique (Canada) v. 71(9) p. 1182-1192.* references. English. (AGRIS 95-154152).

686 Fox, G.P. (Queensland Dept. of Primary Industries, Toowoomba (Australia). Wheat Research Inst.); Henry, R.J. (Queensland Univ., St Lucia (Australia). Queensland Agricultural Biotechnology Centre) (1993) **Barley variety identification by SE-HPLC. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 502.* Abstract only. English. (AGRIS 95-134191).

H01 PROTECTION OF PLANTS-GENERAL ASPECTS

687 Hagileadi, A. (1994) **Wheat as a cover crop to protect Ranunculus grown for tubers.** Agricultural Research Organization, Bet-Dagan (Israel). Dept. of Flowers and Ornamental Plants. *Hassadeh (Israel) v. 74(9) p. 999-1001.* 4 diagrams, 5 ref. Hebrew. (AGRIS 95-154269).

688 Secher, BJM.; Jorgensen, LN.; Murali, NS.; Boll, PS. (1995) **FIELD VALIDATION OF A DECISION SUPPORT SYSTEM FOR THE CONTROL OF PESTS AND DISEASES IN CEREALS IN DENMARK.** *Pesticide Science. 45(2):195-199.* English. [DANISH INST PLANT & SOIL SCI DEPT PLANT PATHOL & PEST MANAGEMENT LOTTENBORGVEJ 2 DK-2800 LYNGBY DENMARK].

The decision in 1986, on an action plan to reduce pesticide use in Denmark by 50% led to increased research on the potential of reducing dosages. A decision support system (PC-Plant Protection), developed by The Danish Institute for Plant and Soil Science, implements this research. It combines a detailed use of threshold values to support decisions on treatment need, choice of pesticides and the appropriate dosage for actual problems in cereals. The pest and disease module within the system has been available commercially since 1993 and up to the end of April 1995, 2000 licences have been issued for its use at agricultural schools and by advisers and farmers. The recommendation model for pest and disease control has been validated in field trials since 1990. The validation has shown that the model is able to provide recommendations for the control of pests and diseases to a satisfactory level, without affecting farmers' gross margins. The model was able to adjust pesticide use to large yearly variations and the average amount of pesticides in the plots treated according to the model was well below that in the reference plots and in the commonly used strategies in Denmark. [References: 9].

H10 PESTS OF PLANTS

689 **[<5. Abstracts and consequences. 5.2. Relations between pests and parasites and predators in agricultural ecosystems with regard of interrelations between production site and margin biotopes as well as the influence of pesticides>]. 5. Zusammenfassung und Schlussfolgerungen. 5.2. Beziehungen zwischen Schaedlingen und Nuetzlingen in Agraroekosystemen unter Beruecksichtigung der Wechselwirkungen zwischen Produktionsstandort und Randbiotopen sowie des Einflusses von Pflanzenschutzmitteln** (1994) Deutsche Forschungsgemeinschaft, Bonn (Germany). *Integrated plant production. Research report. Final research report on a priority program "development of an integrated system of crop production with regard to economic and ecological aspects of plant protection in wheat crops". Heitefuss, R. (ed.); Holtschulte, B.; Niemann, M. Deutsche Forschungsgemeinschaft, Bonn (Germany) v. 2 p. 283-285.* VCH. German. (AGRIS 95-154663).

690 Ahsanullah, Q. (1993) **Soil burning [with rice husk, wheat straw and saw dust] and control of brinjal root knot nematodes (Meloidogyne spp.) in microplot.** University of Agriculture, Faisalabad (Pakistan). Dept. of Plant Pathology. UAF. 9 ills., 19 tables, 46 ref. 76 p. English. (AGRIS 95-135169).

691 Buntin, GD.; Beshear, RJ. (1995) **SEASONAL ABUNDANCE OF THRIPS (THYSANOPTERA) ON WINTER SMALL GRAINS IN GEORGIA.** *Environmental Entomology. 24(5):1216-1223.* English. [UNIV GEORGIA COLL AGR EXPT STN DEPT ENTOMOL GEORGIA STN GRIFFIN, GA 30223 USA].

Thrips species composition and seasonal abundance were studied in winter wheat, Triticum aestivum L., and winter rye, Secale cereale L., during 3 seasons in the coastal plain region of Georgia. Thrips abundance also was examined in wild radish, Raphanus raphanistrum L., a common annual winter weed in small-grain fields. Limothrips cerealium (Haliday) and Frankliniella fusca (Hinds) were the 2 dominant species comprising >89% of the adult thrips collected in both crops. Frankliniella tritici (Fitch), F. bispinosa (Morgan), F. occidentalis (Pergande), F. williamsi Hood, Haplothrips graminis Hood and Plesiothrips perplexus (Beach) also were collected in low numbers in most years. Winter rye supported breeding populations of F. fusca during the autumn, winter, and early spring. Few thrips of any species were collected in winter wheat before spike emergence in March. However large numbers of F. fusca and L. cerealium developed in wheat during the spring. Winter rye also served as a spring host for these thrips, but population increases were limited by grazing and early crop destruction. Differences in F. fusca phenology between wheat and rye probably are related to crop planting time in that rye for grazing is planted approximate to 6 wk earlier than wheat for grain production. Small grains grown for grain production presumably are planted too late for colonization by F. fusca in autumn. Although F, tritici, F. bispinosa, and F. occidentalis adults were present in the spring, these thrips probably did not breed extensively in wheat or rye. However flowering wild radish in wheat fields supported large populations of F. tritici and F, occidentalis in late winter and spring. Therefore, winter small grains, particularly wheat, are important sources of F, fusca and L. cerealium that attack summer hosts. Small grains are not a major source of other Frankliniella spp., except possibly F. williamsi, but wild radish within winter small grains probably is an important spring source of F. tritici and F. occidentalis. [References: 24].

692 Cabrera, HM.; Argandona, VH.; Zuniga, GE.; Corcuera, LJ. (1995) **EFFECT OF INFESTATION BY APHIDS ON THE WATER STATUS OF BARLEY AND INSECT DEVELOPMENT.** *Phytochemistry. 40(4):1083-1088.* English. [UNIV CHILE FAC CIENCIAS DEPT BIOL CASILLA 653 SANTIAGO CHILE].

To compare the effects of aphid infestation with some effects of wounding and drought-stress, several physiological parameters and metabolite concentrations were measured in infested, mechanically wounded or water-stressed young barley plants (Hordeum vulgare cv Aramir). Barley plants infested with the greenbug (Schizaphis graminum) had lower water potentials and CO2 assimilation than non-infested plants. Abscisic acid content increased by 55% in leaves after 72 hr of infestation. Water potentials and stomatal resistance of barley plants changed only as a consequence of infestation by the greenbug or by drought-stress. Proline concentration increased in leaves subjected to infestation or drought by 11- and 14-fold, respectively. Leaves with artificial damage showed the same reduction in chlorophyll contents as leaves of drought-stressed plants. Greenbug infestation caused higher chlorosis than other treatments. Contents of soluble carbohydrates and proteins decreased 52 and 38% by infestation, 38 and 28% by drought, and 14 and 8% by artificial leaf damage, respectively. To study the influence of these treatments on the quality of barley plants as a food source for the aphids, developmental rates (1/D) and the mean relative growth rates (MRGR) of nymphs reared on these seedlings were compared. New aphids reared on previously infested seedlings had the lowest MRGR and 1/D (ca 82 and 68%, respectively) compared to aphids on control plants without previous infestation. Aphids reared on plants subjected to drought also had lower MRGR and 1/D (ca 89% and 77%). Greenbugs on wounded leaves had similar MRGR and 1/D rates to nymphs reared on control plants. These results show that greenbug infestation of barley produced changes similar to those observed in plants subjected to drought-stress and that aphids feeding on both groups of seedlings had lower developmental and mean relative growth rates. Water-stress caused in barley by aphid infestation or drought would probably affect greenbug development due to the effects of stress on the chemical composition of the plant. [References: 32].

693 Drews, Friedrich Wilhelm (1994) **[Synecological studies of simultaneous infestation of winter wheat (Triticum aestivum L.) with**

aphids and cereal pathogen fungi]. **Synoekologische Studien zum simultanen Befall von Winterweizen (Triticum aestivum L.) mit Aphiden und getreidepathogenen Pilzen.** Halle Univ. (Germany). graphs. 172 p. German. (AGRIS 95-154667).

694 Foerster, P. (Giessen Univ. (Germany). Inst. fuer Phytopathologie und Angewandte Zoologie); Basedow, T.; Schmutterer, H. (1994) [<2. **Relations between pests and parasites and predators in agricultural ecosystems with regard to interrelations between production site and margin biotopes as well as the influence of pesticides> 2.4. Effects of pesticides on larvae and adults of Platynus dorsalis (Coleoptera: Carabidae) and adults of Tachyporus hypnorum (Coleoptera: Staphylinidae) in laboratory and semi-field tests]. 2. Beziehungen zwischen Schaedlingen und Nuetzlingen in Agraroekosystemen unter Beruecksichtigung der Wechselwirkungen zwischen Produktionsstandort und Randbiotopen sowie des Einflusses von Pflanzenschutzmitteln. 2.4. Einfluesse von Pflanzenschutzmitteln unter Labor- und Halbfreilandbedingungen auf larvale und adulte Platynus dorsalis (Coleoptera: Carabidae) sowie Tachyporus hypnorum (Coleoptera: Staphylinidae).** *Integrated plant production. Research report. Final research report on a priority program "development of an integrated system of crop production with regard to economic and ecological aspects of plant protection in wheat crops". Heitefuss, R. (ed.); Holtschulte, B.; Niemann, M. Deutsche Forschungsgemeinschaft, Bonn (Germany) v. 2 p. 126-147.* VCH. 11 ill., 3 tables. Bibliography 50 ref. German. (AGRIS 95-154278).

Laboratory and semi-field tests were conducted from 1987-1990 to study the effects of pesticide application on the mortality of larval instars and adults of *Platynus dorsalis* (Coleoptera, Carabidae) and of adults of Tachyporus hypnorum (Coleoptera, Staphylinidae) that are important predators of aphids in winter wheat fields. In the laboratory, the insecticides E 605 (parathion-ethyl) and Dimethoate as well as the fungicide Afugan (pyrazophos) and the herbicide Herbogil (dinoterb) caused high mortality of the predators via treated soil surface and food. The insects were lethally affected even when the pesticides were applied at lower concentrations than recommended in the field. Metasystox R (oxydemeton-methyl) was harmful to larval instars and adults of P. dorsalis. The application of Decis (deltamethrin) on the soil resulted in high mortality of adults of T. hypnorum kept on treated soil but was less harmful to the carabid P. dorsalis. In semi-field tests detrimental effects of the pesticides mentioned above on larvae and adults of P. dorsalis as well as on adults of T. hypnorum were recorded but their extent was strongly dependent on climatic conditions. The mortality of the test insects was, as a rule, much higher under wet than under dry conditions. In the laboratory, larval instars of P. dorsalis were very susceptible to pesticides whereas the adults of the staphylinid T. hypnorum proved to be the least susceptible. The reverse was found in semi-field trials. Nineteen other pesticides showed no effect on adults of P. dorsalis when applied on the surface of the soil. In the laboratory, the effect of pesticide-contaminated soil on the fecundity and egg-fertility of P. dorsalis was also tested.

695 Groeger, U. (Hohenheim Univ., Stuttgart (Germany). Inst. fuer Phytomedizin); Ohnesorge, B. (1994) [<2. **Relations between pests and parasites and predators in agricultural ecosystems with regard to interrelations between production site and margin biotopes as well as the influence of pesticides> 2.3. Regulation of cereal aphid density by natural enemies: influencing factors]. 2. Beziehungen zwischen Schaedlingen und Nuetzlingen in Agraroekosystemen unter Beruecksichtigung der Wechselwirkungen zwischen Produktionsstandort und Randbiotopen sowie des Einflusses von Pflanzenschutzmitteln. 2.3. Die Regulation der Populationsdichte von Getreideblattlaeusen durch Antagonisten: Einflussfaktoren.** *Integrated plant production. Research report. Final research report on a priority program "development of an integrated system of crop production with regard to economic and ecological aspects of plant protection in wheat crops". Heitefuss, R. (ed.); Holtschulte, B.; Niemann, M. Deutsche Forschungsgemeinschaft, Bonn (Germany) v. 2 p. 109-125.* VCH. 4 ill., 2 tables; 12 ref. German. (AGRIS 95-154662).

The population dynamics of cereal aphids and their antagonists were monitored at two sites near Stuttgart: at Hohenheim (narrow cereal fields, many extensive orchards, gardens and woods) and Muenchingen (large fields, relatively few refuges for antagonists). During winter and spring, winter barley and roses, during summer, winter wheat fields were examined. By trap plants (potted wheat plants which were artificially infested with aphids) the first appearance and the spatial distribution of antagonists were monitored. The investigations yielded the following results: - Survival of hibernating virgins of Sitobion avenae was governed by winter temperature: In 1988/89 many virgins survived (minimum temperatures at soil level always above -10 degrees C), in 1990/91 practically no virgins survived (minimum temperature near -20 degrees C. - Early leaf fall in autumn 1989 reduced considerably oviposition of Metopolophium dirhodum on the winter host rose. - Intensity of immigration governed the dormancy among cereal aphid species and, to a smaller extent, the resulting local density of aphid population. It was not responsible for the from year to year changing intensity of aphid outbreaks. - Syrphids proved to be the key factor in winter wheat. The temporal course of their oviposition was crucial for their efficiency: A temporary reduction during the period of maximum aphid population growth, which was caused by cold and wet weather, triggered in June 1990 a serious cereal aphid outbreak - a rare event in the area of Stuttgart. - Syrphid females ready for oviposition are present very early in the year. Trap plants in the vicinity of antagonists refuge habitats caught syrphid eggs early in March, in wheat fields from the beginning of May onwards.

696 Hamer, J. (Mississippi Cooperative Extension Service); Morgan, R.; Collum, E. (1994) **Mississippi Pesticide Impact Assessment Program: peanuts and wheat.** *Publication (USA); no. 1936 28 p.* references. English. (AGRIS 95-134785).

697 Hinks, CF.; Hupka, D. (1995) **THE EFFECTS OF FEEDING LEAF SAP FROM OATS AND WHEAT, WITH AND WITHOUT SOYBEAN TRYPSIN INHIBITOR, ON FEEDING BEHAVIOUR AND DIGESTIVE PHYSIOLOGY OF ADULT MALES OF MELANOPLUS SANGUINIPES.** *Journal of Insect Physiology. 41(11):1007-1015.* English. [AGR & AGRI FOOD CANADA SASKATOON RES CTR 107 SCI PL SASKATOON SK S7N 0X2 CANADA].

Newly-fledged adult male grasshoppers (Melanoplus sanguinipes Fab.) were fed measured quantities of freshly prepared sap from the leaves of seedlings of wheat (Triticum aestivum L. cv. Katepwa) or oats (Avena sativa L. cv. Harmon), or sap from each plant to which soybean trypsin inhibitor (STI) was added. Different patterns of feeding with respect to movement and position of the antennae and palpi were recorded on oat sap compared to wheat sap. All grasshoppers were allowed to feed ad lib twice daily on each diet and the volumes of sap imbibed were recorded. The volumes of sap imbibed were not significantly different during the first day of feeding, but on subsequent days they were significantly smaller in grasshoppers fed oat sap compared to those fed wheat sap, The addition of STI to oat sap had no effect on the volume imbibed. Meal volumes were more or less consistent from day to day in grasshoppers fed wheat sap, but the addition of STI to wheat sap stimulated a significant increase in the volume imbibed. After 5 days of feeding in this manner the grasshoppers were weighed, stimulated to regurgitate the crop contents, then dissected. The complete alimentary tract was removed from each grasshopper and assayed for trypsin and chymotrypsin activity. A significantly higher gain in fresh body weight was recorded in grasshoppers fed wheat sap + STI than in those fed wheat sap alone. In contrast, grasshoppers fed oat sap lost weight during the course of the experiment, and a greater loss was recorded from those fed oat sap to which STI was added. Protein concentration in the regurgitate varied significantly with diet, and was in the following order: wheat sap + STI > wheat sap > oat sap + STI = oat sap. Trypsin and chymotrypsin activities were in the same order as protein concentration. Small increases in trypsin activity were observed in the regurgitate from grasshoppers fed sap + STI from either plant, compared to the sap alone. A 20-fold increase in chymotrypsin activity was observed in the regurgitate of grasshoppers fed wheat sap + STI compared to the regurgitate in those fed *wheat sap. A* 4.5-fold increase in chymotrypsin activity was observed in the regurgitate of grasshoppers fed oat sap + STI compared to the regurgitate of those fed oat sap alone. Protein concentration in the gut tissues varied significantly with diet and paralleled those observed in the regurgitate. Small non-significant increases in trypsin activity were observed in the grasshoppers fed sap + STI from either plant, compared to the sap alone. A 6-fold increase in chymotrypsin activity was observed in the residual gut tissues from grasshoppers fed wheat sap + STI compared to wheat sap, but activity of this enzyme was lower in grasshoppers fed oat sap + STI compared to oat sap alone. The results are discussed in the context of protein availability and its

allocation, and the dynamic interaction between antifeedants, phagostimulants and antibiosis factors and their influence on the impact of proteinase inhibitors. [References: 49].

698 Jin Zuyin; Liu Zuojun (Northwest Teachers Univ., Lanzhou (China). Dept. of Biology) (1994) **Studies on the damage and economic threshold of wheat sheath mining fly [Hydrellia chinensis] to highland barley.** *Acta Phytophylacica Sinica (China) v. 21(1) p. 19-24.* 6 tables; 3 ill., 3 ref. Chinese. (AGRIS 95-134671).

699 Kieckhefer, RW.; Gellner, JL.; Riedell, WE. (1995) **EVALUATION OF THE APHID-DAY STANDARD AS A PREDICTOR OF YIELD LOSS CAUSED BY CEREAL APHIDS.** *Agronomy Journal. 87(5):785-788.* English. [US ARS NO GRAIN INSECTS RES LAB RR3 BROOKINGS, SD 57006 USA].

Accurate prediction of yield loss caused by cereal aphids in small grains involves assessment of the aphid population density on plants, the duration of their feeding, and the growth stage of the crop at the time of feeding. In this research, aphid-day (one aphid feeding on one plant for 24 h) unitage was used as a standard to compare the effects of feeding by greenbug, Schizaphis graminum (Rondani), Russian wheat aphid (RWA), Diuraphis noxia (Mordvilko), and bird cherry-oat aphid (BCO), Rhopalosiphum padi (L.), on the growth and yield of spring wheat, Triticum aestivum L., to measure the degree of additivity of yield loss caused by aphid feeding on the same plants at several stages of plant growth, and to evaluate the adequacy of the aphid-day standard as a predictor of yield loss. Results of greenhouse experiments with a scaled series of aphid-day components (150 aphids x 2 d; 75 x 4 d; 50 x 6 d; 25 x 12 d) of equal total value (300 aphid-days) showed that the three aphid species were similarly damaging to yield but that for RWA and BCO the 25 x 12 d combination was significantly (P less than or equal to 0.01) more damaging than the other aphid-day treatments for those species. The administration of escalating aphid-day dosages to plants concomitant with advancing plant growth stages (two-leaf, 300 aphid-days; four-leaf, 400 aphid-days; two-leaf + four-leaf, 700 aphid-days; boot, 1200 aphid-days; two-leaf + boot, 1500 aphid-days; milk, 200 aphid-days; two-leaf + milk, 2300 aphid-days) revealed that yield loss caused by aphid feeding at two plant growth stages was usually significantly (P less than or equal to 0.01) greater than that at a single stage, but was not fully additive simply as the arithmetic sum of the yield losses at the two stages. Yield losses due to aphid feeding (expressed as milligrams per 100 aphid-days) declined precipitously with advancing plant growth stage. These results show that the aphid-day unitage, properly interpreted in relation to the aphid species involved and the growth stage of the crop, is a useful predictor of grain yield loss at harvest. Relating cumulative aphid-days at successive plant growth stages to ultimate yield loss enables producers to make informed decisions about the need for and timing of rescue chemical treatments. [References: 15].

700 Kindler, SD.; Springer, TL.; Jensen, KB. (1995) **DETECTION AND CHARACTERIZATION OF THE MECHANISMS OF RESISTANCE TO RUSSIAN WHEAT APHID (HOMOPTERA, APHIDIDAE) IN TALL WHEATGRASS.** *Journal of Economic Entomology. 88(5):1503-1509.* English. [USDA ARS PLANT SCI & WATER CONSERVAT RES LAB 1301 N WESTERN ST STILLWATER, OK 74075 USA].

The Russian wheat aphid, Diuraphis noxia (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 aphid's 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. [References: 22].

701 Knauer, N. (Kiel Univ. (Germany). Inst. fuer Wasserwirtschaft und Landschaftsoekologie); Timmermann, D. (1994) **[<2. Relations between pests and parasites and predators in agricultural ecosystems with regard to interrelations between production site and margin biotopes as well as the influence of pesticides> 2.1. Migration and hibernation of carabid beetles (Carabidae, Col.) in the agroecosystem]. 2. Beziehungen zwischen Schaedlingen und Nuetzlingen in Agraroekosystemen unter Beruecksichtigung der Wechselwirkungen zwischen Produktionsstandort und Randbiotopen sowie des Einflusses von Pflanzenschutzmitteln. 2.1. Ausbreitung und ueberwinterung von Laufkaefern (Col. Carabidae) im Agraroekosystem.** *Integrated plant production. Research report. Final research report on a priority program "development of an integrated system of crop production with regard to economic and ecological aspects of plant protection in wheat crops". Heitefuss, R. (ed.); Holtschulte, B.; Niemann, M. Deutsche Forschungsgemeinschaft, Bonn (Germany) v. 2 p. 74-92.* VCH. 6 ill., 7 tables; 23 ref. German. (AGRIS 95-154660).

Only a small part of the carabid beetles living during vegetation period on arable land also hibernate there in the soil. For the purpose of hibernation the bigger part moves to natural elements of a landscape or adjacent biotopes and fulfills thereby a change of habitat. In the autumn dark horizons seems to attract this kind of animals. This is the result of experimental laying-out of winter quarters. In the spring the migration from the winter quarter to the adjacent arable land occurred species specific at different times. There were great variances in the migratory behaviour of the single species between the analysed elements of a landscape and research years. The locomotive behaviour of Pterostichus melanarius during the vegetation period on arable land wasn't affected by the direction of the crop plant rows. The lanes of the tractors didn't disturb the locomotive behaviour of this species. In one of the two research years increased movements on and along the tracks could be observed. The barrier effect of different field boundaries was tested exemplarily on P. melanarius. Field paths and headlands represented no barrier, hedges on the other hand were crossed less. Nevertheless the kind of vegetation plays an important role for the level of the barrier effect. The individual locomotive behaviour - investigated with the harmonic radar - completed the other results. After the harvest no escape of the investigated speciesfrom the fields could be proved. Measures of soil cultivation and sowing killed a lot of beetles.

702 Kocourek, F.; Sedivy, J. (Vyzkumny Ustav Rostlinne Vyrobz, Prague Ruzyne (Czech Republic)) (1995) **The assessment of injury to winter wheat caused by cereal leaf beetles, Oulema spp. (Chrysomelidae, Coleoptera).** *Ochrana Rostlin - UZPI (Czech Republic) v. 31(2) p. 107-119.* 1 ill., 3 tables; 14 ref. English. (AGRIS 95-134745).

The relationship between the degree of flag leaf injury caused by cereal leaf beetles (Oulema sp.) and yield decrease was studied in three-year field trials, using five varieties. With the same degree of plant injury. Differences in yield reduction were recorded both between varieties and between growing seasons. When the flag leaf area was reduced by 17%, grain yield decreased within a range from 1 to 19% and thousand kernel weight decreased within a range from 1 to 10% when compared with the uninjured control. Late varieties showed a higher capability for compensation than early varieties in years with normal weather. Varietal differences in tolerance were not correlated with the degree of infestation of a particular variety by larvae in a particular growing season. The yield reduction between the experimental varieties differed two-to three-fold. Experiments showed higher efficacy of pyrethroids in comparison to organophosphates.

703 Kr"steva, Kh.; Pelov, V. (Institut za Zashchita na Rasteniyata, Kostinbrod (Bulgaria)) (1995) **[Basic harmful leafhoppers species on wheat and barley]. Osnovni vredni vidove tsikadi po pshenitsata i echemika.** Institut po Zashchita na Rasteniyata, Kostinbrod (Bulgaria). Natsionalna Sluzhba za Rastitelna Zashchita, Karantina i Agrokhimiya k"m Ministerstvoto na Zemedelieto i Khranitelnata Promishlenost. *Rastitelna Zashchita (Bulgaria); Plant Protection v. 36(7) p. 23-25.* 6 ill. Bulgarian. (AGRIS 95-154603).

704 Li Shigong; Liu Aizi (Henan Academy of Agricultural Sciences, Zhengzhou (China). Inst. of Plant Protection); Liu Sumei (1994) **Study on the relationships among wheat aphids, natural enemy and yield loss of wheat and the action threshold of aphids.** *Acta Phytophylacica Sinica (China) v. 21(1) p. 15-18.* 3 tables. Chinese. (AGRIS 95-134742).

705 Messina, FJ.; Jones, TA.; Nielson, DC. (1995) **HOST PLANT AFFECTS THE INTERACTION BETWEEN THE RUSSIAN WHEAT APHID AND A GENERALIST PREDATOR, CHRYSOPERLA CARNEA.** *Journal of the Kansas Entomological Society. 68(3):313-319.* English. [UTAH STATE UNIV DEPT BIOL LOGAN, UT 84322 USA].

Greenhouse and field experiments were conducted to determine whether host-plant species affects the ability of a generalist predator to reduce populations of the Russian wheat aphid, Diuraphis noxia (Mordvilko). Aphid colonies were allowed to develop on six species of cool-season grasses for 10 days, after which half of the plants received five neonate larvae of the common green lacewing, Chrysoperla carnea (Stephens). Lacewing larvae substantially reduced aphid density on both grass seedlings (in the greenhouse) and mature plants (in the field). The level of control varied among grass species, however. Aphid populations were reduced to zero or near zero on two slender-leaved grasses (Indian ricegrass and bluebunch wheatgrass), but were maintained at moderate densities on a pubescent cultivar of intermediate wheatgrass. Mechanisms underlying this tri-trophic interaction are unknown, but plant morphology may play an important role because of the "leaf-galling" habit of D. noxia. [References: 18].

706 Nentwig, W.; Poehling, H. M. (eds.); Schaerer, P. (1994) **[Factors influencing the abundance of the cereal leaf beetle (Oulema spec., Coleoptera, Chrysomelidae)]. Analyse dichtebeeinflussender Faktoren beim Getreidehaehnchen (Oulema sp., Chrysomelidae, Coleoptera).** *Agraroekologie (Germany); v. 12 132 p.* Haupt. ill., tables. Bibliography p. 108-116. German. (AGRIS 95-154665).

707 Nowierski, RM.; Zeng, Z.; Scharen, AL. (1995) **AGE-SPECIFIC LIFE TABLE MODELING OF THE RUSSIAN WHEAT APHID (HOMOPTERA, APHIDIDAE) ON BARLEY GROWN IN BENZIMIDAZOLE AGAR.** *Environmental Entomology. 24(5):1284-1290.* English. [MONTANA STATE UNIV DEPT ENTOMOL BOZEMAN, MT 59717 USA].

Age-specific life table studies were conducted on the Russian wheat aphid, Diuraphis noxia (Mordvilko), to evaluate the effects of using a barley-benzimidazole agar system on D. noxia growth, reproduction, and survival. Weibull functions, linear and nonlinear regression, a modified Sharpe and DeMichele biophysical model (MSDBM), and Maxima functions were used to estimate or model survivorship patterns, the lower temperature threshold for development, the upper temperature inhibition threshold, nonlinear aspects of rates of development, and mean daily fecundity patterns of D. noxia, respectively. The Weibull function provided a good fit to the aphid survivorship patterns (R(2) = 0.95). The lower developmental threshold and the upper temperature inhibition threshold for the Russian wheat aphid using the barley-benzimidazole agar system were estimated to be 5.2 and 30.3 degrees C, respectively. The MSDBM also provided an excellent fit to nonlinear aspects of developmental rate trends (R(2) = 0.996). Maxima functions were found to adequately describe patterns of daily fecundity at 3 of the 4 constant temperatures examined. The mean longevity of D. noxia reared on the barley-benzimidazole agar system was greater than those reported by other authors using wheat- and rye-benzimidazole agar systems. Longer nymphal development times using the barley-benzimidazole agar system resulted in a lower intrinsic rate of increase for Russian wheat aphids reared at 19.5 degrees C, than those observed by other authors using wheat- and rye-benzimidazole agar systems, and a developmental threshold that was higher than those reported by other authors for Russian wheat aphids grown on wheat using other plant growth systems. [References: 22].

708 Nyczepir, A.P. (USDA, ARS, Southeastern Fruit and Tree Nut Research Lab, Byron, GA.); Bertrand, P.F.; Cunfer, B.M.; Miller, R.W.; Gueldner, R.C. (1994) **Cultural control of Criconemella xenoplax with pre- and postplant ground covers.** *ARS (USA) (no. 122) p. 72-76.* references. Proceeding of the sixth Stone Fruit Tree Decline Workshop on New Insights and Alternative Management Strategies held October 26-28, 1992, Fort Valley, Georgia. English. (AGRIS 95-134993).

709 Pallas, K. (Halle Wittenberg Univ., Halle (Germany). Inst. fuer Allgemeinen Pflanzenbau, Ackerbau) (1994) **[Effect of cereal crop rotation design on yield and on infestation with selected pests]. Einfluss der Gestaltung von Getreidefruchtfolgen auf Ertrag und ausgewaehlte Schaderreger. 38. Jahrestagung der Gesellschaft fuer Pflanzenbauwissenschaften; Halle/Saale (Germany); 29 Sep - 1 Oct 1994.** *Mitteilungen der Gesellschaft fuer Pflanzenbauwissenschaften (Germany) v. 7 p. 277-280.* 2 graphs, 1 table; 3 ref. German. (AGRIS 95-134746).

710 Parodi, Patricio C. (Universidad de Chile, Santiago (Chile). Fac. de Ciencias Agrarias y Forestales); Nebreda M, Isabel M.; Robles D, Jorge; Poblete S, Raul (1994) **[The Russian wheat aphid Diuraphis noxia (Mordvilko) (Homoptera: Aphididae) taxonomy, biology, effects and control]. El pulgon rojo del trigo - Diuraphis noxia (Mordvilko) (Homoptera: Aphididae) taxonomia, biologia, efectos y control.** 45. Congreso Agronomico; Santiago (Chile); 14-17 Nov 1994. *Simiente (Chile) v. 64(3) p. 182-191.* 58 ref. Spanish. (AGRIS 95-154655).

711 Paul, V.H. (comp.); Obst, A. (1993) **[<Diseases and pests of cereals>]. Krankheiten und Schaedlinge des Getreides.** Mann. ill. Bibliography Numerous ref. vp. 184 p. German. (AGRIS 95-154599).

712 Stilmant, D. (Catholic Univ. of Louvain, Louvain la Neuve (Belgium). Dept. of Ecological and Biogeographical Sciences) (1995) **Population dynamics of cereal leaf beetles, Oulema melanopus L. and Oulema lichenis Voet (Coleoptera: Chrysomelidae) on wheat fields in southern Belgium.** *Belgian Journal of Zoology (Belgium) v. 125(1) p. 199-205.* 3 ill.; 1 table; 8 ref. English. (AGRIS 95-134638).

In order to determine the pest status of cereal leaf beetles in Southern Belgium, the population densities of Oulema melanopus (L., 1758) and O. lichenis (Voet, 1806) were studied at Ciney and Louvain-la-Neuve during 1993 and 1994. During the two-year study period Oulema spp. populations had never reached the economic threshold of 2.5 larvae per tiller. The levels of the Oulema populations were significantly different between the two sites in 1994; Louvain-la-Neuve supporting greater densities than Ciney. Phenological differences between the two locations were postulated to be the result of two phenomena: (1) the early attainment of the physiological time of development, expressed in degree days, necessary for immature stage development, in Louvain-la-Neuve, the warmest location, and (2) the early attainment of the cold sum necessary to end the adult diapause in Ciney, the coldest site, however this second argument stays as a hypothesis that must be tested.

713 Vanderkrol, D.; Schuphan, I.; Thiede, B.; Schmidt, B. (1995) **METABOLISM OF [RING-2, 6-C-14]PARATHION IN PLANT CELL SUSPENSION CULTURES OF CARROT (DAUCUS CAROTA), PURPLE FOXGLOVE (DIGITALIS PURPUREA), SOYBEAN, THORN APPLE (DATURA STRAMONIUM) AND WHEAT (TRITICUM AESTIVUM).** *Pesticide Science. 45(2):143-152.* English. [RHEIN WESTFAL TH AACHEN INST BIOL ECOL ECOTOXICOL ECOCHEM 5 WORRINGER WEG 1 D-52056 AACHEN GERMANY].

means of standardized procedures, the metabolism of [ring-2, 6-C-14]-parathion was investigated in carrot (Daucus carota L.), purple foxglove (Digitalis purpurea L.), soybean (Glycine max Merrill cv. 'Mandarin', and Glycine max Merrill cv. 'Harosoy 63' cultivated on B5 and Miller media, respectively), thorn apple (Datura stramonium L.), and wheat (Triticum aestivum L.) cell suspension cultures. In the wheat and soybean (Mandarin) cells only 2.9 and 8.9%, respectively, of the applied parthion remained unmetabolized after 48 h of incubation, while 51.2, 57.9, 60.3, and 62.4% of the unchanged parent were detected in the D. purpurea, D. Stramonium, carrot and soybean (Harosoy) cultures, respectively. In all suspensions, paraoxon and 4-nitrophenol were found as phase I metabolites, thus demonstrating that plant tissues can catalyse oxidative desulfuration and dearylation of parathion. 4-Nitrophenol was also glycosylated with glucose and possibly galactose. Further, as yet unidentified, metabolites indicated that biotransformations had also occurred at the aromatic moiety. Large amounts of non-extractable residues were detected in the wheat suspension (38.3%), while the other cultures showed a lower incorporation of C-14 into insoluble cell material (0.9-9.4%). For a prospective ecotoxicological evaluation of the metabolic fate of pesticides and xenobiotics in plants in

general, the differential metabolic capacity of plant cell cultures and plants should be taken into account. [References: 43].

714 Vanderwesthuizen, AJ.; Pretorius, Z. (1995) **BIOCHEMICAL AND PHYSIOLOGICAL RESPONSES OF RESISTANT AND SUSCEPTIBLE WHEAT TO RUSSIAN WHEAT APHID INFESTATION.** *Cereal Research Communications. 23(3):305-313.* English. [UNIV ORANGE FREE STATE DEPT BOT & GENET BLOEMFONTEIN 9300 SOUTH AFRICA].

The effect of Russian wheat aphid (RWA), Diuraphis noxia infestation on protein, free amino acid, free proline, chlorophyll and phenolic contents as well as respiration rate was studied in resistant (cv Tugela-DN) and susceptible (cv Tugela) wheat under greenhouse conditions. The results confirm that RWA infestation poses a stress condition for both resistant and susceptible wheat. Responses of resistant plants to stress induced by RWA infestation in many respects resemble known resistance responses to other biotic as well as abiotic stresses. Results indicate that metabolically, resistant plants have a better ability to survive the stress condition imposed by sustained infestation. Infestation induced changes in proline content are evidently contributing to resistance. The increased phenolic content in resistant wheat after infestation may have a deterrent effect as well.

715 Wang Xinjun (Pingliang Prefectural Forecasting Station of Crop Pests, Gansu (China)) (1994) **Studies on damage loss and control index by a group of mixed species of Melolonthidae on winter wheat fields.** *Entomological Knowledge (China) (no. 6) p. 324-325.* 2 tables. Chinese. (AGRIS 95-134639).

716 Wlling, M. (Biologische Bundesanstalt fuer Land und Forstwirtschaft, Darmstadt (Germany). Inst. fuer Biologischen Pflanzenschutz); Bathon, H.; Langenbruch, G. A.; Klingauf, F. (1994) **[<2. Relations between pests and parasites and predators in agricultural ecosystems with regard to interrelations between production site and margin biotopes as well as the influence of pesticides> 2.2. Effects of boundary strips and herbicide-free crop-edges on carabid beetles (Carabidae) and epigeic spiders (Araneae)]. 2. Beziehungen zwischen Schaedlingen und Nuetzlingen in Agraroekosystemen unter Beruecksichtigung der Wechselwirkungen zwischen Produktionsstandort und Randbiotopen sowie des Einflusses von Pflanzenschutzmitteln. 2.2. Auswirkungen von Feldrainen und Ackerschonstreifen auf Laufkaefer (Carabidae) und Bodenspinnen (Araneae).** *Integrated plant production. Research report. Final research report on a priority program "development of an integrated system of crop production with regard to economic and ecological aspects of plant protection in wheat crops". Heitefuss, R. (ed.); Holtschulte, B.; Niemann, M. Deutsche Forschungsgemeinschaft, Bonn (Germany) v. 2 p. 93-108.* VCH. 11 ill., 3 tables; 18 ref. German. (AGRIS 95-154661).

In the agro-ecosystem marginal biotopes adjacent to cultivated fields serve as habitats for several weeds and animals, including beneficial arthropods. In this study the effects of boundary strips and herbicide-free crop edges (as defined by Greaves and Marshall 1987) on pest insects and beneficials in winter wheat fields were investigated. The study was focussed on aphids as the most important pest in cereals and on carabids and epigeic spiders as polyphageous predators. In boundary strips the spectrum of species of both carabids and spiders was more diverse compared to the adjacent wheat fields. In herbicide-free crop edges with a high amount of arable weeds 10-60% more carabid and spider species and specimens were found as in the sprayed control edges. When comparing wheat fields with "rich" marginal structures on one side (broad, diverse boundary strips and hedges) and "poor" marginal structures on the opposite side (narrow, monotone boundary strips), the infestation with cereal aphids was up to 50% lower on the "rich" side. This reduction of aphids was not only at the edges, but also up to 10-20 m inside the fields. By means of mark/recapture-experiments it was shown that most of the investigated field carabid species could immigrate 100-150 m into the fields.

717 Zimowska, G. (USDA, ARS, Insect Attractants, Behavior and Basic Biology Research Laboratory, Gainesville, FL.); Mikolajczyk, P.; Silhacek, D.L.; Oberlander, H. (1994) **Chitin synthesis in Spodoptera frugiperda wing imaginal discs. II. Selective action of chlorfluazuron on wheat germ agglutinin binding and cuticle ultrastructure.** *Archives of insect biochemistry and physiology (USA) v. 27(2) p. 89-108.* references. English. (AGRIS 95-154563).

The action of the chitin synthesis inhibitor, chlorfluazuron, was investigated in Spodoptera frugiperda wing imaginal discs cultured in vitro. Electron microscopy and cytochemical labeling with a lectin, wheat germ agglutinin (WGA), were used to monitor morphogenesis, as well as the presence and localization of chitin and non-polymerized N-acetyl-D-glucosamine (GlcNAc). Chlorfluazuron (CFA) selectively inhibited 20-hydroxyecdysone-stimulated chitin synthesis and procuticle deposition in imaginal discs, without otherwise affecting their morphogenesis. Tracheole migration, evagination, exocytosis, and endocytosis in the epithelial cells, and the presence of non-polymerized GlcNAc in the extracellular matrix, were observed in both CFA-treated and control wing discs. On the other hand, CFA prevented the appearance of WGA-labeled chitin in newly formed procuticle, while the deposition of proteinaceous cuticulin and epicuticle was unaffected. A brief treatment with CFA resulted in WGA labeling of non-polymerized GlcNAc, but not chitin in the procuticle region. The lack of chitin in CFA treated wing discs was correlated with the appearance of an amorphous, non-lamellar procuticle region.

H20 PLANT DISEASES

718 **[<5. Abstracts and consequences. 5.1. Occurrence, epidemic spreading of fungal diseases of winter wheat depending on influence of year's weather and production methods as well as the development of systems for selective use of fungicides>]. 5. Zusammenfassung und Schlussfolgerungen. 5.1. Auftreten, epidemische Ausbreitung und Ertragswirksamkeit von Pilzkrankheiten des Weizens in Abhaengigkeit von Jahreseinfluss und Produktionstechnik sowie die Entwicklung von Systemen zur gezielten Anwendung von Fungiziden** (1994) Deutsche Forschungsgemeinschaft, Bonn (Germany). *Integrated plant production. Research report. Final research report on a priority program "development of an integrated system of crop production with regard to economic and ecological aspects of plant protection in wheat crops". Heitefuss, R. (ed.); Holtschulte, B.; Niemann, M. Deutsche Forschungsgemeinschaft, Bonn (Germany) v. 2 p. 280-282.* VCH. German. (AGRIS 95-155352).

719 **[Fungicide management of winter wheat. Update on the last two years of experimentation in the North East of France]. Protection fongicide raisonnee du ble. Bilan de deux annees d'experimentation dans le nord-est de la France** (1995) Ministere de l'Agriculture, Paris (France). Service Regional de la Protection des Vegetaux. *Phytoma La Defense des Vegetaux (France) (no 471) p. 37-40.* 5 graph. French. (AGRIS 95-155330).

720 Abdelmallek, AY.; Hemida, SK.; Omar, SA. (1994) **FUNGAL SUCCESSION AND DECAY OF HERBICIDE-TREATED WHEAT STRAW.** *Folia Microbiologica. 39(6):561-566.* English. [UNIV ASSIUT FAC SCI DEPT BOT ASSIUT EGYPT].

The effects of alachlor and haloxyfop on wheat straw decay and fungal succession were studied in laboratory trials. Wheat straw segments were immersed in (100 and 1 000 mg/L) herbicides, buried in soil and incubated at 28 +/- 1 degrees C for 8 weeks. Both herbicides significantly stimulated the mass loss and N-mineralization of wheat straw. CO2 evolution was not significantly affected while C-mineralization was inhibited. The pattern of succession of fungi was slightly affected in herbicide-treated wheat straw. However, the frequency of occurrence of Rhizopus stolonifer was lowered throughout all experimental periods. In a pure culture experiment, both alachlor and haloxyfop at 100, 500 and 1 000 mg/L reduced the radial growth of Alternaria alternata, Aspergillus niger, A. flavus, Penicillium funiculosum, R. stolonifer and Trichoderma harzianum. [References: 25].

721 Abdou, E.S. (Hungarian Academy of Sciences, Budapest (Hungary). Plant Protection Inst.); Barna, B. (1992) **Effect of superoxide anion on wheat stem rust uredospores.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 25.* English. (AGRIS 95-135477).

The generation of reactive oxygen species, such as superoxide anion O2- in response to pathogenic attack has received increased attention in the last few years. Although the significance of free radicals in the hypersensitive necrotic reaction has been extensively studied, information on the direct effect of these radicals on plant pathogenic microorganisms is limited. The aim of the work was to study the effect of O2- (generated by riboflavin/methionine photochemical system) on uredospores of Puccinia

graminis tritici. After six hours incubation the inhibition of spore germination ranged from 31% to 98%, while the inhibition of germ tube length ranged from 23% to 89% depending on the concentration of the riboflavin in the agar media. When superoxide dismutase (SOD) enzyme was added to the superoxide generating system, both the germination percentage and the germ tube length were similar to the germination of control spores kept in dark. The reaction of isogenic lines with various resistance genes to infection with O2- treated and not-treated spores was identical, but the number of pustules decreased after treating the spores with superoxide. The effect of superoxide treatments on membrane lipids of the uredospores was also investigated. After O2- treatment 30-35% decrease in phospholipid content was detected, while no significant change was found in free sterol content. Especially phosphatidyl serine was very sensitive to O2- treatment. The rate of lipidperoxidation in treated spores was 8 times higher as compared to untreated ones. These data support the view, that the formation of active oxygen species during plant-pathogen interaction can have a direct inhibitory effect on the pathogen itself.

722 Abu El Naga, S.A.; Khalifa, M.M.; Abd El Latif, O.A.; Nagib, M.A. (Ministry of Agriculture, Kafr El Sheikh (Egypt). Sakha Agricultural Research Station) (1993) **Effect of stem rust inocula obtained from different wheat genotypes on race identity and virulence trends of Puccinia graminis Tritici in Egypt during 1990/91.** *Journal of Agricultural Sciences, Mansoura Univ. (Egypt) v. 18(10) p. 2960-2968.* 6 tables; 16 ref. English. (AGRIS 95-155362).

723 Afanasenko, OS.; Hartleb, H.; Guseva, NN.; Minarikova, V.; Janosheva, M. (1995) **A SET OF DIFFERENTIALS TO CHARACTERIZE POPULATIONS OF PYRENOPHORA TERES DRECHS FOR INTERNATIONAL USE.** *Journal of Phytopathology-Phytopathologische Zeitschrift. 143(8):501-507.* English. [LANDESPFLANZENSCHUTZAMT SACHSEN ANHALT HALLE SITZ MAGDEBURG D-39114 MAGDEBURG GERMANY].

From 1989 to 1992 populations of Pyrenophora teres from Russia, Germany, Czech Republic and Slovakia were studied to determine their structure, and to develop a barley differential set for potential international use. The infection responses were scored on a 5-point reaction scale using detached leaf pieces incubated on filter paper saturated with a aquaeos benzimidazole solution. A set of 12 differentials, incorporated under 4 digits using the octal nomenclature, was identified, and is presented. [References: 33].

724 Alvarez, Delia; Luque, Alicia; D'Anna, Maria Luciana (Universidad Nacional de Rosario, Santa Fe (Argentina). Fac. de Ciencias Bioquimicas y Farmaceuticas) (1993) **[Cellulolytic mycota of wheat cultivated soils and herbicide treatment]. Micota celulolitica de suelos con cultivo de trigo y tratamiento herbicida.** *Boletin Micologico (Chile) v. 8(1-2) p. 61-65.* 21 ref. Spanish. (AGRIS 95-155059).

725 Amoah, BK.; Rezanoor, HN.; Nicholson, P.; Macdonald, MV. (1995) **VARIATION IN THE FUSARIUM SECTION LISEOLA - PATHOGENICITY AND GENETIC STUDIES OF ISOLATES OF FUSARIUM MONILIFORME SHELDON FROM DIFFERENT HOSTS IN GHANA.** *Plant Pathology. 44(3):563-572.* English. [PLANT BREEDING INT CAMBRIDGE LTD MARIS LANE CAMBRIDGE CB2 2LQ ENGLAND].

Fusarium moniliforme, the imperfect stage of the ascomycete Gibberella fujikuroi, is an economically important pathogen with a very wide host range. The genetic characteristics of isolates of the fungus collected from different regions of Ghana from maize, rice and sorghum were determined using the random amplified polymorphic DNA (RAPD) and restriction fragment length polymorphism (RFLP) techniques. The pathogenicity of the isolates was also compared on maize and rice. DNA fingerprints detected as RFLPs of ribosomal DNA and RAPDs separated the isolates into discrete groups which were generally host-related. The possibility of a sub-structuring of the maize population of the fungus into tissue-related subgroups was suggested by the results. A dendrogram of the relatedness of the isolates is presented. However, the pathogenicity of the isolates on rice, measured by their ability to cause 'bakanae' symptoms, did not resolve the isolates into the clearly defined groups suggested by the genetic studies, and maize isolates of the fungus could cause 'bakanae' symptoms to the same extent as rice isolates. Similarly, some isolates identified as rice-type isolates caused as much shoot stunting in maize as maize isolates. However, the effects of the isolates on root growth of maize seedlings showed a broad correlation with the defined genetic groups, with maize isolates of the fungus showing the greatest tendency to cause root stunting [References: 40].

726 Anikster, Y. (Tel Aviv Univ. (Israel). Faculty of Life Sciences. Inst. for Cereal Crops Improvement); Manisterski, J.; Tagansky, M. (1992) **Virulence analysis of two isolates of Puccinia hordei attacking barley cultivars carrying the Pa7 gene.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 124-125.* 5 ref. English. (AGRIS 95-135537).

Both Moroccan rust isolates carry the same factor causing virulence on Cebada Capa barley in the homozygous recessive condition. Both Israeli isolates are homozygous dominants at the same locus. The F2 analysis indicates that only a single major gene encodes the virulence - avirulence trait. Five Israeli accessions of H. spontaneum with resistance to the two virulent cultures from Morocco were found. These accessions contain an unknown gene or genes for resistance and could serve as critical sources of protection in case these dangerous fungal races spread.

727 Aslam, M. (Agricultural Research Council, Islamabad (Pakistan). Crop Diseases Research Inst.) (1992) **Differences in latent period in wheat cultivars affected by isolates of Puccinia recondita Rob. ex Desm. f. sp. tritici.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 74-77.* 2 tables. English. (AGRIS 95-135591).

728 Bailey, K.L.; Harding, H.; Knott, D.R. (1993) **Transfer to bread wheat of resistance to common root rot [Cochliobolus sativus] identified in Triticum timopheevii and Aegilops ovata.** *Canadian journal of plant pathology = Revue Canadienne de phytopathologie (Canada) v. 15(3) p. 211-219.* references. English. (AGRIS 95-155254).

729 Baltazar, B.M.; Scharen, A.L. (Montana State Univ., Bozeman (US). Department of Plant Pathology) (1993) **Variation in virulence of net and spot forms of Pyrenophora teres (Died.) Drechsl. on barley [Hordeum vulgare].** *RACHIS (ICARDA); Barley and Wheat Newsletter v. 12(1-2) p. 3-7.* 5 tables; 10 ref. English. (AGRIS 95-155284).

Differences in levels of virulence of net and spot forms Pyrenophora teres were detected. This suggests that different biotypes of P. teres exist. The importance of the high variation present in populations of net and spot isolates lies in the fact that a barley (Hordeum vulgare) L. ssp. vulgare) cultivar resistant in one location may not be resistant in a different region due to the presence of different biotypes of the pathogen. Among the lines tested, CI 7584 were resistant, and CI 14023, CI 9819, CI 1197 and CI 5845 were moderately resistant to all of the isolates regardless of whether they were net or spot forms of P. teres. Future studies might attempt to understand the mode of inheritance of the genes determining resistance to the spot form of P. teres. Meanwhile, the cultivars detected as highly resistant to both forms of P. teres could possibly be used in breeding programs in crosses with high-yielding genotypes.

730 Bamdadian, A. (Plant Pests and Diseases Res. Inst., Teheran (Iran Islamic Republic). Plant Diseases Dept.) (1992) **Virulence, evolution and distribution of wheat stripe rust (Puccinia striiformis west. f.sp. tritici) in Iran.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 118-120.* 1 table; 6 ref. English. (AGRIS 95-135487).

731 Bartos, P. (Research Inst. of Crop Production, Praha (Czech Republic)); Stuchlikova, E.; Hanusova, R. (1992) **Wheat leaf and stem rust virulences in Czechoslovakia (1970-1990).** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 91-93.* 2 tables; 5 ref. English. (AGRIS 95-135588).

732 Bekele Hunde; Hailu Tefera; Melkamu Ayalew; Mesele Alemu; Paul, Y.S (1994) **Management of Loon Smut and Leaf Stripe of Barley Using Seed**

Dressing Fungicides. 1. Annual Conference Crop Protection Society of Ethiopia; Addis Abeba (Ethiopia); 14-15 Apr 1993. *Proceedings of the First Annual Conference Crop Protection Society of Ethiopia. Eshetu Bekele; Yitbarek Semeane; Tibebu Habtewold; Mengistu Kebede; Kasahun Bekele p. 40-41.* CPSE. English. (AGRIS 95-155275).

Barley is one of the most important food crops in northwestern Ethiopia. Two row local barley "Semereta" is most widely grown due to its earliness as relief food supply until other crops are harvested. But yield is limited to less then 1 t/ha due to various constraints among which diseases like loose smut and stripe disease are the major factors. Disease survey conducted before revealed that incidence of loose smut and stripe disease could reach upto 28 percent and 18 percent, respectively. This study was undertaken in 1990 and 1992 at Adet to identify effective seed dressing fungicide that could reduce this threat from these diseases in an integrated disease management system. The experiment was laid out in RCB design in 3 replication using highly infected seed of "semereta" collected from farmer fields. Five fungicides, namely Vincit (flutriafol + thiabendazol), Prelude universal (Prochloraz + Carhoxin), Agroson H (phenylmercury acetate) Vitauax/prochloroz (carboxin + prochloraz) and Bayton universal (triadimenol + imazalil + fuberidazole) were tested at manufacturers recommended rates. Sixty gram of the seed was drytreated, shaked for 10 min and kept for 10, 30 and 90 days in flasks at room temperature before planting. The plots received 60/60 kg/ha N/P2O5 at sowing and observation was made on seedling height, plant height, disease incidence, 1000 grain weight and grain yield. All fungicides except Agrosan H controlled both diseases with mean control of 81.9 to 99.4 percent loose must and 94.9 to 100 percent stripe disease over the untreated seeds. Agrosson H was only effective in controlling stripe disease. All fungicides were effective at all times of seed dressing. Seedling height was not affected by all the treatment except Bayton universal treated 90 days before planting. Plant height, spike length, seed germination and 1000 seed weight were not influnced by any of the treatments. Seed dressing with Baytan univeral gave the highest yield (25 q/ha) followed by Vincit "F" (23.5 q/ha) and Prelude universal (23.1 q/ha), all treated 90 days before planting, with a yield increase of 18.5 percent, 11.6 percent and 11.2 percent over the untreated seeds, respectively.

733 Boll, P.S.; Secher, B.J.M. (1995) **A weather-based system for calculation risk indices for diseases and pests in agricultural crops [decision support system].** Workshop on Weather Information and Plant Protection; Ultuna (Sweden); 9-10 Nov 1994. Statens Planteavlsforsoeg, Lyngby (Denmark). *SP-Rapport (Denmark) (no.10) p. 51-56.* 9 ref. English. (AGRIS 95-155236).

734 Braendle, U. (Swiss Federal Inst. of Technology, Zuerich (Switzerland). Inst. for Plant Sciences. Phytopathology Group); Schaffner, D.; Wolfe, M.S.; McDermott, J.M. (1992) **DNA and virulence variation in a field population of Erysiphe graminis f.sp. hordei.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 37-38.* 3 ref. English. (AGRIS 95-135524).

Populations of Erysiphe graminis can be highly variable on a local level. The analysis of marker and haplotype frequencies clearly distinguished between populations from the different hosts, with considerable similarity between the mixture and Triton area. This suggests that in variety mixtures containing a cultivar with a recently "broken" resistance, such as Mla13 in Switzerland, the pathogen population consists to a great extent of isolates with the corresponding virulence, Va13. Nevertheless, disease severity is reduced significantly. On hosts with quantitative resistance, Va13 frequency is largely reduced even though there is obvious infection pressure from a virulent population only meters away. This is confirmed by the analysis of haplotype distribution showing that individuals are dispersed within but not necessarily between host areas. Populations from different varieties with quantitative resistance to pathogens can thus be distinguished. In aerial samples of powdery mildew, observed values of DNA haplotypes fit the expected. The negative deviation observed here suggests that a field population does not represent the total genetic variation present in an actual subpopulation.

735 Braul, H. J. (Hannover Univ. (Germany). Inst. fuer Pflanzenkrankheiten und Pflanzenschutz) (1994) **[Changes in protein synthesis of barley during expression of induced resistance against Erysiphe graminis f.sp. hordei after application of metabolism products of a Bacillus subtilis isolate].** **Veraenderungen der Proteinsynthese der Gerste bei Auspraegung der induzierten Resistenz gegen Echten Mehltau nach Applikation der Stoffwechselprodukte eines Bacillus subtilis-Isolates.** Hannover Univ. (Germany). Fachbereich Biologie. 17 ill., 11 tables. Bibliography 124 ref. 111 p. German. (AGRIS 95-155265).

736 Braun, H.J. (International Maize and Wheat Improvement Center, Ankara (Turkey)); Saari, E.E. (1992) **An assessment of the potential of Puccinia striiformis f.sp. tritici to cause yield losses in wheat on the Anatolian Plateau of Turkey.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 121-123.* 1 table; 6 ref. English. (AGRIS 95-135488).

737 Bushnell, W.R. (Minnesota Univ., St. Paul (USA). United States Dept. of Agriculture/Agricultural Research Service. Cereal Rust Lab.); Clark, T.A.; Liu, Z.; Smith, A.G.; Szabo, L.J.; Zeyen, R.J. (1992) **Host response gene expression in powdery mildew of barley.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 48-50.* 2 graphs; 3 ref. English. (AGRIS 95-135533).

738 Caron, D. (Institut Technique des Cereales et des Fourrages, Baziege (France)); Barrault, G.; Albertini, L. (1994) **[Epidemiology of wheat leaf-rust (Puccinia recondita f.sp. tritici) and forecasting of treatments in South-Western France]. Epidemioloige de la rouille brune du ble (Puccinia recondita f.sp. tritici) et previsions de traitements dans le Sud-Ouest de la France.** *Revue de Cytologie et de Biologie Vegetales Le Botaniste (France) v. 17(3-4) p. 121-165.* 56 ref. French. (AGRIS 95-135516).

739 Carver, TLW.; Ingersonmorris, SM.; Thomas, BJ.; Zeyen, RJ. (1995) **EARLY INTERACTIONS DURING POWDERY MILDEW INFECTION.** *Canadian Journal of Botany-Revue Canadienne de Botanique. 73(Suppl 1 A-D):S 632-S 639.* English. [INST GRASSLAND & ANIM PROD ABERYSTWYTH SY23 3EB DYFED WALES].

Within minutes of spore deposition, enzymes including cutinase are released by conidia of Erysiphe graminis; these may prepare the infection court and facilitate subsequent fungal development. Germination follows with emergence of the primary germ tube, which contacts the host leaf. Extracellular material is secreted beneath the primary germ tube, which adheres to the leaf. The primary germ tube forms a penetration peg that breaches the host surface and gains access to host cell components including water. The primary germ tube also recognises factor(s) present in the host surface, and this stimulates elongation of the second-formed germ tube. The elongated second tube in turn responds to host surface factor(s) by differentiating an appressorium. Extracellular material, secreted beneath the growing appressorial germ tube, is laid down thickly around the appressorial lobe. An inner ring of extracellular material can often be seen surrounding penetration pores revealed by the removal of primary germ tubes and appressoria. The chemistry of the extracellular material is unknown, but in addition to adhesive properties recent studies show that a monoclonal antibody that recognises purified cutinase and, possibly, hemicellulases, binds to secretions from conidia, primary germ tubes, and appressoria. External factors can also influence germling development. Although light has little effect on the early stages of germling development, it has a profound effect in delaying the formation of haustoria by apparently mature appressoria. Understanding the control of early pathogen development could indicate avenues for genetic engineering and breeding for disease-resistant plants. [References: 42].

740 Causin, R.; D'Ambra, V.; Montecchio, L.; Mutto Accordi, S. (Padua Univ. (Italy). Istituto di Patologia Vegetale) (1995) **[Effect of different sources of crop residues on a population of Trichoderma sp. naturally present in a soil]. Effetto di residui colturali di diversa natura sulla popolazione di Trichoderma sp. naturalmente presente in un terreno.** *Informatore Fitopatologico (Italy) v. 45(7-8) p. 55-57.* 1 table; 3 graphs; 16 ref. Italian. (AGRIS 95-155256).

The effect caused on a natural population of Trichoderma sp. by burying straws of barley and soybean and stalks of corn, was studied in laboratory trials. Organic matter introduced in the soil always enhanced Trichoderma sp. competitive saprophytic ability. The effect decreased with the time and

was different for each of amendments used. Barley straw was the more efficient crop residue.

741 Chelkowski, J.; Visconti, A.; Dokko, B.; Wisniewska, H. (1995) **FUSARIUM MONILIFORME SHELDON - PATHOGENICITY TO WHEAT SEEDLINGS AND ABILITY TO PRODUCE FUMONISINS.** *Journal of Phytopathology-Phytopathologische Zeitschrift. 143(8):491-493.* English. [POLISH ACAD SCI INST PLANT GENET POZNAN POLAND].

All 17 examined Polish isolates of Fusarium moniliforme Sheldon [syn. F. verticillioides (Sacc.) Nirenberg], originating from wheat, maize acid barley kernels, exhibited pathogenicity to wheat seedlings of the cultivar 'Almari' (5 isolates-very strong, 3 strong, 3 medium, 5 weak and only one very weak). The same isolates were able to produce the mycotoxins fumonisins on rice under laboratory conditions. Fumonisin B-1 (FB1) was detected in concentrations ranging from 1.3 to 2240 mg/kg and fumonisin B-2(FB2) from 0.7 to 600 mg/kg. The yield of the fumonisins produced in vitro was not related to the pathogenicity of individual isolates. [References: 19].

742 Chen Yanglin; Chen Wanquan; Zhang Shuxiang (Chinese Academy of Agricultural Sciences, Beijing (China). Inst. of Plant Protection) (1994) **Studies on control of wheat rust with three complex compounds of Triadimefon.** *Acta Phytophylacica Sinica (China) v. 21(1) p. 67-72.* 4 tables; 2 ref. Chinese. (AGRIS 95-135599).

743 Clifford, B.C. (Wales Univ., Aberystwyth (United Kingdom)); Nazim, M. (1992) **Uredospore production of Puccinia recondita f. sp. tritici as affected by resistance genes in wheat.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 78-80.* 1 table; 10 ref. English. (AGRIS 95-135592).

The effect of the ineffective genes for leaf rust resistance was clear in reducing the colony size and the relative area growth rate, while sporulation seemed to be more specific. Smaller colony size decreases the damage in leaf area which is very critical when infection occurs in a critical stage of growth. According to the data obtained in this investigation, it seemed to be that ineffective major gene means certain level of defence mechanism.

744 Cockerell, V.; Rennie, W.J.; Jacks, M. (1995) **INCIDENCE AND CONTROL OF BARLEY LEAF STRIPE (PYRENOPHORA GRAMINEA) IN SCOTTISH BARLEY DURING THE PERIOD 1987-1992.** *Plant Pathology. 44(4):655-661.* English. [SCOTTISH AGR SCI AGCY OFFICIAL SEED TESTING STN SCOTLAND E CRAIGS EDINBURGH EH12 8NJ MIDLOTHIAN SCOTLAND].

The incidence of Pyrenophora graminea was determined in winter and spring barley seed harvested in each of the 6 years 1987 to 1992. The occurrence of P. graminea was highest in spring barley seed harvested in 1989 and 1990, with 69% of samples in 1989 and 82% in 1990 infected. The mean infection levels were 6 . 1% in 1989 and 7 . 5% in 1990. The introduction of a voluntary Code of Practice in January 1991 significantly reduced infection: in 1992 only 10% of spring barley samples were infected, and the mean infection level was less than 0 . 2%. In spring barley, there was a significant relationship between the level of seed infection and the percentage of diseased tillers in commercial crops ($r = 0 . 890$, $P < 0 . 001$). However, tiller infection was consistently lower than seed infection. During the period of the study the mean annual leaf stripe infection on winter barley seed did not exceed 1%. [References: 16].

745 Cooley, R.N. (Birmingham Univ. (United Kingdom). School of Biological Sciences); Butters, J.; Caten, C.E. (1992) **Failure of phenotypic expression of the beta-tubulin gene of barley powdery mildew in Septoria nodorum.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 45-47.* 1 graph, 1 table; 8 ref. English. (AGRIS 95-135494).

746 Cotterill, P.J.; McLean, L.K. (Victorian Dept. of Food and Agriculture, Horsham (Australia). Crops Research Inst.) (1992) **Evaluation of fungicides to control take-all [Gaeumannomyces graminis var. tritici] and rhizoctonia root rot [Rhizoctonia solani] of wheat.** *Plant Protection Quarterly (Australia) v. 7(2) p. 51-54.* 4 tables, 18 ref. English. (AGRIS 95-155231).

Hexaconazole, flusilazole, prochloraz and propiconazole were very effective in reducing growth of Gaeumannomyces graminis var. tritici, on agar plates whereas all 7 fungicides tested reduced the growth of R. solani. Similarly, in a pot experiment, only mepronil reduced take-all of wheat, whereas all 7 fungicides reduced the severity of rhizoctonia root rot. Of the fungicides tested in a micro-plot experiment, hexaconazole, prochloraz and propiconazole reduced take-all (flusilazole was also tested) and all 4 reduced rhizoctonia root rot. Prochloraz and hexaconazole increased seed weight in take-all infected plants but none of the fungicides had any effect on yield of plants infected with rhizoctonia root rot. In the absence of either disease, the fungicides had little or no effect on plant growth.

747 Crous, PW.; Janse, BJH.; Tunbridge, T.; Holz, G. (1995) **DNA HOMOLOGY BETWEEN PYRENOPHORA JAPONICA AND P-TERES.** *Mycological Research. 99(Part 9):1098-1102.* English. [UNIV STELLENBOSCH DEPT PLANT PATHOL STELLENBOSCH 7600 SOUTH AFRICA].

Pyrenophora isolates associated with net- and spot type net blotch of barley were compared with verified isolates of P. teres f. teres, P. teres f. maculata and P. japonica using total DNA banding patterns, morphology, symptomatology and mating studies. DNA of South African and overseas spot- and net-type isolates digested with Hae III and Msp I showed 74-100% similarity. Furthermore, spot- and net-type isolates could be mated to produce viable progeny, indicating P. teres to have two-allele heterothallism. Single-ascospores inoculated on differential barley cultivars produced spot net or mixed symptoms, suggesting that recombination has occurred. Based on the high degree of homology in DNA banding patterns between P. japonica and P. teres f. maculata, as well as similarities in symptom expression on differential cultivars and general morphology, P. japonica is proposed as synonym of P. teres. [References: 20].

748 Cselenyi, L. (Justus Liebig Univ., Giessen (Germany). Inst. fuer Pflanzenzuechtung 1); Erdogan, M.; Ordon, F.; Friedt, W. (1994) **[Suitability of infested leaf surfaces for the determination of quantitative resistance of barley against Rhynchosporium secalis (Oud.) J.J. Davis]. Eignung der befallenen Blattoberflaeche als Kriterium fuer die Erfassung quantitativer Resistenz der Gerste gegen Rhynchosporium secalis (Oud.) J.J. Davis.** *Nachrichtenblatt des deutschen Pflanzenschutzdienstes (Germany) v. 46(11) p. 247-251.* 2 ill., 3 tables; 29 ref. German. (AGRIS 95-155272).

Most breeders suggest that the ideal breeding strategy for field crops would be the use quantitative resistance. The application of this resistance requires an estimation method suitable to distinguish between genotypes with varying levels of symptoms. Rhynchosporium secalis causes necrotic leaf blotches on barley. Their size and extension can be estimated using the Percent Leaf Area Diseased (PLAD)-Method. The reaction of the investigated genotypes reveals that the PLAD-method is suitable to detect quantitative variation of in- fection. A 1-9 disease assessment scale is proposed for the estimationof PLAD resulting from infections of barley by Rhynchosporium secalis.

749 Dai Fuming; Zhou Shiming (Shanghai Academy of Agricultural Sciences (China). Inst. of Plant Protection) (1994) **Effects of bacteria and yeasts on controlling wheat scab (Fusarium graminearum) in greenhouses and fields.** *Chinese Journal of Biological Control (China) v. 10(4) p. 169-170.* 1 table; 2 ref. Chinese. (AGRIS 95-135603).

750 De Jong, W. (John Innes Centre, Norwich, UK.); Ahlquist, P. (1995) **Host-specific alterations in viral RNA accumulation and infection spread in a brome mosaic virus isolate with an expanded host range.** *Journal of virology (USA) v. 69(3) p. 1485-1492.* references. English. (AGRIS 95-155627).

To facilitate studies of virus-host interaction and the determinants of viral host range, we constructed full-length cDNA clones to all three genomic RNAs of an unusual brome mosaic virus (BMV) isolate with an expanded host range. While other BMV strains, including the previously cloned M1 strain, systemically infect barley and other grasses but not legumes, the expanded-host-range isolate and the set of transcripts from its cDNA clones, designated the M2 strain of BMV, systemically infect both barley and cowpea line TVu-612, a legume. All reassorted combinations of M1 and M2 genomic RNAs were equally competent for replication in barley protoplasts and systemic infection of barley plants but showed widely varying levels of viral RNA accumulation in cowpea protoplasts and systemic infection in TVu-612 cowpea plants. Systemic infection levels were influenced by all three genomic RNAs. M2 RNA2 and M2 RNA3 made independent and additive contributions to the frequency with which reassortants infected TVu-612

systemically. The greater individual effect segregated with M2 RNA3, which encodes functions required for infection spread (the 3a movement protein and coat protein). M2 RNA3 also directed accelerated expansion of BMV lesions in inoculated TVu-612 leaves. If the inoculum contained M2 RNA3, the frequency with which reassortants infected TVu-612 systemically could be further enhanced by the presence of M2 RNA1 rather than M1 RNA1. RNA1 encodes the 1a RNA replication protein, and despite similar accumulation in barley protoplasts, in cowpea protoplasts all reassortants bearing M2 RNA1 accumulated positive- and negative-strand RNAs to levels at least six- to eightfold higher than reassortants bearing M1 RNA1. Overall, the results indicate that changes in several distinct virus functions contribute to adapting BMV-M2 to systemically infect TVu-612 cowpea.

751 Delfosse, P.; Reddy, AS.; Devi, PS.; Murthy, AK.; Wesley, SV.; Naidu, RA.; Reddy, DVR, (1995) **A DISEASE OF WHEAT CAUSED BY INDIAN PEANUT CLUMP VIRUS (IPCV).** *Plant Disease. 79(10):1074.* English. [INT CROPS RES INST SEMI ARID TROP ASIA CTR DIV CROP PROTECT PATANCHERU 502324 ANDHRA PRADESH INDIA].

752 Delos, M. (Service Regional de la Protection des Vegetaux Midi Pyrenees, Balma (France)) (1995) **[Top [optimal eyespot treatment]: a forcasting model for wheat eyespot development]. Top [Traitement Optimal du Pietin-verse]: modele de prevision de l'evolution du pietin-verse.** *Phytoma La Defense des Vegetaux (France) (no 474) p. 26-28.* 7 ref. French. (AGRIS 95-155248).

753 Diekmann, M. (ICARDA, Aleppo (Syria)) (1993) **Epidemiology and geophytopathology of selected seed-borne diseases.** International Center for Agricultural Research in the Dry Areas, Aleppo (Syria). ICARDA. 22 tables; 15 fig., ref. 77 p. ICARDA--028. English. (AGRIS 95-155313).

This study in ICARDA's Seed Production series deals with seed-borne pathogens and their geographical distribution, looks at the relation between the distribution of selected seed-borne pathogens and climatic conditions, and indicates that it is possible to calculate a risk index for any location and any chosen planting time if long-term average data for weather data are available. Examples are given to illustrate how, with the help of statistical models, information with relevance for practical seed production can be gained.

754 Dimov, A. (Institut po Introduktsiya i Rastitelni Resursi "K. Malkov", Sadovo (Bulgaria)) (1995) **[Seed disinfection saves a lot of troubles]. Obezzarazyavaneto na semenata spestyava mnogo glavoboliya.** Institut po Zashchita na Rasteniyata, Kostinbrod (Bulgaria). Natsionalna Sluzhba za Rastitelna Zashchita, Karantina i Agrokhimiya k"m Ministerstvoto na Zemedelieto i Khranitelnata Promishlenost. *Rastitelna Zashchita (Bulgaria); Plant Protection v. 36(7) p. 9-10.* 2 tables. Bulgarian. (AGRIS 95-155210).

755 Djurle, A. (Sveriges Lantbruksuniversitet, Uppsala (Sweden)) (1995) **Glume blotch of wheat: Relationships between macroclimate, microclimate and disease increase [Stagonosporum nodorum].** Workshop on Weather Information and Plant Protection; Ultuna (Sweden); 9-10 Nov 1994. Statens Planteavlsforsoeg, Lyngby (Denmark). *SP-Rapport (Denmark) (no.10) p. 71-73.* 10 ref. English. (AGRIS 95-155237).

756 Dong Qingzhou (Henan Academy of Agricultural Sciences, Zhengzhou (China)) (1994) **Investigation and practice on the epiphytotic tendency prediction of spring wheat yellow dwarf virus in Ningxia [China].** *Acta Phytophylacica Sinica (China) v. 21(4) p. 297-303.* 5 tables; 6 ref. Chinese. (AGRIS 95-135497).

757 Duczek, L.J.; Jones Flory, L.L. (1993) **Relationships between common root rot, tillering, and yield loss in spring wheat and barley.** *Canadian journal of plant pathology = Revue Canadienne de phytopathologie (Canada) v. 15(3) p. 153-158.* references. English. (AGRIS 95-155263).

758 El Erakey, A.M.; Saeed, F.A.; Mohamed, M.S.; Amein, A.M. (Assiut Univ. (Egypt). Faculty of Agriculture) (1993) **Seed and root exudates of wheat cultivars in relation to the association of pathogenic fungi.** *Assiut Journal of Agricultural Sciences (Egypt) v. 24(4) p. 185-205.* 6 tables; 35 ref. English. (AGRIS 95-135615).

759 El Kazzaz, M.K. (Tanta Univ., El Sheikh (Egypt). Facultaet of Agricultural. Agricultural Botany Dept.); Bassiouni, A.; Hassan, M.A.; El Shamy, M.M. (1992) **Response of commercial wheat varieties to infection with two dominant stem rust races of Puccinia graminis Pers. f.sp. tritici Erikss and Henn.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 111-113.* 1 table; 12 ref. English. (AGRIS 95-135613).

760 Elzahaby, HM.; 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. 85(10):1225-1230.* English. [HUNGARIAN ACAD SCI INST PLANT PROTECT POB 102 H-1525 BUDAPEST HUNGARY].

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. [References: 38].

761 Engel, R. (Montana State University) (1994) **Effect of chloride fertilization on physiological leaf spot in winter wheat.** *Montana agresearch (USA) v. 11(1) p. 20-23.* English. (AGRIS 95-135585).

762 Eshetu Bekele (Institute of Agricultural Research Addis Abeba (Ethiopia)) (1993) **Mycotoxin Production Potential of Fusarium Species Identified from Ethiopian Wheat.** 1. Annual Conference Crop Protection Society of Ethiopia; Addis Abeba (Ethiopia); 14-15 Apr 1993. *Proceedings of the First Annual Conference Crop Protection Society of Ethiopia. Eshetu Bekele; Yitbarek Semeane; Tibebu Habtewold; Mengistu Kebede; Kasahun Bekele p.47-48.* CPSE. English. (AGRIS 95-155238).

Mycotoxins are seconday metabolites produced by fungi that are toxic to animals and hymans. They have been implicated in a number of human and animal disease syndromes (Mycotoxicoses). FAO has estimated that 25 percent of the world food crops and up to 50 percent of the crops in Africa are contaminated by mycotoxins. Many Fusarium species, apart from being pathogenic to cereal crops (eg. Fusarium Head Blight of wheat), produce various mycotoxins. A good example of Fusarium mycotoxicoses in human is Alimentary Toxic Aleukia (ATA) which was wide spread among the population of the Soviet Union during World War II. Two groups of mycotoxins: zearalenone and trichothecenes (and their derivatives) are produced by many toxigenic Fusarium strains. Seventy-eight isolates from 17 Fusarium species isolated from stored wheat seed and scabby heads were screened for mycotoxin production on solid and liquid media. The presence of the mycotoxins in culture filtrate was detected by thin-layer chromatography (TLC) and confirmed by gas chromatography-mass spectroscopy (GC-MS). Most of the isolates did not produce a detectable amount of any of the mycotoxins in potato dextrose broth (PDB) liquid medium. However, a few species and isolates produced some of the mycotoxins on corn grit and

rice solid media. Two Fusarium graminearum isolates produced low levels of 3=acetyldexynivalenol (3-ADON) and 15-acetyldeoxynivalenol (15-ADON). Both these isolates produced low level zearalenone. An isolate of F. sporotricioides which was a rare species isolated from Ethiopian wheat, however, produced a variety of trichothecenes on corn grits. The trichothecenes were neosolaniol, NT-1, 8-Acetylneosolaniol, 8-Propionylneosolaniol, 8-Isobutrylneoxolaniol, 8-n-Butrylneosolaniol, T-2 toxin, 8-n-Pentanoylneosolaniol and 8-n-Hexanoylneosolaniol. The last two trichothecenes are reported for the first time. The cytotoxicity of these two new trichothecenes in cultured body hamster kidney cells was comparable to that of T-2 toxin. Unlike most European and North American isolates, this isolate produced T-2 toxin as a minor product and neosolaniol as well as a number of C-8 substituted derivatives as major metabolites. F. nivale and F. avenaceum which were commonly isolated from scabby wheat heads in Ethiopia did not produce any of the mycotoxins under the different culturing conditions used or if present could not be detected with the procedures employed. The result indicated that although Fusarium head blight was a major problem to the wheat crop, the major species that caused the disease were not toxigenic to animals and humans.

763 Eversmeyer, M.G. (Kansas State Univ., Manhattan (USA). Agricultural Research Service. US Dept. of Agriculture. Dept. of Plant Pathology and Division of Biology); Kramer, C.L. (1992) **Models of multiple wheat disease epidemics in the great plains of the USA.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 103-105.* 1 table; 3 ref. English. (AGRIS 95-135612).

Preliminary analysis of loss data shows the optimum number of days over which the meteorological data is averaged varied from 7 to 30 days depending on the disease epidemic being analyzed. Meteorological variables from different epidemic dates were important in development of the best model for each disease. Substitution of data for ten days either side of the date did not significantly decrease the amount of variation explained by the factors in the model. Fall time periods were most important in soil-borne and wheat streak mosaic and barley yellow dwarf while late winter and early spring periods were more effective in the rusts and other foliar pathogens. Snow cover did not enter into any of the models as being important in explaining epidemic development of any of the diseases.

764 Ezzahiri, B. (Hassan 2 Rabat Inst. (Morocco). Dept. de Phytopathologie); Diouri, S.; Roelfs, A.P. (1992) **The role of the alternate host, Anchusa italica, in the epidemiology of Puccinia recondita f. sp. tritici on durum wheats in Morocco.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 69-70.* 1 table; 5 ref. English. (AGRIS 95-135580).

765 Felsenstein, F.G. (Technische Univ. Muenchen, Freising (Germany). Lehrstuhl fuer Pflanzenbau und Pflanzenzuechtung); Verreet, J.A.; Fischbeck, G. (1992) **Qualitative and quantitative aspects of a regional wheat mildew population.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 159-161.* 1 graph, 2 tables; 3 ref. English. (AGRIS 95-135396).

766 Friedrich, S. (1995) **CALCULATION OF CONIDIAL DISPERSAL OF ERYSIPHE GRAMINIS WITHIN NATURALLY INFECTED PLANT CANOPIES USING HOURLY METEOROLOGICAL INPUT PARAMETERS.** *Zeitschrift fur Pflanzenkrankheiten und Pflanzenschutz-Journal of Plant Diseases & Protection. 102(4):337-347.* German. [ZENT AGRARMETEOROL FORSCHUNGSSTELLE BUNDESALLE 50 D-38116 BRAUNSCHWEIG GERMANY].

The influence of climatic conditions upon spore flight of powdery mildew in winter wheat canopies was studied with the intention to develop a simulation model of the conidial dispersal of Erysiphe graminis DC. f. sp, tritici. Considering the whole vegetation period, the measured spore dispersal parallelled disease development in the mean. Looking at short periods, however, no relationship to disease level in the field could be found as due to differences in weather conditions considerable fluctuations of spore flight occurred from day to day. In the night, spore dispersal was less than the calculated sporulation indicating that the conidia produced during this period of the day will not be released until good dissemination conditions follow. The most important factors influencing spore dispersal were found to be wind velocity, vapour pressure deficit within the canopy as well as precipitation. At the onset of higher wind speeds as well as at the beginning or rain, conidial concentrations in the air measured every half hour were considerably higher than the values attained before. The highest spore concentrations in the air, however, could be caused by walking into a mildew-infected field. With the help of the presented model, it is possible for the first time to calculate the course of spore dispersal of a wind-born pathogen within a naturally infected plant canopy satisfyingly using meteorological input variables. [References: 39].

767 Friedrich, S. (1995) **CALCULATION OF THE INCUBATION PERIOD OF POWDERY MILDEW UNDER FIELD CONDITIONS.** *Zeitschrift fur Pflanzenkrankheiten und Pflanzenschutz-Journal of Plant Diseases & Protection. 102(4):348-353.* German. [ZENT AGRARMETEOROL FORSCHUNGSSTELLE BUNDESALLEE 50 D-38116 BRAUNSCHWEIG GERMANY].

The influence of climatic conditions on the incubation period of Erysiphe gr aminis on winter wheat was studied in two field *trials in connection* with the development of a mathematical model for the prognosis of infection probability by powdery mildew. The longest incubation period assessed on the artificially infected upper leaves of the canopy was 14, the shortest almost 6 days. By means of hourly canopy temperatures together with the presented temperature optimum curve (optimum 22 degrees C, maximum 26.5 degrees C), it is possible to calculate the incubation period adequately, 82 % of the values deviate less than 1 day from the measured data. According to the temperature optimum curve, the incubation period of the pathogen on field plants amounts to almost 4 days under optimal conditions. This can be explained by the greater resistance of the inoculated plant tissue compared with that of greenhouse planes or primary leaves. When successfully infected planes suffered from draught, incubation periods approximately 1 day longer than expected (calculated) were noted. [References: 18].

768 Friedrich, S. (1995) **MODELLING INFECTION PROBABILITY OF POWDERY MILDEW IN WINTER WHEAT BY METEOROLOGICAL-INPUT VARIABLES.** *Zeitschrift fur Pflanzenkrankheiten und Pflanzenschutz-Journal of Plant Diseases & Protection. 102(4):354-365.* German. [ZENT AGRARMETEOROL FORSCHUNGSSTELLE BUNDESALLEE 50 D-38116 BRAUNSCHWEIG GERMANY].

The influence of climatic factors upon spore dispersal, conidial germination, infection and incubation period of Erysiphe graminis f. sp. tritici on winter wheat was examined during three field and two climate chamber experiments. Applying the results of these studies and literature data a one dimensional, deterministic mathematical model, forecasting the infection probability by powdery mildew of winter wheat was developed. With hourly meteorological input variables (temperature and air humidity within the canopy, wind speed in 1 m height and precipitation) it is possible to simulate different phases of the pathogen's infection cycle (sporulation, spare dispersal, infection as well as incubation period). By means of the presented model, the course of sport dispersal within a naturally infected plant canopy in dependence on the weather conditions can be simulated satisfyingly for the first time. After conidial landing, mainly precipitation, but also high wind velocities and both very low and very high vapour pressure deficits of the air exhibit a negative effect upon the computed infection probability. Since the time of onset as well as the duration of precipitation strongly influence infection events, it follows that daily values are insufficient for the calculation of infection probability. With the help of this application-orientated forecasting model developed for the German Weather Service, infection events occurring at the beginning of the epidemic during spring are properly detected. For the early proposed control of powdery mildew, the model, thus, provides a reliable aid for decision-making at the first occurrence of disease. [References: 42].

769 Fulgueira, Cecilia; Borghi, Alfredo; Gattuso, Marta; Gattuso, Susana; Bracalenti, Blanca (Universidad Nacional de Rosario, Santa Fe (Argentina). Fac. de Ciencias Bioquimicas y Farmaceuticas) (1992) **[Interaction of two toxigenic fungi with a strain of Streptomyces on the development of wheat seeds]. Interaccion de dos hongos toxicogenicos con una cepa de**

Streptomyces sobre el desarrollo de plantas de trigo. *Boletin Micologico (Chile) v. 7(1-2) p. 7-12.* 20 ref. Spanish. (AGRIS 95-155055).

770 Gallenberg, D. (South Dakota State University Cooperative Extension Service.) (1994) **1994 foliar fungicides for wheat, barley and oats.** *Extension extra / (USA); no. 8066 2 p.* English. (AGRIS 95-155345).

771 Gaunt, RE. (1995) **THE RELATIONSHIP BETWEEN PLANT DISEASE SEVERITY AND YIELD [Review].** *Annual Review of Phytopathology. 33:119-144.* English. [LINCOLN UNIV DEPT PLANT SCI POB 84 CANTERBURY NEW ZEALAND].

The relationship between disease and yield is most often summarized as a simple empirical model that describes average crop performances in the presence of a pathogen. Such models may be robust and useful for surveys but their use is usually constrained to the specific conditions under which the model was developed. Changes in production system usually invalidate the relationship. The alternative is to base the relationship on an epidemiological analysis of the pathogen population and a physiological concept of host growth and development. This review provides the knowledge and conceptual basis and discusses the limitations to progress in the development of such models. It is shown that a host-based assessment of disease is well suited to yield investigations and to multiple pest constraints, and that disease is logically related to yield via radiation interceptions and radiation use efficiency. [References: 125].

772 Heitefuss, R. (Goettingen Univ. (Germany). Inst. fuer Pflanzenpathologie und Pflanzenschutz); Glattkowski, H.; Lassak, V.; Bodendoerfer, H. (1994) **[<1. Occurrence, epidemic spreading of fungal diseases and their effect on crop yields of winter wheat depending on influence of year's weather and production methods as well as the development of systems for selective use of fungicides> 1.4. Development and evaluation of growthstage specific disease-loss ratios of mildew (Erysiphe graminis DC f. sp. tritici Marchal) on winter wheat]. 1. Auftreten, epidemische Ausbreitung und Ertragswirksamkeit von Pilzkrankheiten des Weizens in Abhaengigkeit von Jahreseinfluss und Produktionstechnik sowie die Entwicklung von Systemen zur gezielten Anwendung von Fungiziden. 1.4. Ermittlung und ueberpruefung stadienspezifischer Befalls-Verlust-Relationen von Mehltau (Erysiphe graminis DC f. sp. tritici Marchal) an Winterweizen.** *Integrated plant production. Research report. Final research report on a priority program "development of an integrated system of crop production with regard to economic and ecological aspects of plant protection in wheat crops". Heitefuss, R. (ed.); Holtschulte, B.; Niemann, M. Deutsche Forschungsgemeinschaft, Bonn (Germany) v. 2 p. 42-56.* VCH. 3 ill., 9 tables; 23 ref. German. (AGRIS 95-155349).

In several years field experiments with different winter wheat cultivars and intensities of N-fertilization the mildew incidence (Erysiphe graminis) was continuously recorded and stopped by fungicide applications at different dates. The yield was determined and correlated to the average percentage mildew present at the upper three leaves at the start of fungicide protection. For the wheat growth stages EC 32 to EC 71 disease/loss-ratios were calculated. On their basis and a preliminary control threshold corresponding to 1.6 dt/ha yield loss, dates for necessary fungicide applications in 1990 were determined. From the data of three field experiments in 1987, 1988 and 1989, additional standard disease-respectively loss-functions were derived and utilized for prediction of the yield loss to be expected at a given mildew disease incidence. Comparing the predicted with the in fact measured yield loss shows partly a good, partly a not sufficient agreement. This is due to the systems immanent variability with the determination of small yield differences in field experiments. In spite of this however, the attempt appears promising to predict on the basis of growth stage specific disease/loss-ratios or functions the yield loss caused by mildew. Thereby it should be possible to develop control thresholds by means of which the applications of fungicides could be reduced to an economically justified level.

773 Hempler, C. (1993) **[<Influence of manganese fertilizer on leaf disease and yields of winter wheat and winter barley in reliance on plant density, nitrogen fertilizer and fungicide application>]. Einfluss der Manganduengung auf den Blattkrankheitsbefall und die Ertragsbildung von Winterweizen und Wintergerste in Abhaengigkeit von Saatstaerke, N-Duengung und Fungizideinsatz.** Kiel Univ. (Germany). Agrarwissenschaftliche Fakultaet. Selbstverlag. 85 ill., 66 tables. Bibliography p. 294-322. 345 p. German. (AGRIS 95-155358).

774 Henriksson, M. (Hushaallningssaellskapet, Skara (Sweden)) (1995) **[Host plant range of Swedish isolates of Verticillum dahliae]. Undersoekning av vaerdvaexter till svenska isolat av kransmoegel, Verticillium dahliae.** *Vaextskyddsnotiser (Sweden) v. 59(3) p. 92-96.* 15 ref. Swedish. (AGRIS 95-155442).

775 Hoffmann, G.M. (Technische Univ. Muenchen, Weihenstephan (Germany). Lehrstuhl fuer Phytopathologie); Verreet, J. A. (1994) **[<1. Occurrence, epidemic spreading of fungal diseases and their effect on crop yields of winter wheat depending on influence of year's weather and production methods as well as the development of systems for selective use of fungicides> 1.5. The development of an integrated system of plant protection against foot-, leaf-, and ear-diseases in wheat crops]. 1. Auftreten, epidemische Ausbreitung und Ertragswirksamkeit von Pilzkrankheiten des Weizens in Abhaengigkeit von Jahreseinfluss und Produktionstechnik sowie die Entwicklung von Systemen zur gezielten Anwendung von Fungiziden. 1.5. Entwicklung eines integrierten Systems des Pflanzenschutzes gegen Fuss-, Blatt- und uehrenkrankheiten an Weizen.** *Integrated plant production. Research report. Final research report on a priority program "development of an integrated system of crop production with regard to economic and ecological aspects of plant protection in wheat crops". Heitefuss, R. (ed.); Holtschulte, B.; Niemann, M. Deutsche Forschungsgemeinschaft, Bonn (Germany) v. 2 p. 57-71.* VCH. 4 ill., 5 tables; 20 ref. German. (AGRIS 95-155350).

Epidemiological studies about the population dynamics of fungal pathogens in wheat crop systems in connection with the use of fungicides resulted in definitions of thresholds. The pathogen specific thresholds were proofed for several years, and summarized in a conception of an integrated system of pest-management in wheat crops ("IPS Weizenmodell Bayern"). The system was evaluated over years with variations in cultivars, nitrogen fertilization and sowing dates. The advantages of the model were evident by comparison with other variants, the use resulted in an optimal integration of plant protection measures. Basis of the system is the accurate qualitative and quantitative diagnosis of the pathogens with a special frame, the cereal diagnostic system by Verreet/Hoffmann. Exceeding the DGF project the decision model was introduced to the advisory system in Bavaria with success. In cooperation with a greater number of farm leaders (1991 = 87 farms) the acceptance was high and the results encourage for a successful introduction into wheat crop systems in generally.

776 Hoffstadt, T. (1995) **[Understanding powdery mildew-barley system to prevent resistances development]. Comprendre le pathosysteme oidium-orge. Pour que durent les resistances varietales.** *Perspectives Agricoles (France) (no 204) p. 55-59.* French. (AGRIS 95-135523).

777 Hovmoeller, M.S. (Danish Inst. of Plant and Soil Science, Lyngby (Denmark). Dept. of Plant Pathology. Research Centre for Plant Protection); Oestergaerd, H.; Munk, L. (1992) **Patterns of changes in virulence gene frequencies of relevance for barley powdery mildew populations.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 141-143.* 2 graphs; 6 ref. English. (AGRIS 95-135391).

Selection for one virulence gene may result in decline in frequency of another virulence gene due to hitch-hiking. The size of the decline in frequency of a specific gene depends on the amount of negative gametic disequilibrium generated in the population in previous years between this gene and other genes under selection. Further, the results imply that analysis and interpretation of temporal changes in virulence gene frequencies, e.g., in relation to estimation of selection forces, should be based on the frequency of virulence genotypes including single gene frequencies as well as gametic disequilibria.

778 Huang, R. (Giessen Univ. (Germany). Tropeninst.); Kranz, J. (1992) **Virulence of powdery mildew collected from barley plants with different resistance genes.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 156-158.* 2 tables; 7 ref. English. (AGRIS 95-135526).

779 Huerta Espino, J. (Minnesota Univ., St. Paul (USA). USDA ARS Cereal Rust Lab.); Roelfs, A.P. (1992) **Leaf rust on durum wheats.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 100-102.* 1 table; 9 ref. English. (AGRIS 95-135596).

The differences in virulence of leaf rust isolated from durum and bread wheat were unexpected. There is no way to judge the taxonomic significance of differences observed. However, it became very evident that cultures isolated from durum wheat usually are virulent to few of the most susceptible bread wheat cultivars and some were not virulent to any of the bread wheat lines or cultivars tested. These isolates were often virulent to many of the durum cultivars tested. Likewise, the most virulent isolates from bread wheat were often avirulent to durum wheat cultivars and lines. Both types of isolates often occurred in the same country and sometimes at the same location as at the CIRNO station in Mexico and the La Platina station in Chile. However, in Turkey, the distinction between the durum and bread wheat rust populations was the least distinct in terms of virulence patterns. In breeding programs involving both bread and durum wheat, it is essential to know whether both leaf rust populations are present.

780 Iliev, I. (Institut po Pshenitsata i Sl"nchogleda "Dobrudzha", General Toshevo (Bulgaria)) (1994) **[A method to evaluate wheat resistance to powdery mildew pathogen under laboratory conditions]. Metod za laboratorna otsenka na ustojchivostta k"m prichinitelya na brashnesta mana pri pshenitsata.** Selskostopanska Akademiya, Sofia (Bulgaria). *Rasteniev"dni Nauki (Bulgaria); Plant Science v. 31(7-10) p. 239-243.* 2 tables; 15 ref. English. *(AGRIS 95-155235).*

781 Inglis, GD.; Johnson, DL.; Goettel, MS. (1995) **EFFECTS OF SIMULATED RAIN ON THE PERSISTENCE OF BEAUVERIA BASSIANA CONIDIA ON LEAVES OF ALFALFA AND WHEAT.** *Biocontrol Science & Technology. 5(3):365-369.* English. [AGR & AGRI FOOD CANADA RES CTR POB 3000 LETHBRIDGE AB T1J 4B1 CANADA].

The effect of simulated rain at two intensities (26.7 or 112.7 mm h(-1)) and durations (30 or 60 min) on the persistence of Beauveria bassiana conidia applied in water on leaves of alfalfa (Medicago sativa) or wheat (Triticum aestivum) was investigated. Initial populations of conidia on the leaves of both crops were similar, and ranged from 1.7 X 10(5) to 3.5 X 10(5) colony-forming units cm(-2). The simulated rain reduced the concentration of conidia on leaves by 28-61%. Although there was a slight effect due to rain intensity for alfalfa, there, oar no influence of either rain duration or crop type on the retention of B. bassiana conidia. [References: 13].

782 Jevtic, R. (Institut za ratarstvo i povrtarstvo, Novi Sad (Yugoslavia)); Jerkovic, Z.; Balaz, F.; Pribakovic, M. (1995) **[Wheat and barley diseases in 1993/94 [in Serbia, Yugoslavia]]. Analiza pojave bolesti na psenici i jecmu u 1993/94. godini [u Srbija, Jugoslavija].** 29. seminar agronoma; Vrnjacka Banja (Yugoslavia); 30 Jan - 4 Feb 1995. *Zbornik radova - Poljoprivredni fakultet u Novom Sadu, Institut za ratarstvo i povrtarstvo (Yugoslavia) (no. 23) p. 181-189.* 2 tables; 6 ref. Serbian. (AGRIS 95-135541).

Last year (1993/94), all favourable conditions occurred for primary infections and development of obligatory parasites, particularly Puccinia *recondita tritici and* Erysiphe graminis tritici. The occurrence of septoria (Septoria spp.), and bunt and loose smut of wheat (Tilletia spp. and Ustilago spp.) was significant, while the occurrence of cereal scab (Fusarium spp.) was less significant. Additionally to Erysiphe graminis hordei and Puccinia hordei, barley was damaged significantly by Helminthosporium spp. and Rhynchosporium secalis.

783 Jin, Y. (North Dakota State Univ., Fargo (USA). Dept. of Plant Pathology); Steffenson, B.J. (1992) **Puccinia coronata Corda var. hordei Jin and Steff. var. nov: morphology and pathogenicity on grasses.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 57-59.* 9 ill., 1 table; 2 ref. English. (AGRIS 95-135536).

784 Jin, Y.; Steffenson, BJ.; Bockelman, HE. (1995) **EVALUATION OF CULTIVATED AND WILD BARLEY FOR RESISTANCE TO PATHOTYPES OF PUCCINIA HORDEI WITH WIDE VIRULENCE.** *Genetic Resources & Crop Evolution. 42(1):1-6.* English. [N DAKOTA STATE UNIV DEPT PLANT PATHOL FARGO, ND 58105 USA].

An isolate of Puccinia hordei (ND89-3) originally collected in Morocco is virulent on most barley genotypes reported to possess resistance, except cultivar Estate (CI 3410), which possesses the Rph3 gene and exhibits a low to intermediate level of resistance (infection type 12). Isolate ND89-3 possesses one of the widest virulence spectrums reported for P. hordei. Accessions of Hordeum vulgare (1, 997 in total) and H. spontaneum (885 in total), mostly originating from the Mediterranean region and parts of North Africa, were evaluated with isolate ND89-3 at the seedling stage to identify new sources of leaf rust resistance. Fifty-eight accessions of H. vulgare, and 222 accessions of H. spontaneum exhibited low infection types to this isolate. Further evaluations of these resistant accessions with isolates of P. hordei virulent for Rph3, Rph7, and Rph12 suggested that most of the resistant H. vulgare accessions possess the Rph3 gene. Data suggested additional sources of effective resistance in H. vulgare are rather limited. Five H. vulgare accessions and 167 H. spontaneum accessions were identified as possible sources of new genes for leaf rust resistance. These accessions likely possess resistance genes that are different from Rph1 to Rph12, or gene combinations thereof based on their reaction to four leaf rust isolates. Utilization of these accessions in barley breeding will broaden the germplasm resources available for genetic control of P. hordei. [References: 19].

785 Karadzhova, J. (Institut za Zashchita na Rasteniyata, Kostinbrod (Bulgaria)); Zapryanov, S.; Mersinkov, N.; V"lcheva, D. (1994) **[Study on the reaction of barley cultivars and samples to agents of Fusarium on the barley ears]. Prouchvane otnoshenieto na sortove i obraztsi echemik k"m prichiniteli na fuzarioza po klasa.** Selskostopanska Akademiya, Sofia (Bulgaria). *Rasteniev"dni Nauki (Bulgaria); Plant Science v. 31(7-10) p. 83-86.* 1 table; 6 ref. English. (AGRIS 95-155262).

786 Khan, A.; Spilde, LA. (1995) **THE INFLUENCE OF PROPICONAZOLE FUNGICIDE APPLICATION ON HARD RED SPRING WHEAT CULTIVARS.** *Pakistan Journal of Botany. 27(1):179-186.* English. [NW FRONTIER PROV AGR UNIV DEPT AGRON PESHAWAR PAKISTAN].

The effect of foliar applied systemic fungicide propiconazole (1-[[2-2, 4 dichlorophenyl) on the agronomic. seed quality, and economic response of hard spring wheat (Triticum aestivum L.) was investigated under rain-fed conditions. Propiconazole applied at Feekes growth stage (GS) 10 suppressed leaf spot disease but had no effect on grain yield or other traits measured. Percent reflectance of 800 nm wavelength radiation increased as the visually estimated leaf spot disease severity decreased following fungicide treatment, indicating that foliar reflection may be an efficient and reliable assessment of foliar disease. The use of propiconazole to control foliar diseases and maximize spring wheat production is not economically feasible under other similar environmental conditions.

787 Khatzkevich, LK.; Nesterov, AN. (1994) **COMPLEX OF SPRING WHEAT ROOT ROT PATHOGENS IN SOUTH URAL.** *Mikologiya i Fitopatologiya. 28(6):71-75.* Russian. [ALL RUSSIAN PLANT PROTECT INST ST PETERSBURG RUSSIA].

788 Kiecana, I. (1994) **[Studies on a head *fusariosis* of spring barley (Hordeum vulgare L.) taking into consideration susceptibility of varieties and contents of mycotoxins in grain]. Badania nad fuzarioza klosow jeczmienia jarego (Hordeum vulgare L.) z uwzglednieniem podatnosci odmian i zawartosci mikotoksyn w ziarnie.** Akademia Rolnicza, Lublin (Poland). *Rozprawy Naukowe. Akademia Rolnicza w Lublinie (Poland); no. 161 49 p.* Wydawnictwo Akademii Rolniczej. 12 fig., 21 tables; 99 ref. Polish. (AGRIS 95-155276).

789 Kimpinski, J.; Johnston, HW. (1995) **EFFECTS OF ALDICARB AND FUNGICIDES ON PRATYLENCHUS PENETRANS POPULATIONS, ROOT ROT AND NET BLOTCH SEVERITY ON BARLEY.** *Phytoprotection. 76(1):9-16.* English. [AGR & AGRIFOOD CANADA RES CTR CHARLOTTETOWN PE C1A 7M8 CANADA].

Population levels of the root lesion nematode, Pratylenchus penetrans, which produces necrotic lesions in the root cortex, were recorded in barley (Hordeum vulgare) in experimental plots during 1988, 1989, and 1990. Root lesion nematodes were the only endoparasitic nematodes recovered from barley roots and were the dominant nematode group found in the soil. Based

on 3-yr averages, root rot ratings, caused primarily by Cochliobolus sativus and Fusarium spp., increased from 27% at Zadoks Growth Stage (ZGS) 30-32 in July to 73% at ZGS 70-72 in late August and early September. Net blotch (incited by Pyrenophora teres) was suppressed by a fungicide treatment consisting of a seed application of carbathiin and thiram, and a foliar application of propiconazole. Aldicarb suppressed the populations of root lesion nematodes in the soil, in the total root system, and in crown and seminal roots of barley. Yields were increased by ca 30% where aldicarb and fungicides were applied as a combined treatment. Population densities of root lesion nematodes were much greater in seminal roots than in crown roots at ZGS 30-32 and 55-60. Correlation coefficients between nematodes and yield data were often negative and significant (P less than or equal to 0.05). There were no consistent trends in the numerical relationships between numbers of root lesion nematodes in roots or soil, and incidences of net blotch or root rot of barley. [References: 25].

790 Kloppers, F.J. (Orange Free State Univ., Bloemfontain (South Africa). Dept. of Plant Pathology); Pretorius, Z.A. (1992) **Histological studies of pathotype and temperature effects on leaf rust resistance conferred by Lr29 in wheat.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 8-10.* 6 ref. English. (AGRIS 95-135611).

Seedlings of leaf rust-susceptible and resistant varieties were inoculated and the stages of fungal development were studied. This study showed that Lr29 conditions posthaustorial resistance, typical of most major rust resistance genes. Histological evidence is also presented that the interaction between a leaf rust pathotype and Lr gene in wheat is strongly influenced by temperature and time. In relation to haustorium formation, however, the basic mechanism of Lr29 resistance was not altered. It appears that comprehensive histological characterization of resistance should also consider variables such as temperature, time, pathotype and probably host growth stage.

791 Kloppers, F.J.; Pretorius, Z.A. (Orange Free State Univ., Bloemfontein (South Africa). Dept. of Plant Pathology); Van Lill, D. (1995) **Field evaluation of leaf rust severity, yield loss and quality characteristics in near-isogenic wheat lines with Lr29, Lr35 or Lr37.** *South African Journal of Plant and Soil (South Africa) v. 12(2) p. 55-58.* English. (AGRIS 95-135626).

792 Knaufbeiter, G.; Dahmen, H.; Heye, U.; Staub, T. (1995) **ACTIVITY OF CYPRODINIL - OPTIMAL TREATMENT TIMING AND SITE OF ACTION.** *Plant Disease. 79(11):1098-1103.* English. [CIBA GEIGY LTD CIBA CROP PROTECT BUSINESS UNIT DIS CONTROL CH-4002 BASEL SWITZERLAND].

Cyprodinil, a fungicide with a new mode of action, was recently introduced by Ciba-Geigy for foliar application on cereals, grapes, vegetable crops, and deciduous fruits. In greenhouse studies, the protective and curative activity of cyprodinil was determined against Erysiphe graminis f. sp. tritici on wheat, Drechslera teres on barley, and Venturia inaequalis on apples. Cyprodinil significantly reduced fungal infection stages that are formed after penetration of the leaf. Foliar applications of 600 mg a.i./liter of cyprodinil provided 90 to 100% control of E. graminis leaf symptoms after 7-day protective and 5-day curative applications. Curative applications did not completely prevent symptom development; however, sporulation was reduced 100%. Histological studies showed that secondary haustoria were the stage in the infection cycle of E. graminis most sensitive to cyprodinil. Symptom development of V. inaequalis was reduced 90 to 100% following 6-day protective and 3-day curative applications with 100 mg a.i./liter. This was mainly based on reduction in the growth of the subcuticular stroma. Application of 200 mg a.i./liter of cyprodinil provided 80 to 90% reduction in lesion area of D. teres within an effective application period lasting from 7-day protective to 2-day curative. Histological observations of late infection stages of D. teres were difficult, but it is hypothesized that the activity of cyprodinil against D. teres is based on the inhibition of intra- and intercellular mycelial growth. [References: 17].

793 Knudsen, IMB.; Hockenhull, J.; Jensen, DF. (1995) **BIOCONTROL OF SEEDLING DISEASES OF BARLEY AND WHEAT CAUSED BY FUSARIUM CULMORUM AND BIPOLARIS SOROKINIANA - EFFECTS OF SELECTED FUNGAL ANTAGONISTS ON GROWTH AND YIELD COMPONENTS.** *Plant Pathology. 44(3):467-477.* English. [ROYAL VET & AGR UNIV DEPT PLANT BIOL PLANT PATHOL SECT FREDERIKSBERG DENMARK].

The purpose of this study was to verify, under natural conditions, biological control effects obtained in a former screening programme against Fusarium culmorum. The most successful antagonists against seedborne Fusarium culmorum um and Bipolaris sorokiniana were isolates of Chaetomium sp., Idriella bolleyi and Gliocladium roseum. These results were also obtained when the antagonists were applied to B. sorokiniana-infected barley sown in field soil in pots. In held experiments, G. roseum gave the best control of F. culmorum in winter wheat. One month after sowing, germination increased by 170%, the disease index decreased by 73% and plant dry weight increased by 25%, compared to untreated plots. At harvest, the number of tillers per row was found to have increased by 53%, yield had increased by 160% and the 1000-grain weight had increased by 4%. For all evaluated parameters the effect was significantly different from the untreated plots and not significantly different from the plots treated with the fungicide, Sibutol LS 280. I. bolleyi gave a lower but still significantly effective control, when evaluated for disease index and numbers of tillers per row, while Chaetomium sp. did not show any reduction in the disease. Furthermore, in held experiments using barley infected with B. sorokiniana, a significant effect of G. roseum was demonstrated as increased plant dry weight after 1 month and increased 1000-grain weight at harvest. The disease-controlling effect of G. roseum on F. culmorum was shown in a field experiment with spring barley. [References: 32].

794 Kobayashi, I.; Murdoch, LJ.; Kunoh, H.; Hardham, AR. (1995) **CELL BIOLOGY OF EARLY EVENTS IN THE PLANT RESISTANCE RESPONSE TO INFECTION BY PATHOGENIC FUNGI.** *Canadian Journal of Botany-Revue Canadienne de Botanique. 73(Suppl 1 A-D):S 418-S 425.* English. [AUSTRALIAN NATL UNIV RES SCH BIOL SCI PLANT CELL BIOL GRP CANBERRA ACT 2601 AUSTRALIA].

In addition to passive (or constitutive) defence mechanisms, plants have evolved a range of active (or inducible) responses that occur rapidly on infection with an incompatible (avirulent) pathogen and that are thought to play a major role in the expression of resistance. These defence reactions are only induced if the plant possesses the ability to recognize and respond to the pathogen. Signal reception by the host must initiate a cascade of events that lead to the expression of resistance. Some resistance responses, such as callose deposition, do not require the expression of new genes. Many responses, for example the synthesis and secretion of toxic compounds or molecules that enhance the strength of physical barriers, result from changes in the pattern of gene transcription. Other defence phenomena include hypersensitive cell collapse, intercellular signalling, and the induction of defence gene transcripts in surrounding cells. Changes in cell biochemistry and physiology are accompanied by characteristic structural modifications in the infected cells, such as the redeployment of selected organelles and dramatic modifications of the host cell wall. Recent evidence indicates that microtubules and microfilaments of the plant cytoskeleton facilitate the rapid localization of these and other plant defence responses to the region of infection. [References: 124].

795 Koch, G. (Giessen Univ. (Germany). Inst. fuer Pflanzenbau und Pflanzenzuechtung 2. Biometrie und Populationsgenetik); Koehler, W. (1992) **DNA restriction fragment length analysis and DNA fingerprinting of the European barley powdery mildew population (Erysiphe graminis hordei).** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 34-36.* 2 graphs; 3 ref. English. (AGRIS 95-135390).

Selection of resistant Hordeum vulgare varieties and the application of fungicides are effective on the adaptation of Erysiphe graminis populations. This was analysed using RFLP and DNA fingerprinting. Looking for similarities between individual isolates one large cluster was found which consists of identical fingerprint patterns. Most of these isolates derived from the same sampling route expressed the same MLH and the same pathotype, indicating a high probability that these isolates originated from one clone. For the total population a high level of individual variation (fingerprints) with clear dissimilarities between Denmark/England in the north, Italy in the south and the other countries were found. It is supposed that the northwestern European population consists of not clearly separated local subpopulations which intermix and does not evolve independently. If it is assumed that virulence and fungicide selection is low or not present in North-Italy, then the higher variance between the Italian subsamples, left

demonstrates the natural occurring variability in the pathogen population. The opposite was found for the German (Flensburg) subsample. Under the regime of virulence and fungicide selection, genetic variation can only be maintained for those traits which are significantly variable like fingerprints and not for most of the gene markers.

796 Kolmer, J.A. (Agriculture Canada, Winnipeg (Canada)) (1992) **Selection in a sexual population of the wheat leaf rust fungus, Puccinia recondita.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 66-68.* 3 ref. English. (AGRIS 95-135483).

797 Krone, C. (Hannover Univ. (Germany). Inst. fuer Pflanzenkrankheiten und Pflanzenschutz) (1994) **[The effect of induced resistance on the sink-source relationships between winter barley and Erysiphe graminis f.sp. hordei]. Zum Einfluss induzierter Resistenz auf die 'sink-source'-Beziehungen zwischen Echtem Mehltau und Wintergerste.** Hannover Univ. (Germany). Fachbereich Biologie. 15 ill., 11 tables. Bibliography 168 ref. 99 p. German. (AGRIS 95-155264).

798 Leath, S. (North Carolina State Univ., Raleigh (USA). United States Dept. of Agriculture/Agricultural Research Service. Dept. of Plant Pathology) (1992) **Determination of virulence frequency thresholds associated with epidemic development on wheat lines with different powdery mildew resistance genes.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 166-168.* 3 tables; 2 ref. English. *(AGRIS 95-135582).*

799 Leithold, B. (Halle Wittenberg Univ., Hohenthurn (Germany). Inst. of Plant Breeding and Seed Production) (1992) **Studies of competitive behaviour between mildew and rust on winter wheat material.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 94-96.* 2 graphs; 3 ref. English. (AGRIS 95-135581).

800 Liu Hongyan (Henan Academy of Agricultural Science, Zhengzhou (China). Inst. of PLant Protection) (1994) **The effect of wheat seeds bearing coloured embryo on the growth of wheat seedlings.** *Plant Protection (China) v. 20(6) p. 22.* 2 tables. Chinese. (AGRIS 95-135606).

801 Liu Siheng (Fujian Agricultural Univ., Fuzhou (China). Dept. of Agronomy) (1994) **Research progress on the morphological and structural resistance of wheat to scabs.** *Fujian Science and Technology of Rice and Wheat (China) (no. 4) p. 43-47.* Chinese. (AGRIS 95-135508).

802 Los, O. (Department of Agriculture, Glen (South Africa). Glen Agricultural Development Inst.); Baard, S.W.; Marasas, W.F.O.; Burgers, S.A. (1994) **The effect of crop rotation with wheat and oats on the incidence of Fusarium crown rot of wheat.** *South African Journal of Plant and Soil (South Africa) v. 11(4) p. 170-177.* English. (AGRIS 95-135625).

803 Lund, R.E. (Montana State University, Bozeman, MT.); Scharen, A.L. (1992) ***An example* of path analysis applied to classification variables.** *Kansas State University Conference on Applied Statistics in Agriculture (USA) p. 213-221.* references. Meeting held April 26-28, 1992, Manhattan, Kansas. English. (AGRIS 95-155239).

804 Lyon, GD.; Reglinski, T.; Newton, AC. (1995) **NOVEL DISEASE CONTROL COMPOUNDS - THE POTENTIAL TO IMMUNIZE PLANTS AGAINST INFECTION [Review].** *Plant Pathology. 44(3):407-427.* English. [SCOTTISH CROP RES INST DEPT BACTERIOL & MYCOL DUNDEE DD2 5DA SCOTLAND].

805 Makkouk, K.M.; Kumari, S.G. (ICARDA, Aleppo (Syria)) (1993) **Production of antisera for sensitive detection of two cereal viruses by different ELISA variants [Hordeum vulgare].** *RACHIS (ICARDA); Barley and Wheat Newsletter v. 12(1-2) p. 24-27.* 1 table; 1 fig., 10 ref. English. (AGRIS 95-155282).

Antisera for Syrian isolates of barley stripe mosaic virus (BSMV) and a PAV isolate of barley yellow dwarf virus (BYDV) were produced and used for the detection of these viruses using different ELISA variants. In comparison with the double antibody sandwich ELISA, the most sensitive procedure was ELISA with enzyme amplification (EA-ELISA), where BSMV and BYDV were detected in sap dilutions of 1:1, 310, 720 and 1:5, 120, respectively. In purified virus preparations and by using EA-ELISA, BSMV and BYDV were detected at concentrations of 0.5 and 50 pg, respectively. Other ELISA variants, such as dot-blot ELISA and by using either chromogenic or chemiluminescent substrates, also proved suitable for sensitive detection of both viruses. Penicillinase-based ELISA was adequate for BSMV but not for BYDV detection.

806 Mamluk, O.F. (ICARDA International Center for Agricultural Research in the Dry Areas, Aleppo (Syria)); El Naimi, M. (1992) **Occurrence and virulence of wheat yellow rust in Syria.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 115-117.* 2 tables; 3 ref. English. (AGRIS 95-135486).

807 Manninger, K. (Hungarian Academy of Sciences, Budapest (Hungary). Plant Protection Inst.) (1992) **Occurrence and virulence of wheat leaf rust in Hungary.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 84-86.* 6 ref. English. (AGRIS 95-135593).

808 Masse, J. (Institut Technique des Cereales et des Fourrages, Paris (France)) (1995) **[Crop managment and quality [diseases control and weed control]]. Itineraire technique et qualite: des facteurs a ne pas negliger.** *Perspectives Agricoles (France) (no 203) p. 18-19.* French. (AGRIS 95-135512).

809 Maumene, C. (Institut Technique des Cereales et des Fourrages, Paris (France)) (1995) **[Systemic or contact activity [how does fungicide work]]. Mieux connaitre pour mieux comprendre les interactions plante-pathogene-fongicide.** *Perspectives Agricoles (France) (no 203) p. 108-111.* 5 graph. French. (AGRIS 95-135513).

810 Mcdonald, BA.; Pettway, RE.; Chen, RS.; Boeger, JM.; Martinez, JP. (1995) **THE POPULATION GENETICS OF SEPTORIA TRITICI (TELEOMORPH MYCOSPHAERELLA GRAMINICOLA).** *Canadian Journal of Botany-Revue Canadienne de Botanique. 73(Suppl 1 A-D):S 292-S 301.* English. [TEXAS A&M UNIV DEPT PLANT PATHOL & MICROBIOL COLLEGE STN, TX 77832 USA].

The DNA-based markers of molecular genetics were combined with the analytical tools of population genetics to learn about the population biology of the wheat pathogen Mycosphaerella graminicola. DNA-based genetic markers, including restriction fragment length polymorphisms in nuclear and mitochondrial DNA, DNA fingerprints, and electrophoretic karyotypes were used in combination to show that the amount and distribution of genetic variation within and among field populations of M. graminicola is similar around the world. Measures of gametic disequilibrium suggested that the sexual stage of reproduction has a more significant impact on the genetic structure of M. graminicola populations than asexual reproduction. A field experiment conducted over a 3-year period showed that populations had a high degree of genetic stability over time. The potential effects of selection were quantified in a cultivar mixture experiment with four wheat cultivars that varied in resistance to M. graminicola. In combination, these experiments demonstrated the utility of selectively neutral genetic markers to elucidate the population genetics of fungi. [References: 26].

811 McMullen, M.P. (North Dakota State University, Fargo, ND.); *Franel, L.* (1993) **Tan spot of wheat.** *NDSU Extension Service : [publication] (USA); no. PP-766, rev. 4 p.* English. (AGRIS 95-155339).

812 Mercer, P.C. (Plant Pathology Research Div., Belfast (Ireland). Dept. of Agriculture for N. Ireland) (1992) **Physiologic specialisation of barley mildew in N. Ireland.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 147-149.* 2 graphs; 4 ref. English. (AGRIS 95-135393).

813 Milus, E.A. (University of Arkansas); Mirlohi, A.F. (1994) **Source of inoculum for bacterial streak of wheat.** *Arkansas farm research (USA) v. 43(2) p. 10-11.* references. English. (AGRIS 95-135629).

814 Mueller, K. (Eidgenoessisch Technische Hochschule, Zuerich (Switzerland). Inst. of Plant Sciences. Phytopathology Group); Zoubkovitch, A.; Kadirov, M.; Limpert, E.; Wolfe, M.S. (1992) **Virulence structure in the *barley* powdery mildew population of Byelorussia.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 153-155.* 1 graph, 2 tables; 1 ref. English. (AGRIS 95-135395).

815 Nielsen, J. (1993) **Hordeum jubatum and Elymus canadensis play no role in the epidemiology of loose smut of wheat in western Canada.** *Canadian journal of plant pathology = Revue Canadienne de phytopathologie (Canada) v. 15(2) p. 110-112.* references. English. (AGRIS 95-155336).

816 Nilsson, HE. (1995) **REMOTE SENSING AND IMAGE ANALYSIS IN PLANT PATHOLOGY [Review].** *Annual Review of Phytopathology. 33:489-527.* English. [SWEDISH UNIV AGR SCI DEPT PLANT PATHOL PHYTOPATHOMETRY LAB POB 7044 S-75007 UPPSALA SWEDEN].

This paper reviews various applications of remote sensing and image analysis in plant pathology. It describes technical methods and their possibilities, but also emphasizes the biological prerequisites and restrictions of practical applications. The subject area comprises many nondestructive and noninvasive methods to detect and assess plant diseases and stress objectively and cost-effectively, even though to date we cannot identify the specific cause of the damage. As a supplement to conventional methods, these new methods have great potential to facilitate and increase accuracy and precision in plant pathoiogical research. [References: 370].

817 Nkongolo, K.K.; Dostaler, D.; Couture, L. (1993) **[The effect of betaine hydrochloride, choline chloride and wheat anther extracts on the growth of Fusarium graminearum]. Effet de la betaine, de la choline et d'extraits d'antheres du ble sur la croissance du Fusarium graminearum.** *Canadian journal of plant pathology = Revue Canadienne de phytopathologie (Canada) v. 15(2) p. 81-84.* references. French. (AGRIS 95-155347).

818 Olbe, M.; Sommarin, M.; Gustafsson, M.; Lundborg, T. (1995) **EFFECT OF THE FUNGAL PATHOGEN BIPOLARIS SOROKINIANA TOXIN PREHELMINTHOSPOROL ON BARLEY ROOT PLASMA MEMBRANE VESICLES.** *Plant Pathology. 44(4):625-635.* English. [LUND UNIV DEPT PLANT BIOCHEM S-22100 LUND SWEDEN].

The effects of the phytotoxin prehelminthosporol from the fungal pathogen Bipolaris sorokiniana on the activities of the plasma membrane H+-ATPase, Ca2+- ATPase, and 1, 3-beta-glucan synthase in barley roots were investigated in vitro. Plasma membranes were isolated by aqueous polymer two-phase partitioning. Proton pumping by the H+-ATPase was drastically reduced in a dose-dependent manner, with complete inhibition at 500 mu M prehelminthosporol, while inhibition of ATP hydrolysis was less drastic, with a 35% inhibition at 500 mu M toxin. Ca2+ uptake was also reduced, although to a lesser extent than proton pumping, with a maximal inhibition of 60% at 500 mu M toxin. The 1, 3-beta-glucan synthase activity was weakly stimulated at toxin concentrations below 100 mu M, with higher concentrations being inhibitory. Taken together, our results indicate that prehelminthosporol exerts its effect in at least two ways. First, it appears to disrupt the membrane barrier and thus seriously interfere with establishment of the proton gradient that drives ion and nutrient uptake and affect the efflux of Ca2+ to maintain the low cytoplasmic concentration of Ca2+ essential for the function of Ca2+ as a messenger in signal transduction. Secondly, it appears to inhibit the enzyme activities. The 1, 3-beta-glucan synthase is activated by Ca2+ and can operate in the presence of low concentrations of prehelminthosporol (which may induce Ca2+ leakage into the cytoplasm and hence activate the enzyme), to produce callose to seal leaky membranes. [References: 36].

819 Orolaza, NP.; Lamari, L.; Ballance, GM. (1995) **EVIDENCE OF A HOST-SPECIFIC CHLOROSIS TOXIN FROM PYRENOPHORA TRITICI-REPENTIS, THE CAUSAL AGENT OF TAN SPOT OF WHEAT.** *Phytopathology. 85(10):1282-1287.* English. [UNIV MANITOBA DEPT PLANT SCI WINNIPEG MB R3T 2N2 CANADA].

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. F-2 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 Ptrchlorosis toxin. [References: 28].

820 Orsi, C.; Chiusa, G.; Rossi, V. (Universita Cattolica del Sacro Cuore, Piacenza (Italy)) (1994) **[Further investigations on the relationship between mycoflora of durum wheat kernels and black point incidence [Italy]]. Ulteriori indagini sulla micoflora delle cariossidi di frumento duro - in rapporto alla volpatura [Italia].** *Petria (Italy) v. 4(3) p. 225-236.* 2 tables; 4 graphs; 20 ref. Italian. (AGRIS 95-155372).

A study on the relationships between mycoflora of the kernels at dough stage and black point incidence at ripening previously carried out in Emilia was extended to Northern and Central Italy wheat-growing areas during the years 1990-92. Alternaria alternata (Fr.) Keissler was the prevalent black point agent: it was always isolated from wheat kernels at mealy ripeness (11.2 Feekes' growth stage) and was correlated to black point incidence at ripening (r=0.89, P<=0.01) according to a regression line with a slope equal to one. In two cases only, A. alternata infected seeds did not show high levels of discolouration. Drechslera sorokiniana (Sacc.) Subram et Jaim, practically absent in other sites, was positively correlated with black point incidence only at Ostellato (Ferrara) (P=0.94).

821 Pancaldi, D. (Bologna Univ. (Italy). Dept. di Protezione e Valorizzazione Agroalimentare. Sez. Fitoiatria); Alberti, I.; Nannetti, S. (1992) **Epidemiological studies on the powdery mildew (Erysiphe graminis f.sp. tritici) of common wheat (Triticum aestivum) and durum wheat (Triticum durum) in Northern Italy.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 172-174.* 2 graphs, 6 tables; 3 ref. English. (AGRIS 95-135584).

In the course of the present study the development of the disease was similar in both wheat species. The lower prevalence of disease recorded in the third zone in 1990 can presumably be attributed to the unusual climatic conditions, characterized by windy periods, and to a lower density of plants/square metre? The low levels of infection recorded in 1991 on durum wheat due to the sudden lowering of the average temperature and to the snowfalls which occurred throughout the region when the crop was in the shooting stage. These events caused the death of many plants and the subsequent thinning of the crop, and also alterations to the growth of the remaining plants. From a compressive analysis of the data it therefore appears that: in Emilia-Romagna the most significant increase in the incidence of the disease for both species happens between the stages of booting and heading in the second climatic area average infection levels are higher than in the other two.

822 Pankhurst, CE.; Mcdonald, HJ.; Hawke, BG. (1995) **INFLUENCE OF SOIL-WATER MATRIC POTENTIAL ON THE CONTROL OF PYTHIUM ROOT INFECTION OF WHEAT WITH METALAXYL IN TWO CONTRASTING SOILS OF SOUTH AUSTRALIA.** *Australian Journal of Experimental Agriculture. 35(5):603-610.* English. [CSIRO DIV SOILS PRIVATE BAG 2 GLEN OSMOND SA 5064 AUSTRALIA].

Under prevailing climatic conditions, treatment of winter-sown wheat with metalaxyl (seed dressing, granule, or soil drench applications) significantly limited seed infection by Pythium species but did not give a significant yield response in separate field trials conducted on 2 contrasting

soil types in South Australia. However, following irrigation of trial plots (which raised the soil-water matric potential from about -0.09 MPa to -0.02 MPa) during the first 3 weeks of wheat growth in 1989, metalaxyl granule treatment was effective in limiting seed and root infection by the 2 dominant Pythium species present, P. irregulare and P. echinulatum, and gave a significant increase in grain yield on both soil types. This effect of soil-water matric potential was confirmed in growth cabinet experiments in which metalaxyl was shown to be more effective in controlling infection of wheat by P. irregulare in both soil types when the soil-water matric potential was maintained at -0.02 MPa than at a soil-water matric potential of -0.1 MPa. [References: 26].

823 Pansegrau, M. (Technische Univ. Muenchen, Freising (Germany). Lehrstuhl fuer Gruenland und Futterbau); Simon, U. (1994) **[Effect of grass-seed production on selected pests of winter wheat]. Einfluss des Grassamenbaues auf ausgewaehlte Schaderreger im Winterweizen.** 38. Jahrestagung der Gesellschaft fuer Pflanzenbauwissenschaften; Halle/Saale (Germany); 29 Sep - 01 Oct 1994. *Mitteilungen der Gesellschaft fuer Pflanzenbauwissenschaften (Germany) v. 7 p. 89-92.* 2 tables; 5 ref. German. (AGRIS 95-135614).

824 Parfenova, TA.; Alekseeva, TP. (1995) **TOXIC INFLUENCE OF FUSARIUM SPECIES, CULTURAL LIQUID FILTRATE ON THE WHEAT SEEDS.** *Mikologiya i Fitopatologiya. 29(1):78-82.* Russian. [BYELARUSSIAN ACAD SCI INST GENET & CYTOL MINSK BYELARUS].

Fusarium species in liquid nutrient medium excrete the substances which inhibit the germinating of wheat seeds, suppress the development of root system and stem of germs. Phytotoxic activity of Fusarium filtrates depends from isolates species and wheat genotype. [References: 12].

825 Pasquini, M. (Ist. Sperimentale per la Cerealicoltura, Roma (Italy)) (1992) **Occurrence and virulence of Erysiphe graminis tritici in Italy.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 178-180.* 2 tables; 6 ref. English. (AGRIS 95-135574).

826 Pedersen, E.A.; Hughes, G.R. (1993) **Relative occurrence of Phaeosphaeria nodorum and Mycosphaerella graminicola on spring wheat in Saskatchewan.** *Canadian journal of plant pathology = Revue Canadienne de phytopathologie (Canada) v. 15(2) p. 113-118.* references. English. (AGRIS 95-155343).

827 Polisenska, I.; Vanova, M.; Benada, J. (Zemedelsky Vyzkumny Ustav, Kromeriz (Czech Republic)) (1995) **[Harmfulness of eyespot (Pseudocercosporella herpotrichoides) in winter wheat]. Skodlivost steblolamu (Pseudocercosporella herpotrichoides) na psenici ozime.** *Ochrana Rostlin - UZPI (Czech Republic) v. 31(2) p. 121-131.* 1 graph, 8 tables; 8 ref. Czech. (AGRIS 95-135608).

The effects of different fungicides on infection and grain yield in the susceptible winter wheat variety Branka, and differences in varietal resistance and their responses to fungicide application were studied. Among the varieties investigated, Simona, Siria, Torysa and Sida, and the line KM 1162 showed relatively stable and good resistance. The yield increase due to the application of fungicides was not always explicit. It reached a considerable level in 1994 when there was a general and heavy infection of the stand after rich rainfalls in May. In 1993, and particularly in 1992 with lower infection, the application of fungicides decreased the degree of infection, but the yield increase was not significant.

828 Reinhold, M. (Montana State Univ., Bozeman (USA). Dept. of Plant Pathology); Walther, U.; Okunowski, I. (1992) **Puccinia striiformis hordei - A potential threat to barley production in the United States.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 132-134.* 1 table; 2 ref. English. (AGRIS 95-135538).

Stripe rust of barley seems to be well established in northern Mexico. It also seems to be able to overwinter in the southern United States. A further spread is expected into regions where stripe rust of wheat has historically been a problem and where overwintering hosts are available. The intermountain valleys of the Western United States have, in the past, provided a favorable environment for the pathogen on wheat. The study indicates that many wild grasses, under certain circumstances, can serve as overwintering hosts. It is thus possible for the fungus to overwinter in areas where winter barley is not grown.

829 Reisener, H.J. (Technische Hochschule Aachen (Germany). Institut fuer Biologie 3. Pflanzenphysiologie) (1992) **The hypersensitive response and its relevance to resistance of wheat to wheat stem rust.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 5-6.* 7 ref. English. (AGRIS 95-135610).

830 Rengel, Z.; Graham, R.D. (Adelaide Univ., Glen Osmond (Australia). Waite Agricultural Research Inst.) (1992) **Biosynthesis of phenolics and lignin in Mn-deficient wheat roots infected with the take-all fungus. [Conference paper].** Abstracts of the Australian Society of Plant Physiologists (Australia) p. P62. Australian Society of Plant Physiologists. p. P62. English. (AGRIS 95-135507).

831 Scherm, H.; Yang, XB. (1995) **INTERANNUAL VARIATIONS IN WHEAT RUST DEVELOPMENT IN CHINA AND THE UNITED STATES IN RELATION TO THE EL NINO/SOUTHERN OSCILLATION.** *Phytopathology. 85(9):970-976.* English. [IOWA STATE UNIV SCI & TECHNOL DEPT PLANT PATHOL AMES, IA 50011 USA].

The El Nino/Southern Oscillation (ENSO) is one of the most impor tant 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 into relationships between climate and disease at extended temporal scales. [References: 34].

832 Schulze, DG.; Mccaybuis, T.; Sutton, SR.; Huber, DM. (1995) **MANGANESE OXIDATION STATES IN GAEUMANNOMYCES-INFESTED WHEAT RHIZOSPHERES PROBED BY MICRO-XANES SPECTROSCOPY.** *Phytopathology. 85(9):990-994.* English. [PURDUE UNIV DEPT AGRON 1150 LILLY HALL W LAFAYETTE, IN 47907 USA].

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 G. graminis var. tritici. Mn in clear agar occurred only as Mn2+, whereas Mn around dark roots infected with C. 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. [References: 21].

833 Shang Hongsheng; Zhang Hui; Li Zhenqi (Northwest Agricultural Univ., Yangling, Shaanxi (China). Dept. of Plant Protection) (1994) **RNA synthesis in primary leaves of stripe rusted wheat.** *Plant Physiology Communications (China) v. 30(4) p. 266-268.* 1 table; 12 ref. Chinese. (AGRIS 95-135598).

834 Singh, R.V. (Agricultural and Technology Univ., Faizabad (India). Dept. of Plant Pathology); Singh, A.K.; Singh, B.N. (1992) **Status of wheat rust in Eastern U.P. [Uttar Pradesh].** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 90.* English. (AGRIS 95-135595).

Wheat (Triticum aestivum) is the most important rabi crop of eastern Uttar Pradesh. Out of a total area of 8750 thousand hectare under wheat in the state, more than 2884 thousand hectare area is located in eastern U.P. with production of about 6035 metric tonnes and average productivity of 20.92 quintals per hectare in 1990-91 which is much lower than Punjab, Haryana and Western U.P. Besides other constraints, the problem of brown or orange or leaf rust caused by Puccinia recondita Rob. ex. Desm. is very severe and is of regular occurrence. The leaf rust generally appears in the second week of February and most of the commercial varieties of this area like Sonalika, C 306, Raj 3077, WH 147, Shekhar, Kharchia 65, Lok 1, K 65, K 68 and K 8027 got affected with a severity of more than 50/S. Due to infection of leaf rust in these varieties with such a severity, the commercial production is very much adversely affected. The yellow or stripe rust caused by Puccinia striiformis West, is of rare occurrence and appears in varieties like A-9-30-1 and LGM 201. The black rust or stem rust caused by Puccinia graminis tritici Eriks and Henn. appears late in the season i.e. during the last week of March in only some varieties like Kharchia 65, K 68, C 306, Agra local and A-9-30-1 and that too in few years causing very little loss. The leaf rust appears regularly at the crop of heading stage which causes severe losses in the production of wheat crop.

835 Siniscalco, A. (Universita degli Studi, Bari (Italy). Dept. di Patologia vegetale) (1992) **Virulence factors of Puccinia graminis f.sp.tritici identified in an important area for durum wheat cultivation in Southern Italy.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 106-108.* 1 table; 6 ref. English. (AGRIS 95-135589).

836 Skaf, JS.; Carroll, TW. (1995) **PURIFICATION OF BARLEY YELLOW STREAK MOSAIC VIRUS AND DETECTION BY DAS-ELISA AND ISEM USING POLYCLONAL ANTIBODIES.** *Plant Disease. 79(10):1003-1007.* English. [MICHIGAN STATE UNIV DEPT BOT & PLANT PATHOL E LANSING, MI 48824 USA].

A purification procedure was developed for barley yellow streak mosaic virus (BaYSMV), the causal agent of a disease in barley and wheat. The procedure utilizes differential and density gradient centrifugation in Percoll gradients and yields highly concentrated virus preparations. These preparations were infectious in Nicotiana benthamiana. Electron microscopy of non-glutaraldehyde-fixed virus particles negatively stained or detergent-treated revealed the presence of a finely granular viral nucleocapsid and an envelope presumed to be lipoidal in nature. Internal cross striations characteristic of rhabdovirus particles were not observed. Concentrated virus preparations were used to produce rabbit polyclonal antibodies that were useful in enzyme-linked immunosorbent assay (ELISA) and immunosorbent electron microscopy (ISEM) for the detection of the virus in barley wheat, N. benthamiana, as well as in its vector, the brown wheat mite Petrobia latens. The virus was detected by ELISA and ISEM in the Pocatello Valley, Idaho, in 1992 and 1993, verifying our 1991 detection of the virus in the same valley. Leaf extracts from BaYSMV-infected barley or N. benthamiana plants injected via hypodermic needle and syringe were infectious, causing characteristic disease symptoms in barley. By contrast, viral nucleic acid preparations used to rub-inoculate N. benthamiana plants were noninfectious. [References: 22].

837 Smith, J. (Institut for Grain Crops, Bethlehem (South Africa). Small Grain Centre); Roux, J. le (1992) **First report of wheat stem rust virulence for Sr27 in South Africa.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 109-110.* 5 ref. English. (AGRIS 95-135478).

Currently, wheat stem rust is under satisfactory genetic control in South Africa. This is primarily due to the ongoing incorporation of effective stem rust resistance genes into new wheat breeding material. In recent years this has placed the pathogen under great selection pressure. The result was that virulence was recently detected for two stem rust genes i.e. Sr24 3 and Sr27. Since the new pathotype, with virulence for Sr27, was first detected in 1988, it has steadily increased in proportion to the total stem rust population in South Africa. Although it has had little effect on the commercial wheat production, it has had a major impact on the commercial triticale cultivars, 75 % of which have been rendered susceptible. The latter is probably the reason for the radical increase of this pathotype since 1988. This stresses the importance of stem rust surveys as well as the weakness of concentrating only on a single gene when breeding for resistance.

838 Statler, G.D.; Christianson, T. (1993) **Temperature studies with wheat leaf rust.** *Canadian journal of plant pathology = Revue Canadienne de phytopathologie (Canada) v. 15(2) p. 97-101.* references. English. (AGRIS 95-155338).

839 Swertz, C.A. (Wageningen Agricultural Univ. (Netherlands). Dept. of Plant Breeding); Boekhout, T. (1992) **Nuclear DNA content and mycelial morphology of urediniospores of leaf rust fungi.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 11-12.* 4 ref. English. (AGRIS 95-135575).

The taxa recognised within the Puccinia recondita complex not only differ in mycelial morphology but also in nuclear DNA content of the urediniospores. The results not only indicate that the nuclear DNA content of urediniospores can be a tool for rust taxonomy, but also that it would be more realistic to treat the leaf rusts of Triticum, Secale and Bromus sterilis as separate species.

840 Sykora, M. (Comenius Univ., Bratislava (Czech Republic). Genetics Dept.); Miklovicova, M.; Limpert, E. (1992) **Variation in virulence and fungicide-sensitivity in populations of the barley mildew /Erysiphe graminis f.sp. hordei, Marchal/ in CSFR.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 162-165.* 2 tables; 10 ref. English. (AGRIS 95-135397).

841 Sykora, M.; Krippel, E. (1995) **THE VIRULENCE GENES FREQUENCY IN BARLEY POWDERY MILDEW POPULATION (ERYSIPHE GRAMINIS, F SP HORDEI) IN SLOVAKIA AND NEIGHBOURING COUNTRIES IN 1993.** *Biologia. 50(4):427-430.* English. [COMENIUS UNIV BRATISLAVA DEPT GENET MLYNSKA DOLINA B1 BRATISLAVA 84215 SLOVAKIA].

In 1993 we found the virulence genes frequency in barley powdery mildew population in Slovakia and neighbouring countries. In all observed regions there was uniform presence of virulence genes Ml-a(6), Ml-a(12) and Ml-k resistance genes. However, at the other genes we found significant differences according regions. We suppose that differences are caused by different collections of growing barley varieties in various regions. In Slovakia in pathogen population there are isolates with virulence genes which have at present no direct host variety in the collection of growing barley varieties. Their presence can be caused by migration of pathogen conidia from other regions and association with other virulence genes in complex pathotypes. High frequency of virulence genes was found against Ml-a(6), Ml-a7+?, Ml-a(12) and Ml-k and in Austria also Ml-g resistance genes. In Slovakia and Czech Republic there is the highest virulence against Ml-a(13) resistance gene. In Hungary there is considerable lower virulence. In Slovakia and Hungary a high virulence was found against Ml-La resistance gene. The lowest virulence was observed against Ml-a(3) resistance

gene in all regions (except Hungary). From 459 analyzed barley powdery mildew isolates no one virulent was found against ml-o resistance gene (the variety Alexis).

842 Sykora, M.; Miklovicova, M.; Svec, M. (Komenskeho Univ., Bratislava (Slovak Republic). Katedra Genetiky); Schwarzbach, E. (1994) **[Sensitivity of barley powdery mildew population (Erysiphe graminis f. sp. hordei, Marchal) to fungicides Bayfidan and Folicur in different regions of Slovakia and Hungary in 1992]. Senzitivita populacie mucnatky travovej jacmena (Erysiphe graminis f. sp. hordei Marchal) v roznych regionoch Slovenska a Madarska voci fungicidom Bayfidan a Folicur v roku 1992.** *Polnohospodarstvo (Slovak Republic) v. 40(11) p. 825-832.* 2 ill., 2 tables; 7 ref. Slovak. (AGRIS 95-135535).

In 1992 in Slovakia and northwestern Hungary the sensitivity of barley powdery mildew population to the fungicides (active ingredient triadimenol and tebuconazole) was investigated. Considerable decrease of sensitivity to triadimenol to which the pathogen population is 200-times more resistant than the standard sensitive isolates, was observed. The population is 28-times more resistant against tebuconazole. The pathogen population from eastern Slovakia and central Hungary is more resistant to both fungicides effective substances. All observed populations were very different in the fungicide resistance. Due to continuing applications of fungicides in the cultivation other changes in pathogen population sensitivity can be expected.

843 Szunics, L. (Hungarian Academy of Sciences, Martonvasar (Hungary). Agricultural Research Inst.); Szunics, L. (1992) **Race composition and virulence of wheat powdery mildew (Erysiphe graminis tritici).** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 181-182.* 2 tables; 4 ref. English. (AGRIS 95-135399).

844 Szunics, L. (Hungarian Academy of Sciences, Martonvasar (Hungary). Agricultural Research Inst.); Szunics, L. (1992) **Virulence of wheat powdery mildew (Erysiphe graminis tritici) to certain resistance genes.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 183-184.* 2 tables; 4 ref. English. (AGRIS 95-135400).

845 Takeda, K.; Wu, JR.; Heta, H. (1995) **ANALYSIS OF HOST-PATHOGEN INTERACTION IN FUSARIUM HEAD BLIGHT OF WHEAT AND BARLEY [Japanese].** *Breeding Science. 45(3):349-356.* Japanese. [OKAYAMA UNIV BIORESOURCES RES INST KURASHIKI OKAYAMA 710 JAPAN].

For analyzing the host-parasite interaction of Fusarium head blight in wheat and barley caused by Fusarium spp., a total of 104 Fusarium strains were inoculated to two varieties each of wheat and barley (Exp. 1), half of the strains were reexamined in the next year (Exp. 2), and 12 strains were inoculated to ten varieties each of wheat and barley (Exp. 3). Cut-spike inoculation method developed by the authors was adopted and the infection rate was evaluated based on the percentage of infected florets (barley) or infected spikelets (wheat). Correlation coefficient for the infection rate between two years was exceeded 0.6 indicating the stable expression of the disease reaction. In Exp. 1 and 2, analysis of variance for the infection rate revealed that the host-pathogen interaction was statistically significant. But the strain X within barley and strain X within wheat interaction was very small and almost statistically insignificant, indicating that differentiation of the pathogenicity within the host species was not appreciable. Although the interaction of strain X (barley vs. wheat) was statistically significant, its variance ratio was as small as about 2. The correlation coefficients between the hosts were very high (more than 0.8), and the principal component analysis revealed that the first component showing the general pathogenicity accounted for more than 89% of the total variation whereas the second principal component reflecting the specific pathogenicity between barley and wheat accounted for only 5 similar to 6% of the total variation. In Exp. 3, strain X (barley vs. wheat) interaction was statistically significant and two strains, SHIN-996 and ARC-2124-1, showed a higher pathogenicity to barley than to wheat. However the correlation coefficients among the strains and the hosts were generally high, the second principal component showing the difference between barley and wheat accounted for only 4% of the total variation. Therefore in the Fusarium head blight we can conclude the followings : 1) Strain X within host-species interaction is very small. 2) Strain X (barley vs. wheat) interaction is statistically significant but the host-specific variation is very small in comparison with the variation of the general pathogenisity.

846 Tinline, R.D.; Ukrainetz, H.; Spurr, D.T. (1993) **Effect of fertilizers and of liming acid soil on common root rot in wheat, and of chloride on the disease in wheat and barley.** *Canadian journal of plant pathology = Revue Canadienne de phytopathologie (Canada) v. 15(2) p. 65-73.* references. English. (AGRIS 95-155342).

847 Tischner, H. (Bayerische Landesanstalt fuer Bodenkultur und Pflanzenbau Freising Muenchen, Muenchen (Germany). Abt. Pflanzenschutz) (1995) **[Fungicide-models: A comparison]. Fungizid-Modelle im Vergleich.** *DLG-Mitteilungen (Germany) v. 110(3) p. 18-22.* 5 ill., 3 tables. German. (AGRIS 95-155361).

848 Tomasovic, S.; Matijasevic, M.; Sesar, M. (Botinec Institute for Breeding and Production of Field Crops, Zagreb (Croatia). Department of Small Grain Cereal Crops) (1993) **Fusarium spp. on wheat with special reference to Fusarium head blight (F. graminearum Schw.).** *RACHIS (ICARDA); Barley and Wheat Newsletter v. 12(1-2) p. 41-43.* 9 ref. English. (AGRIS 95-155118).

Gibberella zeae (Schw.) Petch., i.e. Fusarium graminearum Schw. in condial stage, is the most widespread cause of head blight of wheat (Triticum spp.) in the former Yugoslavia (fusarium head blight). The fungus invades wheat spikes in the heading stage; attack is most dangerous at anthesis. The occurrence of Fusarium spp. is favored by high temperatures (25-30 C) and high relative humidity (above 85). There are several measures of controlling Fusarium spp., such as crop rotation and seed treatment. However, the development of wheat cultivars resistant to or tolerant of head blight represents the principal method of controlling the disease that has become increasingly evident over several years.

849 Torabi, M. (Plant Pests and Diseases Research Inst., Teheran (Iran Islamic Republic)) (1992) **Effects of pustule density and leaf age on the latent period of Puccinia recondita in wheat.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 71-73.* 3 graphs, 1 table; 9 ref. English. (AGRIS 95-135590).

850 Toubiarahme, H.; Alihaimoud, DE.; Barrault, G.; Albertini, L. (1995) **EFFECT OF FOUR FUNGICIDES ON BARLEY NET BLOTCH CAUSED BY DRECHSLERA TERES.** *Journal of Phytopathology-Phytopathologische Zeitschrift. 143(6):335-339.* English. [ENSAT INGN AGRON LAB 145 AVE MURET F-31076 TOULOUSE FRANCE].

The effect of four fungicides (benomyl, carbendazim, triadimefon and sulphur), used in intensive barley cropping on the epidemiology of Drechslera teres f. maculata and f. teres, was investigated under a controlled environment. Two fungicides (benomyl and carbendazim) increased disease development, especially al the recommended held rate, sulphur had the same effect at lower concentrations and triadimefon promoted net blotch caused by D. teres f. teres. At the recommended field rate, carbendazim enhanced sporulation in the two pathogen forms, whereas benomyl and sulphur enhanced 14 sporulation only on the maculata form. The results showed that, under controlled conditions, most of the fungicides promoted net blotch development and that sporulation increased either as a result of the pathogen form or of the concentration of the active ingredient. [References: 23].

851 Tvaruzek, L.; Klem, K. (Zemedelsky Vyzkumny Ustav, Kromeriz (Czech Republic)) (1995) **[Chemical control of powdery mildew (Erysiphe graminis sp. tritici) at early growth stages of winter wheat]. Chemicka ochrana proti padli travnimu v ranych fazich vyvoje psenice ozime.** *Ochrana Rostlin - UZPI (Czech Republic) v. 31(2) p. 133-142.* 4 graphs, 2 tables; 11 ref. Czech. (AGRIS 95-135609).

The development of powdery mildew infection and its progress across the layers of leaves were studied in a trial with one autumn and two spring dates of fungicide application in winter wheat. With autumn application the powdery mildew epidemic came late and at a lower initial level of infection; this lower level persisted throughout the vegetation period. That was also expressed in low values of the ADPC parameter. With the first spring application, the development of the disease was stopped already before

reaching the highest level of infection. With the later spring treatment, the initial degree of infection was higher, which was expressed in increasing the ADPC parameter as compared to the earlier applications. Both spring treatments effectively reduced the infection and no considerable increase was observed during the rest of the vegetation period. The insignificant effect of fungicide treatment on grain yield, and the effects of different dates of application on the development of the epidemic are discussed.

852 Wang Yuzhong; Wu Zhifeng; Shi Jianrong (Jiangsu Academy of Agricultural Sciences, Nanjing (China). Inst. of Plant Protection) (1994) **Study on occurrence of wheat sharp eyespot in Jiangsu and the factors influencing its development in fields.** *Acta Phytophylacica Sinica (China) v. 21(2) p. 109-114.* 4 tables; 1 ill., 5 ref. Chinese. (AGRIS 95-135600).

853 Weber, G.E. (Giessen Univ. (Germany). Tropeninst. Abt. Phytopathologie und Angewandte Entomologie) (1992) **Disease progress of Erysiphe graminis on wheat - the limitations of the single disease approach in fields.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 169-171.* 2 graphs; 6 ref. English. (AGRIS 95-135583).

It could be shown that the disease progress of Erysiphe graminis is strongly suppressed in the presence of Septoria nodorum. The results confirm the findings who also reported reduced severities of E. graminis in presence of Septoria spp. Considering the frequently combined occurrence of these two pathogens it is obvious, that single disease studies cannot provide a correct understanding of the dynamics of E. graminis in the field. This holds true for S. nodorum as well. For a number of other cereal pathogens interactions have also been reported (for an extensive review). Therefore it is generally concluded, that wherever multiple attack occurs interactions should be considered, and research should go beyond the so far predominating single disease to an agroecosystem approach.

854 Wei, Y.D. (1994) **The biochemical and molecular basis of interactions between barley and the powdery mildew fungus [including 4 articles].** Kongelige Veterinaer- og Landbohoejskole, Copenhagen (Denmark). Plant Pathology Section. KVL. 10 ill., 266 ref. 118 p. English. (AGRIS 95-155274).

855 Weibull, J.; Niemeyer, HM. (1995) **CHANGES IN DIHYDROXYMETHOXYBENZOXAZINONE GLYCOSIDE CONTENT IN WHEAT PLANTS INFECTED BY THREE PLANT PATHOGENIC FUNGI.** *Physiological & Molecular Plant Pathology. 47(3):201-212.* English. [HASSELSTIGEN 16 S-26030 VALLAKRA SWEDEN].

Hydroxamic acids (Hx), present among members of the family Gramineae, defend the plant against several insect species and some bacteria. Their role in defence against Fungal pathogens is still unclear. We tested the hypothesis that the mode of infection by the fungus influences the release from DIMBOA-glucoside, the main Hx in wheat, of the more active aglycone DIMBOA. Infection by the pathogenic necrotroph Septoria tritici resulted in significant hydrolysis of DIMBOA-glucoside in seedlings of two wheat cultivars differing in Hx concentrations. Infection by Drechslera teres, a necrotroph non-compatible with wheal but pathogenic on barley, caused only a slight reduction of glucoside concentration. The content of aglycone did not increase concurrently in any of these experiments. No change in glucoside content was evident following infection by the obligate parasite Puccinia recondita. In vitro, S. tritici was able to increase by 39% the rate at which DIMBOA disappeared from aqueous solutions. Free DIMBOA was not detected in roots of plants infected with S. tritici, but there was a tendency for glucoside levels to be higher than in roots of control plants. (C) 1995 Academic Press Limited [References: 38].

856 Wellings, C.R. (New South Wales Agriculture, Rydalmere (Australia). Biological and Chemical Research Inst.) (1993) **Cereal Rusts and Mildews Conference, Germany, September 1992.** New South Wales Agriculture. 2 tables. 11 p. English. (AGRIS 95-155233).

Gives an overview of significant developments and research work on cereal rusts presented at the Eighth European and Mediterranean Rusts and Mildews Conference. A review of important research projects underway at the Research Institute for Plant Protection in the Netherlands is also given. Recommendations for research projects on rusts and rust resistant wheat varieties in Australia are included.

857 Wolfe, M.S. (Swiss Federal Inst. of Technology, Zuerich (Switzerland). Inst. of Plant Sciences); Braendle, U.; Koller, B.; Limpert, E.; McDermott, J.M.; Mueller, K.; Schaffner, D. (1992) **Response of populations of Erysiphe graminis f.sp. hordei to the use of resistant varieties in Europe.** Eighth European and Mediterranean Cereal Rusts and Mildew Conference; Weihenstephan (Germany); 8-11 Sep 1992. *Vortraege fuer Pflanzenzuechtung (Germany) v. 24 p. 138-140.* 3 tables; 2 ref. English. (AGRIS 95-135525).

858 Xie Shuixian (Chinese Academy of Agricultural Science, Beijing (China). Inst. of Plant Protection) (1994) **Study on the dispersion of wheat stripe rust disease on wheat seedling in autumn in Gansu, China.** *Plant Protection (China) v. 20(5) p. 6-8.* 1 table; 2 ref. Chinese. (AGRIS 95-135607).

859 Xue, AG.; Burnett, PA. (1995) **EVALUATION OF INTERACTIONS BETWEEN RHYNCHOSPORIUM SECALIS AND PYRENOPHORA TERES ON BARLEY.** *Phytoprotection. 76(1):1-7.* English. [AGR & AGRIFOOD CANADA AGRIFOOD DIVERSIFICAT RES CTR UNIT 100101 ROUTE 100 MORDEN MB R6M 1Y5 CANADA].

Interactions between Rhynchosporium secalis and Pyrenophora teres were investigated on barley (Hordeum vulgare)seedlings grown in a greenhouse and growth chambers. Following mixed inoculations, the two pathogens colonized the same leaf simultaneously, but the leaf area with symptoms (LAS) was less than that produced by either of the two pathogens alone at the same inoculum concentration. On plants inoculated with the mixed inocula, LAS induced by R. secalis was reduced by a greater amount than LAS induced by P. teres. The predominance of P. teres over R. secalis was observed even when inoculations with R. secalis either preceded or followed the inoculation with P. teres by 24 h. Antagonism occurred when inoculum densities were 10(3)-10(4) spores mL(-1) for each pathogen, wetting periods were 24-28 h, and incubation temperature was above 12 degrees C. [References: 14].

860 Zhang Xuejun; Zhao Jun; Wang Jinsheng (Nanjing Agricultural Univ. (China). Dept. of Plant Protection) (1994) **Study on the colonization of Bacillus subtilis strain B3 on roots and stem-base of wheat.** *Chinese Journal of Biological Control (China) v. 10(4) p. 171-174.* 1 table; 5 ill., 5 ref. Chinese. (AGRIS 95-135604).

861 Zhang Zhongge; Peng Yufa; Zhang Yuxun (Chinese Academy of Agricultural Sciences, Beijing (China). Inst. of Plant Protection) (1994) **Inhibition of Bacillus polymyxa strain B48 against several pathogenic fungi and bacteria.** *Chinese Journal of Biological Control (China) v. 10(2) p. 85-86.* 2 tables. Chinese. (AGRIS 95-135498).

862 Zuo Yuhu; Liu Tiruo; Zhang Yunhua (Heilongjiang August First Land Reclamation Univ., Mishan (China). Research Lab. of Plant Immunology) (1994) **Study on the yield losses caused by spring wheat scab.** *Acta Phytophylacica Sinica (China) v. 21(2) p. 115-120.* 5 tables; 2 ill. Chinese. (AGRIS 95-135496).

H50 MISCELLANEOUS PLANT DISORDERS

863 Ahmad, M. (1993) **Agro-physiological response of wheat (Triticum aestivum L.) to drought at its various vegetative growth stages.** University of Agriculture, Faisalabad (Pakistan). Dept. of Agronomy. UAF. 4 ills., 35 tables, 85 ref. 111 p. English. (AGRIS 95-136196).

864 Amir, M. (1993) **Effect of presowing seed treatments on wheat (Triticum aestivum L.) grown under saline conditions.** University of Agriculture, Faisalabad (Pakistan). Dept. of Agronomy. UAF. 12 tables, 99 ref. 89 p. English. (AGRIS 95-136195).

865 Chen Zhiqiang; Xu Chunhui; Chen Mengqing (Academia Sinica, Beijing (China). Inst. of Biology) (1994) **Effect of cold-hardening on thylakoid membrane lipids and proteins of spring wheat and winter wheat.** *Acta Botanica Sinica (China) v. 36(6) p. 423-429.* 5 tables; 2 ill., 19 ref. Chinese. (AGRIS 95-136144).

866 Cracknell, R.L.; Dewan, T. (Australian Wheat Board, Melbourne) (1993) **An overview of the weather damage problem [wheat; sprouting;**

Australia]. *Chemistry in Australia (Australia) v. 60(9) p. 483.* 2 tables. English. (AGRIS 95-136139).

867 Dencic, S.; Kastori, R.; Kobiljski, B.; Petrovic, M. (Poljoprivredni fakultet, Novi Sad (Yugoslavia). Institut za ratarstvo i povrtarstvo) (1995) **[Influence of drought on morphologic and agronomic traits of wheat]. Efekat suse na morfoloska i agronomska svojstva psenice.** 29. seminar agronoma; Vrnjacka Banja (Yugoslavia); 30 Jan - 4 Feb 1995. *Zbornik radova - Poljoprivredni fakultet u Novom Sadu, Institut za ratarstvo i povrtarstvo (Yugoslavia) (no. 23) p. 203-211.* 3 tables; 16 ref. Serbian. (AGRIS 95-136145).

223 wheat genotypes originating from various countries were studied. Drought had no significant effect on stem height and stoma density. Spike length, number of spikelets per spike, and grain mass per spike showed negative reaction to drought. Variability analysis of the studied indices shows that, regardless of treatment, two traits varied most: number of sterile spikelet per spike and grain mass per spike. The genotypes were identified whose morphologic and anatomic traits did not change significantly under the conditions of drought, i.e., the genotypes which are tolerant to water shortage. According to their origin, these genotypes are not from one area, but from various parts of the world.

868 Desouza, RF.; Calheiros, MBP.; Carbonell, SRM.; Lepri, SR.; Alliprandini, LF.; Pavan, MA. (1995) **TOXICITY OF ALUMINUM TO WHEAT - A METHODOLOGY FOR KEEPING PHYTOTOXIC FORMS IN NUTRIENT SOLUTION.** *Arquivos de Biologia e Tecnologia. 38(2):501-511.* Portuguese. [INST AGRON PARANA CAIXA POSTAL 1331 BR-86001970 LONDRINA PARANA BRAZIL].

The speciation of aqueous Al is controlled by environmental factors such as pH, ionic strength, and the concentration of Al-binding ligands, particularly phosphate ions. We compare the results of increasing pH from 4 to 5, ionic strength from 1 to 30 mmol dm(-3) and p from 0.1 to 2.0 mmol dm(-3) on Al fractionation and the toxicity effect on wheat cultivars. The most toxic forms for wheat were Al3+ and simple hidroxides, such as Al(OH)(2+) and Al(OH)(+)2. In order to keep these phytotoxic forms of Al, the following condictions were imposed to the nutrient solution: pH 4, ionic strength and P concentration less than 1 and 0.1 mmol dm(-3) respectively. Root elongation was the most sensitive plant material to Al toxicity, and was severely reduced with Al3+ concentration greater than 5 x 10(-6) M in the following toxicity order to wheat cultivars: Ahahuac > IAPAR-6 (Tapejara) > IAC-5 (Maringa). It was concluded that any evaluation of the environmental impacts of Al must include speciation, rather than simple total aqueous Al.

869 He Ruotian (Guangxi Agricultural Univ., Nanning (China)) (1994) **Effect of choline chloride on the photosynthetic parameters and growth of wheat.** *Guihaia (China) v. 14(3) p. 246-254.* 9 tables; 2 ill., 23 ref. Chinese. (AGRIS 95-136143).

870 Huang, J.W. (Cornell Univ., Ithaca, NY (USA). Plant, Soil and Nutrition Lab.); Grunes, D.L.; Kochian, L.V. (1995) **Aluminium and calcium transport interactions in intact roots and root plasmalemma vesicles from aluminium-sensitive and tolerant wheat cultivars.** *Plant and Soil (Netherlands) v. 171(1) p. 131-135.* 17 ref. English. (AGRIS 95-136192).

871 *Klein, R.N.* (Nebraska Cooperative Extension); Lyon, D.J.; Watkins, J.E. (1994) **Freeze injury to Nebraska wheat.** *E.C. (Nebraska Cooperative Extension Service) (USA); no. 94-132-S 8 p.* English. (AGRIS 95-136188).

872 Leistner, HU.; Kramer, R.; Kretschmann, M. (1995) **CYTOLOGICAL CHARACTERIZATION OF HORDEUM VULGARE L UNDER THE INFLUENCE OF A TOXIN PRODUCED BY DRECHSLERA TERES (SACC) SHOEM.** *Microbiological Research. 150(3):281-289.* English. [BUNDESANSTALT ZUCHTUNGSFORSCH KULTURPFLANZEN INST PATHOGENDIAGNOST THEODOR ROEMER WEG 4 D-06449 ASCHERSLEBEN GERMANY].

Both application of the crude toxin preparation from Drechslera teres and treatment with fractions of this toxin induced similar cytological defects in the leaf tissue selected from Hordeum vulgare L., like the inoculation of the pathogen: changes in chloroplast- and mitochondria-structure, necrosis of single cells. The toxin fraction 6 with the highest biological activity still triggered cytological detectable changes in the leaf-tissue of the susceptible barley variety 'Femina' at a concentration of 1 ppm. Tests of barley genotypes with a defined degree of resistance against the pathogen showed, that the toxin induced cytological damages are useful for a differentiation between resistant and susceptible plants. The host nonspecifity of the D. teres-toxin also could be demonstrated at the ultrastructural level in selected nonhost plants.

873 Lu Congming; Zhang Qide; Kuang Tingyun (Academia Sinica, Beijing (China). Inst. of Botany) (1994) **The effects of water stress on photosystem II in wheat.** *Acta Botanica Sinica (China) v. 36(2) p. 93-98.* 5 ill., 15 ref. Chinese. (AGRIS 95-136189).

874 Lu Jun (Zhejiang Agricultural Univ., Hangzhou (China). Dept. of Soil and Agricultural Chemistry) (1994) **The injury to winter wheat growth by soil waterlogging and its mechanism.** *Acta Phytophysiologica Sinica (China) v. 20(3) p. 221-226.* 2 tables; 6 ill., 10 ref. Chinese. (AGRIS 95-136142).

875 Mehmood, A. (1993) **Agrophysiological response of wheat (Triticum aestivum L.) to water stress at its various reproductive growth stages.** University of Agriculture, Faisalabad (Pakistan). Dept. of Agronomy. UAF. 35 tables, 76 ref. 117 p. English. (AGRIS 95-136194).

876 Novak, V. (Slovenska Akademia Vied, Bratislava (Slovak Republic). Ustav Hydrologie) (1992) **[Identification of drought and its impact on biomass formation in relation to irrigation requirements]. Identifikacia sucha z hladiska produkcie biomasy pre potreby zavlah.** Economic and Ecological Aspects of Irrigation; Bratislava (Slovak Republic); Sep 1992. *Economic and ecological aspects of irrigation. Proceedings of the international symposium. Vyskumny Ustav Zavlahoveho Hospodarstva, Bratislava (Slovak Republic); Zakladna Organizacia Slovenskej Polnohospodarskej Vedecko-Technickej Spolocnosti, Bratislava (Slovak Republic) p. 39-44.* VUZH. 1 ill., 1 table; 10 ref. Slovak. (AGRIS 95-136151).

The drought intensity is evaluated by the drought index mi sub(d) = 1 - mi sub(r). Its definition is based on the relative transpiration mi sub(r') in terms of the ratio of transpiration E sub(t) to the potential transpiration E sub(to). This approach is illustrated by the seasonal courses of mi sub(d) for 3 agricultural crops - maize, winter wheat and spring barley. It was shown, that the seasonal courses of mi sub(d) for 3 crops are different during the same season in the locality Trnava (Southern Slovakia).

877 Pleijel, H.; Skarby, L.; Wallin, G.; Sellden, G. (1995) **A PROCESS ORIENTED EXPLANATION OF THE NONLINEAR RELATIONSHIP BETWEEN GRAIN YIELD WHEAT AND OZONE EXPOSURE.** *New Phytologist. 131(2):241-246.* English. [SWEDISH ENVIRONM RES INST POB 47086 S-40258 GOTHENBURG SWEDEN].

A model for the impact of ozone on grain yield in spring wheat (Triticum aestivum L.) was constructed. The model was based on the observations in the literature as well as in the present experiment, that the productivity of the above-ground biomass and the carbon partitioning of the above-ground biomass do not respond to ozone above the same threshold concentrations. The model was applied to a data set in which spring wheat was exposed to different ozone concentrations in open-top chambers. It was concluded that the nonlinearity of a simple dose-response curve for grain yield can be explained in terms of the product of two linear responses: (1) the response of total above-ground biomass to an ozone dose above 10 nl l(-1), and (2) the response of the harvest index to an ozone dose above 40 nl l(-1). The nitrogen content of the grain increased linearly with the dose above 40 nl l(-1) It is hypothesized that the effect of comparatively small ozone concentrations on total above-ground biomass is caused by a reduction of leaf duration by ozone, and that the effect on carbon partitioning is caused by ozone affecting the sink capacity or activity of the growing grain. The maximum coefficients of determination (r(2)) for the linear regression between grain yield and accumulated ozone dose above thresholds in the range of 0-70 nl l(-1), were never as great as those for total above-ground biomass and harvest index. Nevertheless, statistically significant linear regressions were obtained for the thresholds 20, 30 and 40 nl l(-1), the highest correlation being with 30 nl l(-1) Thus, it seems acceptable to use linear regressions between grain yield and the accumulated dose, although these do not take into direct account the complexity of the effects of ozone on wheat. [References: 25].

878 Sandelius, A.; Naslund, K.; Carlsson, A.; Pleijel, H.; Sellden, G. (1995) **EXPOSURE OF SPRING WHEAT (TRITICUM AESTIVUM) TO OZONE**

IN OPEN-TOP CHAMBERS - EFFECTS ON ACYL LIPID COMPOSITION AND CHLOROPHYLL CONTENT OF FLAG LEAVES. *New Phytologist. 131(2):231-239.* English. [UNIV GOTHENBURG INST BOT DEPT PLANT PHYSIOL CARL SKOTTSBERG GATA 22 S-41319 GOTHENBURG SWEDEN].

Spring wheat (Triticum aestivum L. cv. Drabant) was exposed to different concentrations of ozone in open-top chambers in a field of commercially grown wheat. The following treatments were used: charcoal-filtered air (CF), non-filtered air (NF) and non-filtered air supplemented with 25 nl l(-1) ozone (NF+) and 35 nl l(-1) ozone (NF++) for 7 h d(-1). Flag leaves were analysed for chlorophyll content, total fatty acid composition and fatty acid compositions and contents of monogalactosyldiacylglycerol (MGDG), digalactosyldiacylglycerol (DGDG), phosphatidylcholine (PC) and phosphatidylethanolamine (PE). The chlorophyll content decreased significantly with time and ozone concentration. After 4 wk of exposure, the content of MGDG was significantly lower in flag leaves from the NF++ treatments than in those from the other treatments. The contents of DGDG and PC also decreased while that of PE increased, although these changes were not statistically significant. In the total lipid extract the proportion of 18:3 decreased with time and ozone concentration. Similar changes occurred in MGDG 18:3 at a later stage. Using the concept of accumulated exposure over threshold (AOT), it was evident that the parameters studied differed in ozone sensitivity. After 4 wk of exposure, the best linear dose-response relationships between accumulated exposure and chlorophyll as well as MGDG contents were obtained with a threshold ozone concentration of 30 nl l(-1). For total lipid 18:3 and MGDG 18:3 the corresponding thresholds were 40 and 50 nl l(-1), respectively. Furthermore, the sensitivity to ozone, expressed as loss of chlorophyll, increased with increasing flag leaf age. In leaves exposed for 7, 13 and 20 d, the best linear fits were obtained with AOT50, AOT40 and AOT30, respectively. In conclusion, ozone sensitivity increased with flag leaf age and different membrane constituents were differently sensitive to ozone. The results support previous suggestions that ozone causes premature senescence in wheat flag leaves. [References: 29].

879 Sasaki, M. (Okayama Univ., Kurashiki, Okayama (Japan). Research Inst. for Bioresources); Kasai, M.; Yamamoto, Y.; Matsumoto, H. (1995) **Involvement of plasma membrane potential in the tolerance mechanism of plant roots to aluminium toxicity.** *Plant and Soil (Netherlands) v. 171(1) p. 119-124.* 15 ref. English. (AGRIS 95-136150).

880 Stuart, I.M. (Joe White Maltings Ltd, Collingwood (Australia)) (1993) **The effects of weather damage on malt [barley].** *Chemistry in Australia (Australia) v. 60(9) p. 486, 488.* 8 ref. English. (AGRIS 95-136148).

881 Yan Xianxi; Zhao Tanfang; Ye Baoxing (Shandong Agricultural Univ., Taian (China)) (1994) **Effect of salt stress on membrane system in radicle cells of barley.** *Acta Botanica Sinica (China) v. 36(suppl.) p. 33-36.* 15 ill., 6 ref. Chinese. (AGRIS 95-136149).

H60 WEEDS

882 **[<5. Abstracts and consequences. 5.3. Managing of competition between cultural plant and weeds by cultivation methods and selective use of herbicides>]. 5. Zusammenfassung und Schlussfolgerungen. 5.3. Steuerung der Konkurrenzbeziehungen zwischen Kulturpflanze und Unkraut durch anbautechnische Massnahmen und gezielte Anwendung von Herbiziden** (1994) Deutsche Forschungsgemeinschaft, Bonn (Germany). *Integrated plant production. Research report. Final research report on a priority program "development of an integrated system of crop production with regard to economic and ecological aspects of plant protection in wheat crops". Heitefuss, R. (ed.); Holtschulte, B.; Niemann, M. Deutsche Forschungsgemeinschaft, Bonn (Germany) v. 2 p. 286-288.* VCH. German. (AGRIS 95-156423).

883 Amann, A.; Hurle, K. (1994) **[<3. Managing competition between cultivated plants and weeds by cultivation methods and selective use of herbicide> 3.3. Effect of sowing time and primary cultivation on weed infestation in different crops]. 3. Steuerung der Konkurrenzbeziehungen zwischen Kulturpflanze und Unkraut durch anbautechnische Massnahmen und gezielte Anwendung von Herbiziden. 3.3. Einfluss von Saattermin und Grundbodenbearbeitung auf die Verunkrautung in verschiedenen Kulturen.** Hohenheim Univ., Stuttgart (Germany). Inst. fuer Phytomedizin. *Integrated plant production. Research report. Final research report on a priority program "development of an integrated system of crop production with regard to economic and ecological aspects of plant protection in wheat crops". Heitefuss, R. (ed.); Holtschulte, B.; Niemann, M. Deutsche Forschungsgemeinschaft, Bonn (Germany) v. 2 p. 175-191.* VCH. 4 ill., 2 tables; 22 ref. German. (AGRIS 95-156429).

Good weed management must be integrated into the production system. In order to achieve integration the effects of all agricultural measures on weed infestation have to be considered. In this paper results of a 2 year field experiment in which the effect of sowing time and primary cultivation on the weed seed bank, weed infestation, probability of weed emergence, and crop yield are described. The crops were: winter rape, winter wheat, spring barley and maize. Primary cultivation included ploughing and shallow tine cultivation. For each crop an early and a late sowing date, which differed 3-4 weeks, was chosen. No weed control measures were carried out. Ploughing led to 40-80% less infestation than tine cultivation. Due to shallow tine cultivation weed seeds accumulated in the upper soil layer from which weeds emerge preferably, and therefore gave heavy infestation. On average late sown crops had 30% less weeds than early sown crops. Except for winter wheat late sowing resulted in 20-60% less crop yield compared to the early sowing date, and with ploughing yield were 20-35% higher than with shallow cultivation. The results demonstrate that the kind of primary tillage, and the sowing time do have a strong effect on weed infestation. Although under the present economic conditions the effect of these measures will not suffice, they are worthwhile to be considered under conditions where effective direct control measures are not available.

884 Barrett, P.R.F. (Aquatic Weeds Research Unit, Broadmoor Lane, Sonning, Reading RG4 0TH (United Kingdom)) (1994) **Field and laboratory experiments on the effects of barley straw on algae.** *Comparing glasshouse and field pesticide performance II. Proceedings of an international symposium held at the University of Kent, Canterbury, 12-14 April 1994. Hewitt, H.G.;Caseley, J.; Copping, L.G.; Grayson, B.T.; Tyson, D. (eds.) p. 191-200.* British Crop Protection Council. 18 ref., BCPC Monograph No. 59. English. (AGRIS 95-156207).

885 Baylis, J.M.; Watkinson, A.R.; Lintell Smith, G. (East Anglia Univ., Norwich (United Kingdom). School of Biological Sciences); Firbank, L. (ITE, Huntington (United Kingdom). Monks Wood Experimental Station) (1992) **Reduced nitrogen inputs in wheat: the effects on weed-crop competition and weed population dynamics. [Conference paper].** 1. International Weed Control Congress; Melbourne, Vic. (Australia); 17 Feb 1992. *Proceedings of the First International Weed Control Congress, Volume 2. Submitted Papers. Richardson, R.G. (comp.) p. 76-80.* Weed Science Society of Victoria Inc. 4 fig., 7 ref. English. (AGRIS 95-156252).

886 Bellostas, A.; Aibar, J. (1994) **[The importance of the invasive activity of the grass weed Lolium rigidum Gaudin in the Huesca Province [Spain] winter cereal fields]. La importancia de Lolium rigidum Gaudin como infestante de los cereales de invierno en la provincia de Huesca.** *Lucas Mallada (Espana) (no.6) p. 55-76.* 6 tab., 8 fig.; 18 ref. Spanish. (AGRIS 95-136428).

887 Boerboom, C.M. (Washington State University); Young, F.L.; Kwon, T.; Feldick, T. (1993) **IPM research project for inland Pacific Northwest wheat production.** *Research bulletin (Washington State University. Agricultural Research Center) (USA); no. XB1029 46 p.* references. English. (AGRIS 95-136474).

888 Brighenti, A.M.; Silva, J.F. da; Lopes, N.F.; Cardoso, A.A.; Ferreira, L.R. (1994) **[Chemical control of wormwood in no-tillage wheat]. Controle quimico da losna em plantio direto de trigo.** *Planta Daninha (Brazil) v. 12(1) p. 3-8.* 9 graphs; 5 ref. Portuguese. (AGRIS 95-136469).

889 Christensen, S. (1995) WEED SUPPRESSION ABILITY OF SPRING BARLEY VARIETIES. *Weed Research. 35(4):241-247.* English. [DANISH INST PLANT & SOIL SCI DEPT WEED CONTROL & PESTICIDE ECOL DK-4200 SLAGELSE DENMARK].

Three years of experiments with spring barley showed significant differences in weed suppression ability among varieties. Weed dry matter in the most suppressive variety, Ida, was 48% lower than the mean weed dry

matter of all varieties, whereas it was 31% higher in the least suppressive variety, Grit. Ranking varietal responses to weed competition in terms of grain yield loss corresponded well to ranking weed dry matter produced in crop weed mixtures. There was no correspondence between the varietal grain yields in pure stands and their competitiveness, suggesting that breeding to optimize both yielding and competitive ability may be possible. Non-linear regression models were fitted to canopy height and light interception data for each variety in all three years. The canopy height model provided a precise description of development and maximum canopy height of the varieties. A light interception model was developed to describe the light interception profiles of the varieties. A study of the estimated parameters showed significant correlation between weed dry matter, rate of canopy height development and the light interception profile. However, when estimates were standardized to eliminate the effect of year, there was no correlation between weed dry matter and the light interception profile parameters, indicating that varietal competitiveness was not related to this trait. A multiple regression analysis showed that a model comprising parameters of maximum canopy height, maximum light interception and temporal displacement of light interception provided a good description of the varietal differences. [References: 16].

890 Derksen, DA.; Thomas, AG.; Lafond, GP.; Loeppky, HA.; Swanton, CJ. (1995) **IMPACT OF POST-EMERGENCE HERBICIDES ON WEED COMMUNITY DIVERSITY WITHIN CONSERVATION-TILLAGE SYSTEMS.** *Weed Research. 35(4):311-320.* English. [AGR CANADA BOX 760 INDIAN HEAD SK S0G 2K0 CANADA].

The influence of herbicides on weed community dynamics is an issue of agroecological concern. A field study was initiated in 1986 with zero-, minimum-, and conventional-tillage systems. In 1989 and 1990, the fourth and fifth years of study, weed community diversity and relative composition were assessed prior to and following the application of post-emergence non-residual herbicides. Weed communities were assessed at the level of tillage system to balance the effect of different crop sequences and crop-herbicide combinations within each comparison. In general, herbicides did not reduce community diversity when compared by Shannon's H' and dominance-diversity curves. An increase in species richness and evenness, as assessed by Shannon's E and Margalef's D-MG, occurred in some cases. Differences in relative community composition among tillage systems were apparent before the application of herbicides, but disappeared following herbicide application. The use of herbicides in this study reduced weed densities, maintained weed diversity, and inhibited community changes that were due to changing tillage systems. [References: 29].

891 Deshmukh, SV.; Kale, HB.; Atale, SB. (1995) **EFFECT OF 2, 4-DIPHENOXY ACETIC ACID, ISOPROTURON AND ISOGUARD PLUS ON WEED CONTROL IN IRRIGATED, LATE-SOWN WHEAT (TRITICUM AESTIVUM).** *Indian Journal of Agronomy. 40(2):296-297.* English. [PUNJABRAO KRISHI VIDYAPEETH WHEAT RES UNIT AKOLA 444104 MAHARASHTRA INDIA].

892 Dessaint, F.; Chadoeuf, R.; Barralis, G. (1993) **[Long-term influence of soil cultivation on the density of adventitious weed sprouts in crops not undergoing weed treatment]. Influence a long terme du travail du sol sur la densite des levees d'adventices en situation de non desherbage.** *Canadian journal of botany = Journal canadien de botanique (Canada) v. 71(7) p. 919-926.* references. French. (AGRIS 95-156231).

893 Doll, H.; Holm, U.; Sogaard, B. (1995) **EFFECT OF CROP DENSITY ON COMPETITION BY WHEAT AND BARLEY WITH AGROSTEMMA GITHAGO AND OTHER WEEDS.** *Weed Research. 35(5):391-396.* English. [RISO NATL LAB DEPT ENVIRONM SCI & TECHNOL DK-4000 ROSKILDE DENMARK].

The effect of Agrostemma githago L. and other naturally occurring weeds on biomass production and grain yield was studied in winter wheat and winter barley. Naturally occurring weeds had only a negligible effect on barley, but reduced wheat grain yield by 10% at a quarter of normal crop density. The interaction between the cereals and A. githago was studied in additive series employing different crop densities. Growth of this weed species was strongly dependent on crop density, which was more important for controlling weed growth than it was for obtaining a normal grain yield. Wheat and especially barley had a better competitive ability than A. githago. Wheat and A. githago utilized resources for growth better when grown in mixture than when grown in pure stands as the relative yield totals were significantly larger than unity. [References: 12].

894 Drossert Steltges, M. (Bonn Univ. (Germany). Inst. fuer Landwirtschaftliche Betriebslehre); Steffen, G. (1994) **[<4. Computer aided simulation and decision models for optimization of production system winter wheat following economic and following criteria> 4.2. The economic threshold concept in weed control, including the assessment of resultant costs]. 4. Rechnergestuetzte Simulations- und Entscheidungsmodelle zur Optimierung des Produktionssystems Winterweizen nach oekonomischen und oekologischen Kriterien. 4.2. Das Schadensschwellenkonzept fuer die Unkrautbekaempfung. Eine Erweiterung durch Folgekostenbewertung.** *Integrated plant production. Research report. Final research report on a priority program "development of an integrated system of crop production with regard to economic and ecological aspects of plant protection in wheat crops". Heitefuss, R. (ed.); Holtschulte, B.; Niemann, M. Deutsche Forschungsgemeinschaft, Bonn (Germany) v. 2 p. 230-250.* VCH. 6 ill., 2 tables; 15 ref. German. (AGRIS 95-156488).

In order to be adapted to reality, the concept of economic thresholds asks for the effects of various weed control strategies on the subsequent crops. One should understand by the notion of rotation costs the modification of the economical performance which results from a difference of the weed seed bank due to controlling or non controlling. The increased seed bank due to non control can result in modifications of yield for the subsequent crop which are measured in money. In order to quantify the rotation costs, a system simulation model of a crop rotation with sugar beets, winter wheat and winter barley is developed, in which the concept of economic thresholds is integrated. For the regeneration of crop rotation, it is necessary to enlarge the existing models for sugar beets and winter wheat with winter barley. The connection between the single crop occurs with the help of the seed bank which is regenerated for various weed groups. The quantification of the various parameters can occur on the basis of the defined difference equations. Simulation experiments for optimum control moments are carried out for single crops and single years. Depending on the initial seed bank, rotation costs are calculated between 4.5 DM/ha and 3 DM/ha per 1000 seeds. These values increase since in reality the difference in seed potential is much larger with and without costs. In order to come closer to reality, the yields for various weather conditions in the year with their consequences on the seed bank are being ascertained. A comparison between the economical performances with and without rotation costs characterizes the information value which can vary between 13 and 75 DM per ha depending on the weather conditions.

895 El Khanagry, S.S.G. (1993) **Comparative study on weed communities associated with some field crops [wheat, maize].** Cairo Univ. (Egypt). Faculty of Agriculture. 55 tables; ref. p. 186-197. 200 p. English. (AGRIS 95-136436).

896 Hald, A.B. (National Environmental Research Institute, Frederiksborgvej 399, 400 Roskilde (Denmark)) (1994) **Comparison of different management techniques for crop margins in relation to wild plants (weeds) and arthropods.** *Field margins: integrating agriculture and conservation. Proceedings of a symposium held at Coventry, UK, 18-20 April 1994. Boatman, N. (ed.) p. 301-306.* British Crop Protection Council (BCPC). 6 ref., BCPC Monograph No. 58. English. (AGRIS 95-156358).

897 Heitefuss, R. (Goettingen Univ. (Germany). Inst. fuer Pflanzenpathologie und Pflanzenschutz); Bodendoerfer, H.; Gerowitt, B. (1994) **[<4. Computer aided simulation and decision models for optimization of production system winter wheat following economic and ecological criteria> 4.1. Long-term development and simulation of weeds in a crop rotation beet-winter wheat-winter barley with different frequencies of weed control and consideration of weed economic thresholds]. 4. Rechnergestuetzte Simulations- und Entscheidungsmodelle zur Optimierung des Produktionssystems Winterweizen nach oekonomischen und oekologischen Kriterien. 4.1. Langfristige Entwicklung und Simulation der Verunkrautung in der Fruchtfolge Rueben-Winterweizen-Wintergerste bei unterschiedlicher Haeufigkeit der Bekaempfung und unter Beruecksichtigung von Schadensschwellen.** *Integrated plant production. Research report. Final research*

report on a priority program "development of an integrated system of crop production with regard to economic and ecological aspects of plant protection in wheat crops". Heitefuss, R. (ed.); Holtschulte, B.; Niemann, M. Deutsche Forschungsgemeinschaft, Bonn (Germany) v. 2 p. 214-229. VCH. 11 ill., 1 table; 25.ref. German. (AGRIS 95-156487).

The development of the weed population in the crop rotation beet-winter wheat-winter barley has been monitored continuously since 1981 in a long-term experiment. Weeds are controlled with herbicides in different frequencies or according to economic thresholds. Various parameters of the population dynamic are recorded, e.g. the weed emergence at different dates, the seed production of selected species and the weed seed banks in the soil, which were quantified by using the germination method. Due to the better ripening conditions in the wheat crop the field densities of Apera spica-venti increased more rapidly in the treatment with no control in winter wheat than with no control in winter barley. Field densities and the weed seed bank of Galium aparine increased relatively fast, if it is not controlled in both cereal crops. By controlling according to weed economic thresholds in both cereal crops, the long-term weed densities were maintained, while unnecessary applications of herbicides were avoided. Based on the experimental data a simulation model was developed for the species A. spica-venti, G. aparine and Myosotis arvensis. The average development of the population under different control strategies is simulated for the three species.

898 Hunter, JH. (1995) **CONTROL OF PERSIAN DARNEL (LOLIUM PERSICUM) AND OTHER GRASSES WITH CLETHODIM.** *Weed Technology. 9(3):432-439.* English. [CANADA EXP FARM INDIAN HEAD SK S0G 2K0 CANADA].

The response of Persian darnel, green foxtail, wild oat, and volunteer cereals to clethodim applied at two growth stages, and the effect of these treatments on flax yield and quality were determined in a series of field experiments in which each weed species was evaluated separately. Clethodim applied at 45 g/ha provided excellent control of Persian darnel, green foxtail, wild oat, and volunteer wheat and barley. Sethoxydim applied at 150 g/ha provided excellent control of Persian darnel, green foxtail, wild oat, and volunteer barley. Flax was tolerant at five times the recommended rate of application and was unaffected by plant growth stage at time of application. When applied at-an early (2- to 3-leaf) stage, control of Persian darnel, green foxtail, wild oat, and volunteer wheat and barley was excellent at 20 g/ha. Except for Persian darnel, weed control as determined by reduction in plant dry weight, was negatively affected by growth stage at time of-application. Although visible control and reduction in plant dry weight were somewhat less when clethodim was applied at the 4-to 5-leaf stage, control of each weed species was acceptable. When weight of water in plant tissue (fresh weight - dry weight) was used as a measure of living plant tissue, wild oat and volunteer barley control were unaffected by growth stage at time of application.

899 Ionescu, F.; Paunescu, G.; Sarpe, N. (Institutul de Cercetari pentru Cereale si Plante Tehnice Fundulea, Simnic (Romania). Statiunea de Cercetari *Agricole* Simnic Craiova) (1994) **[The efficiency of some new types and associations of herbicides for controlling dicotyledonous weeds in wheat crops in the zone of SCA Simnic-Craiova]. Eficacitatea unor tipuri si asociatii noi de eerbicide pentru combaterea buruienilor dicotiledonate din cultura graului in zona SCA Simnic-Craiova.** *Lucrari stiintifice (Romania) v. 9 p. 115-123.* 2 tables; 6 ref. Romanian. (AGRIS 95-136355).

The research carried out during 1990-1992 at the Station for Agricultural Research Simnic-Craiova showed that the new herbicides: Icedin super 1 l/ha, Glean 20 g/ha, Grodil WDG 40 g/ha were most efficient in controlling dicotyledonous weeds in wheat crops, in almost the same efficiency as the known *herbicide* Icedia forte in doses of 2 l/ha. The herbicides: Granstar 20 g/ha, Harmony 40 g/ha and Logran d 1, 5 kg/ha showed a less efficiency in weed control than the herbicides Icedin super, Icedin forte, Glean or Grodin WDG. The herbicides association Starane + Icedin super in doses of 0, 8 + 0, 5 l/ha should be applied for weed control in wheat crops infested with Galium aparine and Convolvulus arvensis. All the herbicides were applied postemergently in the phase of tillering-beginning of building straw in wheat. The dicotyledonous weeds were controlled in the phase of rosette.

900 Jeffery, L.S. (Brigham Young Univ., Utah (USA)) (1992) **Wheat progeny response to preharvest herbicide applications. [Conference paper].** 1. International Weed Control Congress; Melbourne, Vic. (Australia); 17 Feb 1992. *Proceedings of the First International Weed Control Congress, Volume 2. Submitted Papers. Richardson, R.G. (comp.) p. 233-236.* Weed Science Society of Victoria Inc. 1 table, 1 fig., 6 ref. English. (AGRIS 95-156147).

901 Kaspar, J. (Technische Univ. Muenchen Weihenstephan, Freising (Germany). Inst. fuer Pflanzenbau und Pflanzenzuechtung); Fischbeck, G. (1994) **[<3. Managing competition between cultivated plants and weeds by cultivation methods and selective use of herbicide> 3.1. Effects of nitrogen competition between weed population and winter wheat on yield]. 3. Steuerung der Konkurrenzbeziehungen zwischen Kulturpflanze und Unkraut durch anbautechnische Massnahmen und gezielte Anwendung von Herbiziden. 3.1. Auswirkungen der Stickstoffkonkurrenz zwischen Unkrautflora und Winterweizen auf die Ertragsbildung.** *Integrated plant production. Research report. Final research report on a priority program "development of an integrated system of crop production with regard to economic and ecological aspects of plant protection in wheat crops". Heitefuss, R. (ed.); Holtschulte, B.; Niemann, M. Deutsche Forschungsgemeinschaft, Bonn (Germany) v. 2 p. 149-159.* VCH. 4 ill., 2 tables; 10 ref. German. (AGRIS 95-156428).

At the experimental station of the University of Munich/Weihenstephan, the influence of the nitrogen competition between winter wheat and weeds on the yield of cereals has been examined within the framework of a crop rotation experiment. During three years of experiments, very different competition effects by weeds were found without weed control. Especially during the period of stem elongation, characterised by a high nitrogen consumption, the nitrogen competition between weeds and winter wheat had a clear effect on the nitrogen absorption of winter wheat which was connected to yield losses. With increasing ripening of wheat the influence of nitrogen competition by dicotyledoneous weeds is reduced. The effects of chemical treatment after emergence is mainly dependent on weather conditions. It led in only two periods of examination to a nearly weed-free cereal crop. Generally the use of a soil herbicide proved successful. Only in 1988/89 an infestation of grass weeds could not be eliminated efficiently. In the following period, a greater nitrogen competition was the result. Thus important yield losses could no longer be avoided.

902 Lapins, D.; Kotovics, T.; Klasens, V.; Berzins, A. (Latvia University of Agriculture, Jelgava (Latvia)); Gurkina, J. (Latvia State Plant Protection Centre (Latvia)) (1995) **[Herbicide STOMP effectivity in barley fields]. Herbicida STOMP efektivitate miezu sejumos.** *Raziba (Latvia) (no.6) p. 9-12.* 5 table. Latvian. (AGRIS 95-156359).

Research on the effectivity of herbicide STOMP, MCPA mixture in barley fields was carried out in 1993-1994. The effect of these hebicides in weed control and on spring barley yields was studied. The conditions and methods of the experiments are described. The experimental data are shown in tables. The results of the experiments show that the difference in spring barley yields was caused by the difference in soil fertility and the depth of soil tillage before sowing, not by the effect of the herbicides.

903 Lemerle, D. (New South Wales Agriculture, Wagga Wagga (Australia). Agricultural Research Inst.); Cousens, R.D. (Sydney Univ., Camden (Australia). School of Crop Sciences) (1992) **Suppression of weeds by competitive wheat cultivars and interactions with herbicide. [Conference paper].** 1. International Weed Control Congress; Melbourne, Vic. (Australia); 17 Feb 1992. *Proceedings of the First International Weed Control Congress, Volume 2. Submitted Papers. Richardson, R.G. (comp.) p. 282-284.* Weed Science Society of Victoria Inc. 16 ref. English. (AGRIS 95-156253).

904 Levick, K.; Nicholls, J. (Monash Univ., Clayton (Australia). Dept. of Ecology and Evolutionary Biology) (1992) **Wheat waxes and wettability. [Conference paper].** 1. International Weed Control Congress; Melbourne, Vic. (Australia); 17 Feb 1992. *Proceedings of the First International Weed Control Congress, Volume 2. Submitted Papers. Richardson, R.G. (comp.) p. 285-286.* Weed Science Society of Victoria Inc. 3 fig., 5 ref. English. (AGRIS 95-156148).

905 Lu Junqun; Qi Jiahua; Zhou Ronghua (Xinjiang Academy of Agricultural Sciences, Urumqi (China)) (1994) **Natural distribution, biosystematics and origin of weedy rye in Xinjiang [China].** *Xinjiang Agricultural Sciences (China) (no. 1) p. 24-26.* 5 ref. Chinese. (AGRIS 95-136392).

906 Lundkvist, A. (Sveriges Lantbruksuniversitet, Uppsala (Sweden)) (1995) **Influence of climatic conditions on the effect of reduced herbicide doses.** Workshop on Weather Information and Plant Protection; Ultuna (Sweden); 9-10 Nov 1994. Statens Planteavlsforsoeg, Lyngby (Denmark). *SP-Rapport (Denmark) (no.10) p. 79-82.* 2 ill., 11 ref. English. (AGRIS 95-156363).

907 Marocchi, G. (Regione Emilia Romagna, Bologna (Italy). Osservatorio per le Malattie delle Piante) (1995) **[Wheat, the weed control in post-emergency period]. Frumento, si diserba in post-emergenza.** *Terra e Vita (Italy) v. 36(2) p. 32-37.* 4 tables; 1 graph. Italian. (AGRIS 95-136393).

908 Matic, R.; Black, I.D. (South Australian Dept. of Agriculture, Adelaide. Northfield Research Lab.) (1992) **Integrated weed management systems for the control of sand fescue (Vulpia fasciculata) in barley in South Australia. [Conference paper].** 1. International Weed Control Congress; Melbourne, Vic. (Australia); 17 Feb 1992. *Proceedings of the First International Weed Control Congress, Volume 2. Submitted Papers. Richardson, R.G. (comp.) p. 315-317.* Weed Science Society of Victoria Inc. 2 tables, 3 ref. English. (AGRIS 95-156361).

909 Medd, R.W. (New South Wales Agriculture, Orange (Australia). Agricultural Research and Veterinary Centre); McMillan, M.G.; Cook, A.S. (New South Wales Agriculture, Glen Innes (Australia). Agricultural Research and Advisory Station) (1992) **Spray-topping of wild oats (Avena spp.) in wheat with selective herbicides.** *Plant Protection Quarterly (Australia) v. 7(2) p. 62-65.* 3 tables, 23 ref. English. (AGRIS 95-156393).

In field experiments, the majority of wild oat plants were between stem elongation and booting when sprayed with recommended or lower rates of diclofop-methyl, fenoxaprop-ethyl, flamprop-methyl or tralkoxydim. The herbicides, except diclofop-methyl, significantly reduced both the emergence of inflorescences (by up to 99 percent) and seed production (by up to 96 percent). However, fenoxaprop-ethyl and flamprop-methyl reduced the formation of wild oat inflorescences and seed production significantly more than did tralkoxydim. Whilst there was some phytotoxic damage visible in one of the crops, this did not affect the density of wheat heads or wheat grain size. From these preliminary tests it is considered that the tactic of applying low doses of selective herbicides during stem jointing could be useful for preventing seed production of wild oats. Other advantages and aspects to be considered, in developing this form of spray-topping for use in cropping, are discussed.

910 Medd, R.W. (New South Wales Agriculture and Fisheries, Orange (Australia). Agricultural Research and Veterinary Centre); McMillan, M.G.; Cook, A.S. (New South Wales Agriculture and Fisheries, Glen Innes (Australia). Agricultural Research and Advisory Station) (1992) **Spray-topping of wild oats (Avena spp.) in wheat with selective herbicides. [Conference paper].** 1. International Weed Control Congress; Melbourne, Vic. (Australia); 17 Feb 1992. *Proceedings of the First International Weed Control Congress, Volume 2. Submitted Papers. Richardson, R.G. (comp.) p. 330-332.* Weed Science Society of Victoria Inc. 1 table, 11 ref. English. (AGRIS 95-156394).

911 *Milsom, T.P.; Turley, D.; Lane, P.; Wright, B.; Donaghy, S.J.; Moodie, P.* (Central Science Laboratory, Ministry of Agriculture, Fisheries and Food, Tangley Place, Worplesdon, Surrey GU3 3LQ (United Kingdom)) (1994) **Boundary strips in cereal fields: dynamics of flora, weed ingress and implications for crop yield under different strip management regimes.** *Field margins: integrating agriculture and conservation. Proceedings of a symposium held at Coventry, UK, 18-20 April 1994. Boatman, N. (ed.) p. 179-182.* British Crop Protection Council (BCPC). 5 ref., BCPC Monograph No. 58. English. (AGRIS 95-156514).

912 Mishra, J.S.; Gautam, K.C. (National Research Centre for Weed Science, Jabalpur (India)) (1995) **Overcoming the weed menace in wheat.** *Indian Farming (India) v. 44(11) p. 33-36.* 2 tables; English. (AGRIS 95-136472).

913 Nalewaja, J.D. (North Dakota State Univ., Fargo (USA). Crop and Weed Sciences Dept.) (1992) **Efficient weed control in wheat (Triticum aestivum L.) and maize (Zea mays L.). [Conference paper].** 1. International Weed Control Congress; Melbourne, Vic. (Australia); 17 Feb 1992. *Proceedings of the First International Weed Control Congress, Volume 1. Invited Papers. Combellack, J.H.; Levick, K.J.; Parsons, J.; Richardson, R.G. (ed.) p. 224-230.* Weed Science Society of Victoria Inc. 3 tables, 22 ref. English. (AGRIS 95-156425).

914 Nayyar, M.M.; Shafi, M. (Agronomic Research Inst., Faisalabad (Pakistan)); Mahmood, T. (Ayub Agricultural Research Inst., Faisalabad (Pakistan). Plant Physiology Section); Randhawa, A.M. (1994) **Effect of herbicides on monocot weeds [Avena fatua, Phalaris minor and Lolium temulentum] in wheat.** *Journal of Agricultural Research (Pakistan) v. 32(2) p. 149-155.* 3 tables, 9 ref. English. (AGRIS 95-156435).

915 Pandey, S. (New England Univ., Armidale (Australia). Dept. of Agricultural Economics); Medd, R.W. (New South Wales Agriculture and Fisheries, Orange (Australia). Agricultural Research and Veterinary Centre) (1992) **A multi-period economic model for control of wild oats (Avena fatua). [Conference paper].** 1. International Weed Control Congress; Melbourne, Vic. (Australia); 17 Feb 1992. *Proceedings of the First International Weed Control Congress, Volume 2. Submitted Papers. Richardson, R.G. (comp.) p. 375-377.* Weed Science Society of Victoria Inc. 4 fig., 4 ref. English. (AGRIS 95-156395).

916 Plumbe, R.P.L.; Rognon, J.; Szoeke, T. (Rhone Poulenc Secteur Agro, Lyon (France)) (1992) **Herbicide development for weeds in temperate crops - a European perspective [wheat, maize, oilseeds]. [Conference paper].** 1. International Weed Control Congress; Melbourne, Vic. (Australia); 17 Feb 1992. *Proceedings of the First International Weed Control Congress, Volume 1. Invited Papers. Combellack, J.H.; Levick, K.J.; Parsons, J.; Richardson, R.G. (ed.) p. 311-313.* Weed Science Society of Victoria Inc. 1 ref. English. (AGRIS 95-156376).

917 Rapparini, G. (Bologna Univ. (Italy). Centro di Fitofarmacia) (1995) **[The weed control of post-emergence of the wheat and minor cereals]. Il diserbo di post-emergenza del frumento e dei cereali minori.** *Informatore Agrario (Italy) v. 51(3) p. 73-83.* 3 tables. Italian. (AGRIS 95-136427).

918 Re, A.A.M. del; Capri, E.; Ghebbioni, C. (Universita Cattolica del Sacro Cuore, Piacenza (Italy). Istituto di Chimica Agraria ed Ambientale); Imbroglini, G.; Conte, E.; Donnarumma, L. (Istituto Sperimentale per la Patologia Vegetale, Rome (Italy)) (1994) **[Herbicide persistence in soils with different tillage systems and weed control levels (Zea mays, Beta vulgaris, Triticum)]. Persistenza degli erbicidi in terreni assoggettati a diverse modalita' di lavorazione e diversi livelli di diserbo [Zeamays, Beta vulgaris, Triticum].** *Annali della Facolta' di Agraria - Universita' Cattolica del Sacro Cuore, Milano (Italy) v. 34(1-2) p. 3-20.* 8 tables; 2 graphs; 12 ref. Italian. (AGRIS 95-156388).

The effect on herbicide soil persistence of the soil management, herbicide treatment and crop at the end of a 4-year experiment were measured. The results obtained showed that soil persistence was not affected by herbicide mixture and crop (maize, sugarbeet and wheat), while it was slightly affected by soil tillage, showing higher spatial variability. The herbicide 2, 4-D, alachlor, ioxymil, linuron, mecoprop and fluralin were always under the detection limits; the recovery of atrazine, chloridazon, metamitron e phenmedipham were comprised between 0.70 and 14.4%. MCPA and flamprop-isopropyl applied in crop post-emergence were the herbicides most detected (43.9 and 77.7% recovered respectively).

919 Richards, M.C.; Whytock, G.P. (SAC Edinburgh, West Mains Road, Edinburgh EH9 3JG (United Kingdom)) (1993) **Varietal competitiveness with weeds.** *Aspects of Applied Biology (United Kingdom) (no.34) p. 345-354.* 8 ref., Physiology of varieties, University of Nottingham, UK, 6-8 April 1993. English. (AGRIS 95-156366).

920 Ruiter, H. de; Meinen, E.; Uffing, A.J.M. (Institute for Agrobiology and Soil Fertility (AB DLO), Wageningen (Netherlands)) (1994) **Influence of adjuvants on the efficacy of herbicides applied to plants grown indoors and outdoors.** *Comparing glasshouse and field pesticide performance II. Proceedings of an international symposium held at the University of Kent, Canterbury, 12-14 April 1994. Hewitt, H.G.;Caseley, J.; Copping, L.G.; Grayson, B.T.; Tyson, D. (eds.) p. 245-250.* British Crop Protection Council. 1 ref., BCPC Monograph No. 59. English. (AGRIS 95-156436).

921 Salonen, J. (Agricultural Research Centre, Jokioinen (Finland)) (1992) **Propagation, impact and management of Elymus repens in continuous cereal cultivation. [Conference paper].** 1. International Weed Control Congress; Melbourne, Vic. (Australia); 17 Feb 1992. *Proceedings of the First International Weed Control Congress, Volume 2. Submitted Papers. Richardson, R.G. (comp.) p. 454-456.* Weed Science Society of Victoria Inc. 5 ref. English. (AGRIS 95-156365).

922 Sarkar, P.A. (Allahabad Agricultural Inst. (India). Dept. of Agronomy) (1992) **Effectiveness of sodium chloride and 2, 4-D in controlling Parthenium hysterophorus L. and other weeds in late sown wheat. [Conference paper].** 1. International Weed Control Congress; Melbourne, Vic. (Australia); 17 Feb 1992. *Proceedings of the First International Weed Control Congress, Volume 2. Submitted Papers. Richardson, R.G. (comp.) p. 457-460.* Weed Science Society of Victoria Inc. 3 tables, 4 ref. English. (AGRIS 95-156149).

923 Schenke, H. (1993) **[<Cultivation methods for winter wheat in organic farming: weed population and yields depending from mechanical weed control, seed quality plant density and organic fertilisers (liquid manure)>]. Anbautechnik von Winterweizen im organischen Landbau: Unkrautaufkommen und Ertragsbildung in Abhaengigkeit von mechanischer Unkrautregulierung, Saatgutqualitaet, Standraumzumessung und organischer Duengung.** Bonn Univ. (Germany). Inst. fuer Organischen Landbau. Selbstverlag. ill., tables. Bibliography p. 159-174. 176 p. German. (AGRIS 95-156432).

924 Schenke, Holger (Rheinische Friedrich Wilhelm Universitaet, Bonn (Germany). Institut fuer organischen Landbau) (1995) **[Weed control in winter wheat by stimulation of growth and development]. Unkrautkontrolle durch Foerderung der Konkurrenzkraft von Winterweizen.** *Oekologie und Landbau (Germany) (no.1) p. 28-30.* 2 ill. German. (AGRIS 95-156422).

925 Schnell, H.; Linke, K.H.; Sauerborn, J. (University of Hohenheim 380, PO Box 700562, 70593 Stuttgart (Germany)) (1994) **Trap cropping and its effect on yield and Orobanche crenata Forsk. infestation on following pea (Pisum sativum L.) crops.** *Tropical Science (United Kingdom) v. 34(3) p. 306-314.* 14 ref. English. (AGRIS 95-136521).

926 Schumann, H. (Bonn Univ. (Germany). Lehrstuhl fuer Speziellen Pflanzenbau und Pflanzenzuechtung) (1994) **[<3. Managing competition between cultivated plants and weeds by cultivation methods and selective use of herbicide> 3.4. Studies on competition and increase of weed in a rotation with winter wheat, winter barley and sugar beet]. 3. Steuerung der Konkurrenzbeziehungen zwischen Kulturpflanze und Unkraut durch anbautechnische Massnahmen und gezielte Anwendung von Herbiziden. 3.4. Unkrautkonkurrenz und -vermehrung in einer Fruchtfolge mit Winterweizen, Wintergerste und Zuckerrueben.** *Integrated plant production. Research report. Final research report on a priority program "development of an integrated system of crop production with regard to economic and ecological aspects of plant protection in wheat crops". Heitefuss, R. (ed.); Holtschulte, B.; Niemann, M. Deutsche Forschungsgemeinschaft, Bonn (Germany) v. 2 p. 192-211.* VCH. 4 ill., 13 tables; 31 ref. German. (AGRIS 95-156431).

To determine influence of differently terminated application of underseeds and herbicides on weed competition and increase in winter barley and its following crops sugar beet, winter wheat and sugar beet two year field experiments at two locations in the Rhine area are carried out in crop plant populations varied by genotype, seed rate and nitrogen management. Comparing the effects of similar treatments in winter wheat, winter barley and sugar beet different weed control strategies for the rotation, including underseeds as a mean of suppression of weeds, are valued using the criteria yield loss in the single culture and the population dynamics in the rotation. The amount of competition in mixed stands results from the competitive power of weed and crop plant. This is influenced by weed's growth mass and composition of species and by cultivation system of winter barley. Strong stands of two rowed barley varieties are able to suppress weed plants. Possibility of compensation of competition is given by crop plant's density- and nitrogen-management. A low effect of cultivation methods seeding is determined by success of weed control. Increased seed content by lasting weeds produces following weeds, which can be proofed to the third following crop. Because of the sensible stages to weed competition of winter barley and winter wheat after EC25 and sugar beet after 6 leaves and because of early seeding weeds and their carry over in the rotation weed competition has to be removed early for avoiding yield losses and following weed surely. With underseeds as an alternative form of weed control, dependent on species and sowing date, interference can be produced, which suppresses weed but not crop plant.

927 Scott, RC.; Peeper, TF.; Koscelny, JA. (1995) **WINTER WHEAT (TRITICUM AESTIVUM) YIELD RESPONSE TO WINTER ANNUAL BROADLEAF WEED CONTROL.** *Weed Technology. 9(3):594-598.* English. [OKLAHOMA STATE UNIV DEPT AGRON STILLWATER, OK 74078 USA].

Selected herbicide treatments from 25 winter annual broadleaf weed control experiments conducted across Oklahoma from 1979 to 1993 were examined for winter wheat yield response to weed control, All experiments contained one or two of the same three weeds (henbit, bushy wallflower, or cutleaf eveningprimrose) as the primary target(s). Herbicide treatments included chlorsulfuron at 8.8 or 17.6 g ai/ha, and/or 2, 4-D at 420 g ae/ha, all broadcast POST to wheat. Most herbicide treatments controlled the weeds, but increased wheat grain yield at only one site, wherein bushy wallflower density was 830/m(2). Correlation analysis found no relationship between weed densities and wheat yield when chlorsulfuron at 8.8 g/ha was applied for henbit or moderate levels of bushy wallflower or cutleaf evenmgprimrose. There was a significant positive relationship favoring spraying of bushy wallflower when the correlation analysis included data from one site with a density of 830 plants/m(2).

928 Thakur, SS.; Pandey, IB.; Singh, SJ.; Mishra, SS. (1995) **RESPONSE OF WHEAT (TRITICUM AESTIVUM) VARIETIES TO WEED MANAGEMENT UNDER LATE-SOWN CONDITION ON CALCAREOUS SOIL OF NORTH BIHAR.** *Indian Journal of Agronomy. 40(2):204-208.* English. [RAJENDRA AGR UNIV DEPT AGRON PUSA 848125 BIHAR INDIA].

A field experiment was conducted during 1990-91 and 1991-92 to study the response of wheat (Triticum aestivum L. emend. Fiori & Paol.) varieties to weed management at Pusa. All the weed-management practices gave significant control of weeds and higher grain yield than weedy check. Among the weed-management practices, hand-weeding recorded the maximum grain yield and was significantly superior to all other treatments. Although higher dose of isoproturon (2.0 kg ai/ha) recorded the highest weed-control efficiency, it had an adverse effect on crop growth and reduced the grain yields. All the wheat varieties performed equally in respect of grain and straw yields except 'HP 1102'. Application of isoproturon beyond the rate of 1.0 kg ai/ha was not found desirable.

929 Thill, D.C.; Mallory Smith, C.A. (Idaho Univ., Moscow (USA). Dept. of Plant, Soil and Entomological Sciences) (1992) **Integrated control of wild oat, Avena fatua, in spring barley Hordeum vulgare, in Idaho. [Conference paper].** 1. International Weed Control Congress; Melbourne, Vic. (Australia); 17 Feb 1992. *Proceedings of the First International Weed Control Congress, Volume 2. Submitted Papers. Richardson, R.G. (comp.) p. 519-521.* Weed Science Society of Victoria Inc. 9 ref. English. (AGRIS 95-156362).

930 Vanova, M. (Zemedelsky Vyzkumny Ustav, Kromeriz (Czech Republic)) (1995) **[Weeds in spring barley]. Jarni jecmen a plevele.** *Uroda (Czech Republic) v. 43(2) p. 6-8.* 2 graphs, 1 ill. Czech. (AGRIS 95-136432).

931 Vanova, M. (Zemedelsky Vyzkumny Ustav, Kromeriz (Czech Republic)) (1995) **[Wild oat in cereal crops]. Oves hluchy v obilninach.** *Rostlinolekar (Czech Republic) v. 6(1) p. 5-7.* 1 ill. Czech. (AGRIS 95-136470).

932 Vanova, M.; Spitzer, T. (1995) **DIFFERENT RESPONSES OF WINTER WHEAT CULTIVARS TO CHLORTOLURON [Slovak].** *Rostlinna Vyroba. 41(11):505-509.* Slovak. [ZEMEDELSKY VYZKUMNY USTAV HAVLICKOVA 2787 CR-76741 KROMERIZ CZECH REPUBLIC].

Effects of three formulations of the chlortoluron active ingredient and several combined products also containing this agent on the growth and development of winter wheat were studied in small-plot field experiments. Effects on a number of tillers and dry matter production per unit area and grain yield in sets of eight and nine winter wheat varieties were investigated in 1991/1992, 1992/1993 and 1993/1994. The results obtained in 1991/1992

showed that pre-emergent and post-emergent application of herbicides which contained chlortoluron as one of effective agents to the Hana variety caused reduction of plant weight in all cases studied. Significant reduction was recorded after the pre-emergent application of Syntop, Assert + chlortoluron and a combination of Dicuran 80 WP + Aminex. In 1992/1993, the pre-emergent autumn application of Pendiron and post-emergent spring one of three formulations of chlortoluron were investigated in a set of nine winter wheat varieties. Pendiron showed phytotoxicity expressed in considerable growth hindering. A number of tilters was lower in all varieties when compared to a check variety, and significantly lower in Vega and Torysa varieties in which grain yield was also significantly reduced. Significant yield reduction was determined in Livia too. Bt three chlortoluron formulations in spring post-emergent application significant yield loss was assessed in Vega and Torysa. In 1993/1994, responses of nine winter wheat varieties to the post-emergent autumn application with chlortoluron contained in three commercial products were studied. The varieties Vega, Bruta and Sida showed significant reduction of a tiller number after all of the products applied. Dry matter yield per unit area was reduced in all varieties studied, and significantly reduced in Vega, Bruta and Sida after all products. In the varieties Asta, Siria, Danita and Simona - after the products which are marked with asterisks (Fig. 4). Grain yield was significantly lower in Vega. Based on statistical evaluation, the application of chlortoluron can be considered as a measure which could cause the reduction of production ability, including yield loss in sensitive varieties. That can be increased in fields which do not enable higher compensation of a lower tiller number and biomass dry matter at early growth and developmental stages. Despite high yield potential, the varieties Vega, Bruta, Torysa and Sida were sensitive.

933 Verschwele, A. (1994) **[<Winter wheat varieties and their specific competitive efficiency as a limiting factor for weed growth>]. Sortenspezifische Kulturkonkurrenz bei Winterweizen als begrenzender Faktor fuer das Unkrautwachstum.** Goettingen Univ. (Germany). Fachbereich Agrarwissenschaften. Selbstverlag. 48 ill., 38 tables. Bibliography p. 105-115. 121 p. German. (AGRIS 95-156427).

934 Verschwele, A.; Niemann, P. (1994) **[<3. Managing competition between cultivated plants and weeds by cultivation methods and selective use of herbicide> 3.2. Competitive ability of winter wheat cultivars for indirect weed control]. 3. Steuerung der Konkurrenzbeziehungen zwischen Kulturpflanze und Unkraut durch anbautechnische Massnahmen und gezielte Anwendung von Herbiziden. 3.2. Die Konkurrenzkraft von Winterweizensorten als Beitrag zur indirekten Unkrautbekaempfung.** Biologische Bundesanstalt fuer Land- und Forstwirtschaft, Braunschweig (Germany). Inst. fuer Unkrautforschung. *Integrated plant production. Research report. Final research report on a priority program "development of an integrated system of crop production with regard to economic and ecological aspects of plant protection in wheat crops". Heitefuss, R. (ed.); Holtschulte, B.; Niemann, M. Deutsche Forschungsgemeinschaft, Bonn (Germany) v. 2 p. 160-174.* VCH. 8 ill., 1 table; 22 ref. German. (AGRIS 95-156430).

Differences in growth habit and growth rate of cereal cultivars are controlled genetically. The light dynamics in crop stands and consequently the growth of weeds are effected by these characteristics. Field trials were conducted at two sites southeast of Braunschweig to evaluate the weed suppressive potential of selected winter wheat cultivars. The cultivars showed a considerable variability in traits like plant height, leaf angle and growth rate. Cultivars with a high shading capacity suppressed weeds better: Weed growth rate was more than twice in the low competitive cultivars 'Slejpner' or 'Kraka' compared to strong competitors 'Hai' and 'Adular'. Light penetration into the canopy was strongly correlated with traits like ground cover, plant height and stem weight. The ranking of the cultivars related to weed suppression was only slightly influenced by weed species, year, site and nitrogen dose. This finding opens the possibility to evaluate the interspecific competitive ability of cultivars noting only a few key morphological characteristics and using these information for indirect weed control. Investigations will be continued to measure the effects and interactions of agronomical factors upon relevant cultivar characteristics responsible for weed suppression more precisely and to optimize the competitiveness of cereal crop stands.

935 Wilson, BJ.; Wright, KJ.; Brain, P.; Clements, M.; Stephens, E. (1995) **PREDICTING THE COMPETITIVE EFFECTS OF WEED AND CROP DENSITY ON WEED BIOMASS, WEED SEED PRODUCTION AND CROP YIELD IN WHEAT.** *Weed Research. 35(4):265-278.* English. [UNIV BRISTOL LONG ASHTON RES STN DEPT AGR SCI IARC BRISTOL BS18 9AF AVON ENGLAND].

Competition between winter-sown wheat and Viola arvensis Murray or Papaver rhoeas L. was studied in two experiments in two successive years. The effects of varying crop and weed density were modelled in terms of weed biomass over time, weed seed production and crop yield. Biomass model parameters, representing maximum weed biomass and intra and interspecific competition, were obtained for different assessment dates, enabling biomass levels to be predicted during the two growing seasons. Weed biomass declined, and its maximum level was reached earlier, with increasing crop density. Intraspecific competition was higher in the absence than in the presence of crop, increasing with time and with weed density. Halving the wheat population increased June biomass of V. arvensis by 74% and of P. rhoeas by 63%. Crop yield losses with increasing weed density were greater with low than with medium and high crop populations. P. rhoeas was significantly more competitive than V. arvensis in both years. Weed biomass in 1989 responded more to reductions in crop density following the milder winter of 1988/89 than in the previous year; however crop yields were less affected in 1989 due to summer drought, restricting late weed growth and competition. Weed seed production was related to weed biomass; the progressive lowering of crop density increased seed production, and both species were very prolific in the absence of crop. By combining models, seed production could be derived for a given competitive effect on the crop. Threshold weed populations, based on low weed levels that are not economic to control, could then be equated with the accompanying weed seed production. [References: 18].

936 Zaicou, C.M.; Gill, G.S. (Western Australian Dept. of Agriculture, Perth) (1992) **Effect of crop seeding rates and chemical control of brome grass on crop yield and brome grass seed output [wheat-lupin rotations]. [Conference paper].** 1. International Weed Control Congress; Melbourne, Vic. (Australia); 17 Feb 1992. *Proceedings of the First International Weed Control Congress, Volume 2. Submitted Papers. Richardson, R.G. (comp.) p. 589-591.* Weed Science Society of Victoria Inc. 2 fig., 3 ref. English. (AGRIS 95-156254).

937 Zimdahl, R.L. (Colorado State Univ., Fort Collins (USA). Weed Research Lab.) (1992) **Weed impact on wheat, maize, and other temperate crops. [Conference paper].** 1. International Weed Control Congress; Melbourne, Vic. (Australia); 17 Feb 1992. *Proceedings of the First International Weed Control Congress, Volume 1. Invited Papers. Combellack, J.H.; Levick, K.J.; Parsons, J.; Richardson, R.G. (ed.) p. 118-122.* Weed Science Society of Victoria Inc. 2 tables, 18 ref. English. (AGRIS 95-156377).

J10 HANDLING, TRANSPORT, STORAGE AND PROTECTION OF AGRICULTURAL PRODUCT

938 Niquet, G. (Institut Technique des Cereales et des Fourrages, Paris (France)) (1995) **[Cooling ventilation to preserv grain]. Ventilation de refroidissement: la meilleure facon de conserver les grains.** *Perspectives Agricoles (France) (no 203) p. 22-25.* French. (AGRIS 95-136604).

J11 HANDLING, TRANSPORT, STORAGE AND PROTECTION OF PLANT PRODUCT

939 Abou Zaid, M.I.; Aly, A.Z.; Tohamy, M.R.A. (Zagazig Univ. *(Egypt).* Faculty of Agriculture); El Sayed, M.A.S. (1993) **Effect of some storage fungi on chemical and rheological properties of wheat grains.** *Zagazig Journal of Agricultural Research (Egypt) v. 20(1A) p. 163-175.* 12 tables; 32 ref. English. (AGRIS 95-136644).

940 Ahmedani, M.S. (1993) **Some studies on correlation between mite infestation and qualitative losses of stored grain in private godowns of D.G. Khan [Pakistan].** University of Agriculture, Faisalabad (Pakistan). Dept. of Agricultural Entomology. UAF. 30 ills., 61 tables, 25 ref. 156 p. English. (AGRIS 95-136646).

941 Alagusundaram, K.; Jayas, DS.; White, NDG.; Muir, WE.; Sinha, RN. (1995) **CONTROLLING CRYPTOLESTES FERRUGINEUS (STEPHENS) ADULTS IN WHEAT STORED IN BOLTED-METAL BINS USING ELEVATED CARBON DIOXIDE.** *Canadian Agricultural Engineering. 37(3):217-223.* English. [UNIV MANITOBA DEPT BIOSYST ENGN 438 ENGN BLDG WINNIPEG MB R3T 5V6 CANADA].

Experiments were conducted in two 5.56 m-diameter farm bins to determine the mortality of caged adult rusty grain beetles, Cryptolestes ferrugineus (Stephens) (Coleoptera: cucujidae), under elevated carbon dioxide (CO2) concentrations. The bins were filled with wheat to a depth of 2.5 m. Dry ice was used to create high CO2 concentrations in the wheat bulks. Two different modes of application of dry ice were used: (i) pellets on the grain surface and in the aeration duct and (ii) pellets on the grain surface and blocks in insulated boxes on the grain surface. The pellets exposed to the ambient conditions on the grain surface and in the aeration duct sublimated quickly and had to be replenished at frequent intervals. Dry ice blocks in insulated boxes, however, maintained high CO2 concentrations without replenishment for over 15 d. In both modes of application, the observed CO2 concentrations in the intergranular gas were about 15% and 30% (all the CO2 concentrations given in this article are on a volume basis) at 2.05 m and 0.55 m above the floor, respectively. At 0.55 m above the floor, the mortality of rusty grain beetle adults was more than 90% while in the top portions of the bulk (2.05 m above the floor) the mortality was only 30%. On an average about two thirds of the insects were killed. The use of controlled atmosphere treatment within an integrated pest management context is outlined. [References: 23].

942 Buchelos, CT.; Katopodis, CA. (1995) **A SURVEY OF BEETLES IN STORE-ROOMS CONTAINING BARLEY AND MAIZE FOR ANIMAL FEED, ON THE ISLAND OF LEFKAS, GREECE - ABUNDANCE AND POPULATION FLUCTUATION OF THE MOST SIGNIFICANT SPECIES.** *Journal of Stored Products Research. 31(3):253-258.* English. [AGR UNIV ATHENS AGR ZOOL & ENTOMOL LAB GR-11855 ATHENS GREECE].

During an 18-month survey on stored barley and maize intended for animal feed conducted in store-rooms on the island of Lefkas, Greece, 21 different taxa of stored product Coleoptera belonging to 12 families were represented in a total of 6027 individuals, The most abundant species were Sitophilus oryzae (L.) and S.granarius (L.). The abundance of each taxon in both products is presented, white their presence in different parts of the stores is commented upon, Finally, the population fluctuations of the 5 most numerically significant taxa are described. [References: 11].

943 Cofieagblor, R.; Muir, WE.; Zhang, Q.; Sinha, RN. (1995) **CO2 PRODUCTION BY CRYPTOLESTES FERRUGINEUS (STEPHENS) IN STORED WHEAT UNDER ADIABATIC CONDITIONS.** *Journal of Agricultural Engineering Research. 62(2):95-103.* English. [UNIV WINNIPEG DEPT BIOSYST ENGN WINNIPEG MB R3T 5V6 CANADA].

Cumulative carbon dioxide (CO2) production from the respiration of Cryptolestes ferrugineus (Stephens) in stored wheat was measured in an adiabatic respiratory calorimeter. The effects of the following variables on CO2 production were determined: initial grain temperature (15, 20, 25, 30 and 35 degrees C), grain moisture content (12, 15 and 18% w.b.), grain mechanical condition (wheat with 0, 10 and 20% broken kernels), adult age, (1, 4 and 8 weeks old), adult population density (1250, 2500 and 5000 insects/200 g of wheat, and immatures stages (second, third and fourth instar larvae at a density of 1250 larvae/200 g of wheat). The main effects of the variables and their interactions on the rate of CO2 production were highly significant ($P < 0.001$, from analysis of variance). Carbon dioxide production by adult and larvae increased with increasing initial grain temperature, moisture content and wheat breakage. Carbon dioxide production per insect also increased with age from 1 week to 4 weeks old and then decreased at 8 weeks of age, and it increased with increasing density from 1250 to 2500 insects/200g of wheat and then decreased at 5000 insects/200g of wheat. The CO2 production rate by 4-week-old adult C. ferrugineus at 15-35 degrees C in wheat with 20% broken kernels of 12-18% m.c. was fitted by an exponential equation, whereas the CO2 production rate by the second, third and fourth instar larvae at 20-35 degrees C in wheat with 20% broken kernels of 12-18% moisture content (m.c.) was fitted using linear and exponential equations. (C) 1995 Silsoe Research Institute [References: 15].

944 Dunkel, F.V. (Montana State University, Bozeman, Montana); Ivie, M.A. (1994) **Xylocoris Galactinus (Fiber) (Hemiptera: Anthocoridae) newly discovered in Montana stored grain.** *The Pan-Pacific entomologist (USA) v. 70(4) p. 327-328.* English. (AGRIS 95-136766).

945 El Neshawy, S.M. (Ministry of Agriculture, Cairo (Egypt). Plant Pathology Research Inst.); Tohamy, M.R.A.; Kheder, M.A.; Sallam, M.E.A. (1992) **Wheat grain deterioration by storage fungi in relation to some environmental factors.** *Zagazig Journal of Agricultural Research (Egypt) v. 19(6) p. 2635-2646.* 6 tables; 24 ref. English. (AGRIS 95-156610).

946 Hocking, E.J.; Suter, D.A.I. (Western Cereal Lab., Enfield (Australia)); Booth, R. (Newport Scientific Pty Ltd, Narrabeen (Australia)); Downie, P. (Perten Instruments Australia Pty Ltd, Victoria (Australia)) (1993) **Comparison of the falling number test and stirring number test for evaluation of weather damaged wheat. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 508.* Abstract only. English. (AGRIS 95-136642).

947 Jayas, D.S.; Alagusundaram, K.; Shunmugam, G.; Muir, W.E.; White, N.D.G. (1992) **Simulation of temperatures in stored bulks of wheat using a three-dimensional finite element model.** *American Society of Agricultural Engineers. Meeting (USA); no. 926527 21 p.* references. Paper presented at the "1992 International Winter Meeting sponsored by The American Society of Agricultural Engineers, " December 15-18, 1992, Nashville, Tennessee. English. (AGRIS 95-136647).

948 McCleary, B.V. (Megazyme Aust. Pty Ltd, Warriewood (Australia)); Smith, E.E.; Suter, D.A.I. (Western Cereal Lab., Enfield (Australia)) (1993) **Factors affecting the correlation between starch damage and maltose values for wheat flours. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 509.* Abstract only. English. (AGRIS 95-136827).

949 Varnava, A. (Cyprus Grain Commission, Nicosia (Cyprus). Inspection Dept.); Navarro, S.; Donahaye, E. (1995) **Long-term hermetic storage of barley in PVC-covered concrete platforms under Mediterranean conditions.** *Postharvest Biology and Technology (Netherlands) v. 6(1-2) p. 177-186.* 8 ref. English. (AGRIS 95-136635).

950 Xu Guogan; Li Kesheng; Wang Yuejin (Ministry of Agriculture, Beijing (China). Inst. of Plant Quarantine) (1994) **Studies on the technique of fumigating stored grain pests by circulating methyl bromide in silo bin.** *Plant Quarantine (China) v. 8(2) p. 76-79.* 4 tables; 2 ill., 1 ref. Chinese. (AGRIS 95-136643).

L01 ANIMAL HUSBANDRY

951 Meron, Y. (1994) **Direct silaging of lucerne green matter by adding wheat straw treated with sulphur dioxide; digestion of carbohydrates by milk cows.** Agricultural Research Organization, Bet-Dagan (Israel). Metabolic Dept. *Hassadeh (Israel) v. 74(8) p. 888-890.* 4 tables, 13 ref. Hebrew. (AGRIS 95-137728).

952 Vigh Larsen, F.; Jensen, L.R. (1995) **[Effect of light and feeding on production, carcass and meat quality in young red deer]. Effekt af lysprogram og fodring paa produktion, slagte- og koedkvalitet af unge krondyr produceret paa stald.** Statens Husdyrbrugsforsoeg, Foulum (Denmark). *Forskningsrapport (Denmark); no. 33 21 p.* SH. 8 tables; 24 ref. Danish. (AGRIS 95-137907).

L02 ANIMAL FEEDING

953 Abd El Gawad, A.M. (Cairo Univ. (Egypt) Faculty of Agriculture); Zahran, K.M.A.; Khadr, N.S.A. (1993) **Use of ammoniated wheat or rice straw in goat rations.** *Journal of Agricultural Sciences, Mansoura Univ. (Egypt) v. 18(12) p. 3466-3480.* 5 tables; 45 ref. English. (AGRIS 95-158067).

954 Brand, T.S. (Department of Agriculture, Elsenburg (South Africa). Elsenburg Agricultural Development Inst.); Van der Merwe, G.D. (1994) **Comparison of triticale cultivars with maize grain for finishing lambs.** *South African Journal of Animal Science (South Africa) v. 24(4) p. 142-146.* English. (AGRIS 95-158003).

955 Castaing, J. (Association Generale des Producteurs de Mais, Montardon (France). Service Utilisations Animales); Albar, J.; Serin, J.F. (1995) **[The use of feed by-products from southern France: corn meal, wheat middlings and rice short meal]. Valorisation par le porc charcutier de co-produits d'industries agro-alimentaires du sud de la France: farine de maiserie, remoulage demi-blanc, farine basse de riz.** 27. Journees de la Recherche Porcine en France. [27. French Swine Research Days]; Paris (France); 31 Jan - 2 Fev 1995. *[27. French swine research days. Paris (France) 1995 January 31, February 1 and 2]. 27. Journees de la recherche porcine en France. Paris (France) 31 janvier, 1 et 2 fevrier 1995. Institut Technique du Porc, Paris (France); Institut National de la Recherche Agronomique, Paris (France) p. 223-230.* ITP. 10 ref., 8 tableaux. French. (AGRIS 95-138118).

956 Chotinski, D. (Institut po Ptitsev"dstvo, Kostinbrod (Bulgaria)); Stanchev, Kh.; Aleksandrov, S. (1994) **[Effect of beta-gluconase addition for partial or full substitution of maize by barley in the mixes for broiler chickens]. Efekt ot dobavkata na beta-glukonaza pri chastichno i p"lno zamestvane na tsarevitsata s echemik v smeski za pileta brojleri.** Selskostopanska Akademiya, Sofia (Bulgaria). *Zhivotnov"dni Nauki (Bulgaria); Animal Science v. 31(7-8) p. 111-115.* 5 tables; 31 ref. Bulgarian. (AGRIS 95-138230).

957 Godfrey, SI.; Nagaraja, TG.; Winslow, SW.; Rowe, JB. (1995) **RUMEN MICROBIAL ADAPTATION TO LONG-TERM FEEDING OF VIRGINIAMYCIN IN SHEEP FED BARLEY AND VIRGINIAMYCIN AS A SUPPLEMENT.** *Australian Journal of Agricultural Research. 46(6):1149-1158.* English. [DEPT AGR BARON HAY COURT S PERTH WA 6151 AUSTRALIA].

Profiles of rumen fermentation were examined in sheep supplemented with barley or barley plus virginiamycin for 7 weeks and challenged with 1.7 kg of barley with or without virginiamycin. Twenty-five sheep were housed in individual pens and fed chaff, up to a maximum of 1.4 kg/day. Sheep were allocated to one of three treatments; no grain supplement (n = 5), barley grain 700 g twice weekly (n = 10) or barley with virginiamycin (40 g/t grain; n = 10). After 7 weeks, five animals in each treatment group fed grain received 1 7 kg of barley and five received 1.7 kg of barley plus virginiamycin (40 g/t). Sheep supplemented with barley alone maintained a normal pattern of rumen fermentation in response to 1.7 kg of barley indicating adaptation of rumen microbes to grain feeding. In animals supplemented with barley on its own and then fed barley plus virginiamycin there were higher concentrations of L-lactic acid ($P < 0.001$) and ammonia ($P < 0.01$) and a lower rumen pH ($P < 0.01$) than sheep in other treatments at 9, 12 and 24 h following grain feeding. The number of protozoa was decreased ($P < 0.001$) 24 h following feeding in sheep supplemented with barley and challenged with barley plus virginiamycin compared to pre-feeding (0 h) counts, but not in other treatment groups. Incubations of rumen fluid with glucose from sheep supplemented with barley and barley plus virginiamycin indicated virginiamycin was still effective in reducing L-lactate production following 9 weeks of supplement feeding. The results indicate virginiamycin may disrupt rumen function in sheep already adapted to grain that has not been treated with virginiamycin. [References: 18].

958 Hargreaves B, Antonio (Instituto de Investigaciones Agropecuarias, Osorno (Chile). Estacion Experimental Remehue) (1994) **[Use of the whole plant of small grain cereals in animal production]. Uso de cereales de grano pequeno como planta completa en produccion animal.** *Produccion Animal. Serie B - Universidad Austral de Chile. Instituto de Produccion Animal (Chile) (no. 18) p. 1-22.* 36 ref. Spanish. (AGRIS 95-157869).

959 Jeroch, H. (Halle Wittenberg Univ., Halle (Germany). Inst. fuer Tierernaehrung); Daenicke, S. (1995) **[Barley in poultry nutrition especially of fowls]. Gerste in der Ernaehrung des Gefluegels, insbesondere der Huehner.** *Uebersichten zur Tierernaehrung (Germany) v. 23(1) p. 27-54.* 13 tables. Bibliography 118 ref. German. (AGRIS 95-138234).

960 Jondreville, C. (Institut Technique des Cereales et des Fourrages, Villerable (France)); Brongniart, I.; Gatel, F.; Grosjean, F. (1995) **[Effect of enzyme supplementation on the ileal digestibility of barley-based diets in growing pigs [Bio Feed beta CT]]. Influence de l'addition d'enzymes Bio-Feed beta CT sur la digestibilte ileale des composants d'aliments contenant une proportion variable d'orge chez le porc en croissance.** 27. Journees de la Recherche Porcine en France. [27. French Swine Research Days]; Paris (France); 31 Jan - 2 Fev 1995. *[27. French swine research days. Paris (France) 1995 January 31, February 1 and 2]. 27. Journees de la recherche porcine en France. Paris (France) 31 janvier, 1 et 2 fevrier 1995. Institut Technique du Porc, Paris (France); Institut National de la Recherche Agronomique, Paris (France) p. 217-222.* ITP. 13 ref. French. (AGRIS 95-138117).

961 Jondreville, C. (Institut Technique des Cereales et des Fourrages, Villerable (France)); Gatel, F.; Grosjean, F.; Callu, P.; Brinet, P. (1995) **[Diminution of protein levels in wheat and soybean meal-based diets supplemented with industrial amino acids: growth and slaughter performance and nitrogen excretion by growing-finishing pigs]. Diminution du taux proteique dans les regimes ble - tourteau de soja supplementes en acides amines industriels: performances d'engraissement et excretion azotee du porc charcutier.** 27. Journees de la Recherche Porcine en France. [27. French Swine Research Days]; Paris (France); 31 Jan - 2 Fev 1995. *[27. French swine research days. Paris (France) 1995 January 31, February 1 and 2]. 27. Journees de la recherche porcine en France. Paris (France) 31 janvier, 1 et 2 fevrier 1995. Institut Technique du Porc, Paris (France); Institut National de la Recherche Agronomique, Paris (France) p. 279-284.* ITP. 10 ref. French. (AGRIS 95-138123).

962 Jondreville, C. (Institut Technique des Cereales et des Fourrages, Villerable (France)); Van Den Broecke, J.; Gatel, F.; Bertin, J.M.; Beaux, M.F.; Grosjean, F. (1996) **[Factors affecting protein and amino acid ileal digestibility in wheat meal by-products for pigs]. Facteurs de variation de la digestibilte ileale de la proteine et des acides amines d'issues de meunerie chez le porc charcutier.** 27. Journees de la Recherche Porcine en France. [27. French Swine Research Days]; Paris (France); 31 Jan - 2 Fev 1995. *[27. French swine research days. Paris (France) 1995 January 31, February 1 and 2]. 27. Journees de la recherche porcine en France. Paris (France) 31 janvier, 1 et 2 fevrier 1995. Institut Technique du Porc, Paris (France); Institut National de la Recherche Agronomique, Paris (France) p. 189-195.* ITP. 20 ref. French. (AGRIS 95-138115).

963 Kaoma, C.; Blaha, J.; Heger, J.; Skarkova, L. (1995) **EFFECTS OF DIFFERENT ENZYME PREPARATIONS ON GROWTH RATE AND FEED EFFICIENCY IN BROILERS FED ON MASH OR PELLETED BARLEY-CONTAINING DIETS.** *Zivocisna Vyroba. 40(9):411-415.* English. [PRAGUE AGR UNIV INST TROP & SUBTROP ZEMEDELSTVI 6 SUCHDOL CR-16521 PRAGUE CZECH REPUBLIC].

The efficacy of four different enzyme preparations containing both beta-glucanase and arabinoxylanase activities was studied in two experiments on chicks fed on barley-containing diets given as mash or as pellets. In Expt. 1, starter and finisher mash diets were used, containing 15% and 18% barley, respectively. The inclusion of all enzymes resulted in improvements in body weight gain as compared with the control group, the differences being significant in most cases. Feed efficiency was also improved with all enzyme supplements. The improvements were greater in the starter period (1-21 days) than in the finisher period (21-42 days). In Expt. 2, pelleted diets of the same composition as in Expt. 1 were used. Weight gains were significantly increased and feed efficiency improved in all enzyme-treated groups. Similarly like in Expt. 1, the effect of enzymes was more evident in the starter period than in the finisher period. There was no close relationship between beta-glucanase or xylanase activity as determined in vitro and the biological efficacy of enzyme preparations.

964 Kim, C.M.; Chung, T.Y. (Konkuk University, Seoul (Korea Republic). College of Animal Husbandry); Lee, B.S. (Rural Development Administration, Suwon (Korea Republic)) (1994) **Influence of cutting length of ammoniated barley straw on the eating and ruminating behavior of Korean native cattle.** *Korean Journal of Animal Science (Korea Republic) v. 36(5) p. 487-493.* 6 tables; 17 ref. Korean. (AGRIS 95-138000).

965 Kozlowski, M.; Czarnyszewicz, J. (1994) **[Slaughter value of hogs fed with complete mixed feed with bruised triticale grain in]. Wartosc rzezna tucznikow zywionych mieszankami pelnoporcjowymi z udzialem sruty pszenzytniej.** *Gospodarka Miesna (Poland) (no.5) p. 24-25, 28.* 3 tables. Polish. (AGRIS 95-138180).

The results of slaughter analysis have proved that use of triticale in hogs feeding is profitable. Dissection of the proper leg showed essential differences among feeding hogs' groups. The improvement of leg conformation in hogs fed with mixture with bruished triticale grains had no conspicious influence on the results of physicochemical and chemical evaluation of dorsal muscle (longissimus dorsi).

966 Lanza, A.; Pennisi, P.; Biondi, L.; Lanza, M. (Catania Univ. (Italy). Istituto di Scienze e Tecnologie delle Produzioni Animali) (1993) **[Effects of different feeding systems on milk production in Comisana ewes. 1: Use of a complete diet]. Effetti di diversi sistemi alimentari sulla produzione lattea di pecore Comisane. 1: Prove di impiego dell'unifeed.** [Societa Italiana delle Scienze Veterinarie. 47. National meeting. Session 5. Zootechny and animal nutrition]; Riccione, Forli (Italy); 29 Sep - 3 Oct 1993. *Atti della Societa Italiana delle Scienze Veterinarie (Italy) v. 47(pt.3) p. 1751-1755.* 4 tables; 14 ref. Italian. (AGRIS 95-157990).

3 groups of Comisana ewes received from 32th to 220th day of lactation the following feeds: traditional (group 1); complete diet (group 2); complete diet (phase a), complete diet + green forage (phase b) (group 3). Complete diet consists of alfalfa pelletted hay and concentrate. Ewes of group 3 where grazing on barley for 1.5 h/d (phase b). Different diets didn't have any effect on milk production and body weight changes. Grazing in the last part of the trial (group 3 vs 2) didn't influence animals' performance. In both group 2 and 3 intake was high (about 111 g ss/kg P sup(0.75)). Milk daily production, milk fat and protein percentage were, respectively for group 1, 2 and 3: 0.783, 0.811 and 0.79 kg/d; 7.19, 9.58 and 7.92% for fat; 6.48, 7.06 and 5.91 for protein. Somatic cell count was high (> 1, 600, 000 cells/ml) in every group.

967 Leeson, S. (University of Guelph, Guelph, Ontario, Canada); Proulx, J. (1994) **Enzymes and barley metabolizable energy.** *The Journal of applied poultry research (USA) v. 3(1) p. 66-68.* references. English. (AGRIS 95-158166).

968 Macrae, JC.; Bruce, LA.; Brown, DS. (1995) **EFFICIENCY OF UTILIZATION OF ABSORBED AMINO ACIDS IN GROWING LAMBS GIVEN FORAGE AND FORAGE - BARLEY DIETS.** *Animal Production. 61(Part 2):277-284.* English. [ROWETT RES INST ABERDEEN AB2 9SB SCOTLAND].

The efficiency of utilization of absorbed essential amino acids (AA) was studied in wether lambs (35 to 40 kg live weight) given dried grass and dried grass : barley pelleted diets over an intake range from maintenance (M) to 2.5 M energy intake. Each animal was prepared with a duodenal and ileal simple (T-shaped) cannula for the collection of digesta entering and leaving the small intestine and with a catheter into the abomasum for the infusion of digesta phase markers (Ru-103 phenanthroline and Cr-51 ethylene diamine tetra acetic acid). The efficiencies of utilization of total AA and individual essential AA (EAA) were calculated from the ratios of the regressions describing AA retention per unit nitrogen (N) intake (assessed using the N retention data obtained in the present study and the AA composition of N retention derived during an accompanying comparative slaughter experiment) and AA absorption per unit N intake. These ratios for total EAA were 0.5 for the grass diet and 0.59 for the grass plus barley diet. Values for individual EAA ranged from 0.32 for threonine in sheep given the grass diet to 0.88 for arginine in sheep given the grass : barley diet. Whilst the ratios for total and individual EAA were generally higher for the grass : barley diet the very wide 95% confidence limits associated with these derived values make any between-diet or between-EAA comparisons equivocal. The data appear to support the introduction by the Agricultural and Food Research Council (1992), of a scaling factor to reduce the high efficiency of utilization of AA used previously. [References: 23].

969 Orihuela Torres Belon, E.; Moreno R, A. (Universidad Nacional Agraria La Molina, Lima (Peru). Facultad de Zootecnia) (1993) **[Utilization of germinated barley (Hordeum vulgare) in the feeding of growing guinea-pigs]. Utilizacion de la cebada (Hordeum vulgare) germinada en la alimentacion de cuyes en crecimiento.** *[Summary of investigations supported by FUNDEAGRO [Foundation for the Development of Agriculture] 1988-1992]. Resumen de investigaciones apoyadas por FUNDEAGRO [Fundacion para el Desarrollo del Agro] 1988-1992. Quevedo Iturri, F.; Arroyo Vergara, R. (eds.). Proyecto Transformacion de la Tecnologia Agropecuaria (TTA), Lima (Peru). Fondo para el Aumento de Oportunidades de Investigacion; Fundacion para el Desarrollo del Agro, Lima (Peru) v. 2: p. 138-140.* Ilus. Spanish. (AGRIS 95-137964).

970 Osuji, PO.; Khalili, H.; Umunna, NN. (1995) **THE EFFECTS OF COTTONSEED CAKE WITH OR WITHOUT MOLASSES ON FEED UTILIZATION, PURINE EXCRETION, AND MILK PRODUCTION OF BORAN (BOS INDICUS) COWS FED A MIXTURE OF WHEAT AND OAT STRAW.** *Tropical Agriculture. 72(1):63-69.* English. [INT LIVESTOCK CTR AFRICA POB 5689 ADDIS ABABA ETHIOPIA].

The effects of 1.35, 1.80, or 2.25 kg dry matter (DM) of cottonseed cake, with (1.85 kg DM) or without molasses, on straw intake, diet digestibility, live-weight change, excretion of purine derivatives (PD), and milk production of Boran (Bos indicus) cows were studied. There were no significant ($P > 0.05$) interactions. Straw intake was 0.47 kg DM lower ($P < 0.001$) showing a substitution effect of 254 g kg(-1) with molasses. Straw intake tended also to decrease from 5.18 to 4.94 kg DM ($P < 0.15$) with a daily substitution of 107 g kg(-1) with increasing levels of cottonseed cake. Molasses increased DM and organic matter (OM; $P < 0.01$) but decreased crude protein (CP; $P < 0.001$) and neutral-detergent fibre (NDF; $P < 0.01$) digestibilities. Molasses ($P < 0.05$) and increasing levels of cottonseed cake ($P < 0.01$) increased daily milk yield from 3.06 to 3.26 and from 2.96 to 3.32 kg, respectively. Molasses increased live-weight by 300 g day(-1) ($P < 0.05$). Increasing levels of cottonseed cake caused a live-weight change of 69 g to 467 g day(-1) ($P < 0.05$). A supply of microbial-N increased ($P < 0.001$) in molasses diets but microbial-N production kg(-1) digestible OM was not affected by treatments ($P > 0.05$). [References: 36].

971 Patil, AR.; Goetsch, AL.; Kouakou, B.; Galloway, DL.; Forster, LA.; Park, KK. (1995) **EFFECTS OF CORN VS CORN PLUS WHEAT IN FORAGE-BASED DIETS CONTAINING BROILER LITTER ON FEED INTAKE, RUMINAL DIGESTA CHARACTERISTICS AND DIGESTION IN CATTLE.** *Animal Feed Science & Technology. 55(1-2):87-103.* English. [UNIV ARKANSAS DEPT ANIM SCI FAYETTEVILLE, AR 72701 USA].

Cattle consuming low-to moderate-quality forage were supplemented with corn or a 1:1 corn:wheat mixture with or without broiler litter to determine effects on feed intake, ruminal digesta characteristics and digestion. In the first experiment, mature beef steers (529 +/- 33 kg initial body weight) with cannulas in the rumen and duodenum were fed prairie hay and soybean meal alone (control) or with (dry matter basis) 0.3% body weight (BW) of ground corn (C), 0.15% BW of corn plus 0.15% BW of ground wheat (CW), corn plus 0.3% BW of broiler litter (C-L) or the corn-wheat mixture plus 0.3% BW of broiler litter (CW-L). Ruminal fluid ammonia nitrogen (N) concentration 2 h after feeding was increased ($P < 0.05$) by supplementation and was greater ($P < 0.05$) for C-L than for CW-L (8.9, 9.3, 11.4, 27.6 and 21.4 mg dl(-1) for control, C, CW, C-L and CW-L, respectively). Neither duodenal microbial N how nor efficiency of microbial growth was affected by treatment. In the second experiment, Holstein steers (129 +/- 11 and 219 +/- 17 kg initial and final BW, respectively) consumed ad libitum bermudagrass hay alone (control) or with (dry matter basis) 0.6% BW of corn (C), 0.3% BW of corn plus 0.3% BW of wheat (CW), corn plus 0.6% BW of broiler litter (C-L) or the corn-wheat mixture plus 0.6% BW of broiler litter (CW-L). Total organic matter (OM) intake was increased ($P < 0.05$) by supplementation and inclusion of broiler litter in supplements (4.34, 4.91, 5.14, 5.27 and 5.32 kg day(-1)); total tract OM digestion was increased ($P < 0.05$) by supplementation and was lower ($P < 0.05$) for supplement treatments with than without broiler litter (57.2, 61.8, 63.0, 59.5 and 59.9%); and digestible OM intake was increased ($P < 0.05$) by supplementation and was not altered by broiler litter inclusion in supplements (2.51, 3.05, 3.25, 3.14 and 3.20 kg day(-1) for control, C, CW, C-L and CW-L, respectively). In summary, supplementation of a diet containing broiler litter with a corn-wheat mixture compared with corn alone decreased ruminal ammonia N concentration early after feeding but did not change duodenal microbial N flow or efficiency of microbial growth. Grain source did not alter total feed intake by growing Holstein steers consuming diets with broiler litter, and an increase in total feed intake when broiler litter was included in diets compensated for low digestibility of broiler litter. [References: 38].

972 Roensch, M. (Jena Univ. (Germany). Inst. fuer Ernaehrung und Umwelt); Richter, G.H.; Flachowsky, G. (1994) **[Fattening results of young bulls fed barley whole plant pellets and different concentrated doses in fattening period]. Mastergebnisse von Jungbullen bei Fuetterung mit Gerste-Ganzpflanzenpellets und unterschiedlichen Konzentratgaben im Mastverlauf.** VDLUFA-Schriftenreihe (Germany); no. 38 p. 793-796. VDLUFA. 4 tables. p. 793-796. German. (AGRIS 95-137985).

973 Schmidtwilcke, HA. (1995) **UNPROCESSED WHEAT BRAN IN DISTURBANCES INVOLVING THE MOTILITY OF THE LARGE INTESTINE.** *Ernahrungs-Umschau. 42(9):330-333.* German. [ST FRANZISKUS HOSP HOHENZOLLERNRING 72 D-48145 MUNSTER GERMANY].

974 Seiwert, C. (Bonn Univ. (Germany). Inst. fuer Tierernaehrung); Niess, E. (1994) **[Research on fattening pigs about the necessary amino acid supply in the middle fattening period]. Untersuchungen an Mastschweinen ueber die notwendige Aminosaeuren-Versorgung in der Mittelmast.** VDLUFA-Schriftenreihe (Germany); no. 38 p. 377-380. VDLUFA. 4 tables. p. 377-380. German. (AGRIS 95-138158).

975 Shahid, M.S. (1992) **Effect of substitution of wheat bran with dried citrus pulp in the fattening ration of male buffalo calves.** University of Agriculture, Faisalabad (Pakistan). Dept. of Animal Nutrition. UAF. 52 tables, 23 ref. 80 p. English. (AGRIS 95-138047).

976 Troccon, J.L. (Institut National de la Recherche Agronomique, Saint Gilles (France). Centre de Rennes, Recherches sur la Vache Laitiere); Pottier, E. (1995) **[Feeding weaned calves with wheat grain]. Alimentation des veaux d'elevage. Distribution au cours de la periode de sevrage de ble-grain traite mecaniquement.** *Productions Animales (France) v. 8(1) p. 43-48.* 13 ref. French. (AGRIS 95-157877).

977 Tueller, R.; Jahn, A. (1995) **[Turkey fattening with wheat]. Mit Weizen Puten maesten.** *Deutsche Gefluegelwirtschaft und Schweineproduktion (Germany) v. 47(4) p. 32-34.* 3 tables. German. (AGRIS 95-138287).

978 Umunna, NN.; Osuji, PO.; Nsahlai, IV.; Khalili, H.; Mohamedsaleem, MA. (1995) **EFFECT OF SUPPLEMENTING OAT HAY WITH LABLAB, SESBANIA, TAGASASTE OR WHEAT MIDDLINGS ON VOLUNTARY INTAKE, N UTILIZATION AND WEIGHT GAIN OF ETHIOPIAN MENZ SHEEP.** *Small Ruminant Research. 18(2):113-120.* English. [INT LIVESTOCK CTR AFRICA POB 5689 ADDIS ABABA ETHIOPIA].

This study investigated the effect of feeding oats hay alone or with 250 g of dolichos lablab (Lablab purpureus, 50% flowering at harvest) hay, wheat middlings, leaves of sesbania (Sesbania sesban) or tagasaste (Chamaecytisus palmensis) on the growth of 66 Ethiopian Menz sheep and the nutrient metabolism of five sheep from each treatment. One other dietary treatment was oats straw supplemented with lablab. Sheep on the hay-lablab diet, compared with the straw-lablab diet, had higher intake (774 vs. 711 g day(-1); $P < 0.01$), growth rate (28 vs. 18 g day(-1); $P < 0.1$), digestibilities of DM (576 vs. 531 g kg(-1); $P < 0.05$), OM (608 vs. 557 g kg(-1); $P < 0.05$) and microbial N supply (6.0 vs. 4.2 g day(-1); $P < 0.05$), but both diets had similar N retentions. Intake of oats hay tended to be depressed by supplementation, but the depression was more pronounced with lablab and tagasaste. Supplementation increased total intake (g day(-1)) of DM (650 vs. 758-815; $P < 0.001$) and OM (573 vs. 678-737; $P < 0.001$), microbial N supply (4.6 vs. 6.0-8.0 g day(-1) $P < 0.001$), N retention (0.1 vs. 1.7-3.7 g day(-1); $P < 0.001$) and growth rate (15 vs. 25-41 g day(-1); $P < 0.001$), but not digestibility of DM and OM. Sesbania and wheat middlings, as compared with tagasaste and lablab, promoted higher intake of DM (815 and 812 vs. 758 and 774 g day(-1); $P < 0.05$), body weight (BW) gain (35 and 41 vs. 25 and 28 g day(-1); $P < 0.05$), but not microbial N supply. The results were discussed in relation to, and supported, the hypothesis that variation in the performance of animals given leguminous supplements may partly be ascribed to how quickly the supplement disappears from the rumen. Oat hay is a better feed than oat straw and alone could mitigate BW losses of sheep.

979 Vicenti, A.; Laudadio, V.; Marsico, G.; Ciruzzi, B. (Bari Univ. (Italy). Dipartimento di Produzione Animale); Trisolini, N. (1995) **[The utilization of wheat germ in fattening turkeys reared in two different environments. 1: Performances and carcass quality [Apulia]]. L'uso del germe di grano nell'ingrasso di tacchini allevati in due differenti ambienti di allevamento. 1: Performance produttive e aspetti quanti-qualitativi delle carcasse [Puglia].** *Rivista di Avicoltura (Italy) v. 64(7-8) p. 51-57.* 7 tables; 2 graphs; 20 ref. Italian. (AGRIS 95-158224).

980 Weisbjerg, M.R.; Hvelplund, T.; Bibby, B.M. (1994) **[Nutrient metabolism in the digestive tract of cows fed with different amounts of soya bean meal or urea together with barley whole crop and modelling of the rumen protein metabolism]. Naeringsstofomsaetningen i mave-tarmkanalen hos koeer tildelt forskellige maengder sojaskraa eller urea sammen med byghelsaed samt modellering af proteinomsaetningen i vommen.** Statens Husdyrbrugsforsoeg, Copenhagen (Denmark). *Forskningsrapport. Statens Husdyrbrugsforsoeg (Denmark); no. 27 25 p.* SH. 5 ill., 12 tables; 18 ref. Danish. (AGRIS 95-138006).

981 Yamani, K.A.O.; Ayyat, M.S. (Zagazig University, Zagazig (Egypt). Faculty of Agriculture, Department of Animal Production); Abdalla, M.A. (Ministry of Agriculture, Sharkiya Governorate (Egypt)) (1994) **Evaluation of the traditional rabbit diet versus the pelleted diet for growing rabbits for small scale units.** Cahiers Options Mediterraneennes (CIHEAM); v. 8 p. 213-222. CIHEAM-IAMZ. 5 tables. 8 ref. p. 213-222. English. (AGRIS 95-138209).

A pilot experiment was carried out to evaluate the prevailing nonpelleted diets: berseem hay-barley and berseem hay-corn in comparison with the grower pelleted diet for rabbits from the nutritional and economic efficiencies points of view. The chemical analysis, the digestibility of nutrients, the N-utilization, the effect on the growth performance carcass traits and blood constituents were studied. The hay-barley and hay-corn were provided separately. The digestibility and N-utilization of the grower pelleted diet were of better values than the corresponding values for the hay-barley and hay-corn diets. The hay-barley diet was of intermediate nutritional value between the other two diets. From the nutritional and economic parameters the hay-barley diet was preferable than the expensive grower pelleted diet and the lower nutritional quality hay-corn diet. The hay-barley diet could be recommended as non-pelleted rabbit diet if it is enriched with vitamin-mineral premix as feed additive to improve more its nutritive value.

L20 ANIMAL ECOLOGY

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L51 ANIMAL PHYSIOLOGY-NUTRITION

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985 Baumont, R. (Institut National de la Recherche Agronomique, Ceyrat (France). Centre de Clermont Ferraud); Daveau, O.; Perpere, C. (1994) **A trial to quantify the roles of ruminal and oropharyngeal signals in the control of food intake by cows.** Proceedings of the Society of Nutrition Physiology

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986 Duengelhoef, M. (1994) **[Investigations on the digestibility of phosphorus in feedstuffs of mineral or plant origin in pigs]. Untersuchungen zur Verdaulichkeit des Phosphors mineralischer und pflanzlicher Herkunft beim Schwein.** Bonn Univ. (Germany). Inst. fuer *Tierernaehrung. Berichte aus der Agrarwissenschaft (Germany) 174 p.* Shaker. 5 ill., 65 tables. Bibliography 149 ref. German. (AGRIS 95-139610).

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991 Kang, H.S. (Gyeongsang National University, Chinju (Korea Republic). College of Agriculture); Lee, H.B. (Dongsuh Agriculture Production Company Ltd., Chinju (Korea Republic)) (1994) **In situ degradability of NH3-N or alkaline H202 treated rice straw suspended in the rumen of dairy cows-(2)-Crude protein degradability of rice straw suspended in the rumen of dairy cows fed HCHO treated grains (Corn or barley) based diet.** *Korean Journal of Dairy Science (Korea Republic) v. 16(1) p. 41-56.* 5 tables; 33 ref. Korean. (AGRIS 95-139299).

992 Kang, H.S. (Gyeongsang National University, Chinju (Korea Republic). College of Agriculture); Lee, H.B. (Dongsuh Agriculture Production Company Ltd., Chinju (Korea Republic)) (1994) **In situ degradability of NH3-N or alkaline H202 treated rice straw suspended in the rumen of dairy cows-(3)-An observation of the ruminal microbes;Anaerobic fungi, in the in situ residuals of treated rice straw suspended in the rumen of dairy cows fed HCHO treated barley based diet by scanning electron microscope.** *Korean Journal of Dairy Science (Korea Republic) v. 16(1) p. 57-74.* 23 illus.; 3 tables; 28 ref. Korean. (AGRIS 95-139300).

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1001 Moorby, J.M. (SAC, Ayr (United Kingdom)); Dewhurst, R.J.; McKendrick, E.J.; Roberts, D.J. (1994) **Milk protein production and urinary purine derivative excretion from dairy cows fed mineralised dark grains.** Proceedings of the Society of Nutrition Physiology (Germany); v. 3 p. 237. DLG. 1 table; 3 ref. p. 237. English. (AGRIS 95-139283).

1002 Oosting, SJ.; Vanbruchem, J.; Chen, XB. (1995) **INTAKE, DIGESTION AND SMALL INTESTINAL PROTEIN AVAILABILITY IN SHEEP IN RELATION TO AMMONIATION OF WHEAT STRAW WITH OR WITHOUT PROTEIN SUPPLEMENTATION.** *British Journal of Nutrition. 74(3):347-368.* English. [AGR UNIV WAGENINGEN DEPT ANIM HUSB TROP ANIM PROD SECT POB 338 6700 AH WAGENINGEN NETHERLANDS].

The effects of ammoniation of wheat straw with or without supplementation of protein sources of either high (casein) or relatively low (potato protein) rumen degradability on intake and digestion were studied with four sheep in a 4 x 4 Latin square design. Rations offered were: (1) untreated wheat straw (UWS), (2) ammoniated wheat straw (AWS), (3) AWS supplemented with 3.2 g casein/kg live weight (W)(0.75) per d (AWSC) and (4) AWS supplemented with 3.9 g potato protein/kg W-0.75 per d (AWSP). Straw was offered ad lib. and all rations were supplemented with sugarbeet pulp and a mineral mixture. NH3 treatment increased intake and digestion. Supplementation of AWS with potato protein increased total digestible organic matter intake (DOMI) compared with AWS whereas supplementation with casein did not affect total DOMI. Protein supplementation of AWS significantly reduced rumen digestion of cellulose,

and when the supplementation was with casein it reduced rumen digestion of neutral-detergent fibre and hemicellulose also. This lower rumen digestion was compensated by a higher proportion of digestion occurring in the hindgut for hemicellulose ($P < 0.05$ for AWSC, $P > 0.05$ for AWSP), but not for cellulose. Across all rations, rumen fluid volume increased with increasing cell-wall intake. The efficiencies of microbial protein synthesis were (average of three different methods of estimation) 23.3, 26.2, 34.8 and 31.7 g N/kg apparently-rumen-degraded organic matter for UWS, AWS, AWSC and AWSP respectively. The difference between UWS and AWS was not significant, but values for AWSC and AWSP were significantly higher than that for AWS. The rumen digestion of feed amino acid-N (AA-N) was significantly higher for AWSC than for the other rations. The apparent small-intestinal digestion of AA-N and N was significantly higher for AWSP than for the other rations. The true small-intestinal digestion values were 0.86, 0.84 and 0.68 for AA-N, N and non-protein-N respectively. Ileal endogenous losses of AA-N were approximately 6 mg/g duodenal non-protein dry-matter flow. Linear relationships were observed between DOMI and N balance and truly absorbed AA-N, indicating that DOMI could have been limited by small-intestinal amino acid availability. Regression of N balance p. truly absorbed AA-N resulted in an estimate of net efficiency of utilization of truly absorbed AA-N of 0.54. [References: 38].

1003 Overton, TR.; Cameron, MR.; Elliott, JP.; Clark, JH.; Nelson, DR. (1995) **RUMINAL FERMENTATION AND PASSAGE OF NUTRIENTS TO THE DUODENUM OF LACTATING COWS FED MIXTURES OF CORN AND BARLEY.** *Journal of Dairy Science. 78(9):1981-1998.* English. [UNIV ILLINOIS DEPT ANIM SCI ANIM SCI LAB 264 1207 W GREGORY DR URBANA, IL 61801 USA].

Five Holstein cows were used in a 5 x 5 Latin square design and fed diets containing five different ratios of starch from ground shelled corn and steam-rolled barley. The DMI decreased and both the proportions of OM and starch digested in the rumen increased as barley starch increased in the diet. Corn and barley starches fed in a ratio of 75:25 maximized the proportions of ADF and NDF digested in the rumen. Replacement of 25% of the corn starch with barley starch resulted in the largest increase in the molar percentage of propionate and the largest decrease in the molar percentage of acetate in ruminal fluid. Passage of NAN to the duodenum was not affected by treatment; however, the percentage of nonammonia nonmicrobial N in NAN decreased as barley starch increased. Passage of AA to the duodenum was largest when corn and barley starches were fed in ratios of 100: 0 and 0:100 because of the influence of DMI and microbial protein synthesis. Production of milk, CP, and SNF was similar when cows were fed diets containing corn and barley starches in ratios of 100:0, 75:25, and 50:50 but was decreased when the ratios were 25:75 and 0:100. Increased production responses of cows when diets contained larger amounts of starch from ground shelled corn were probably due to increased DMI. [References: 38].

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1006 Schaarmann, G. (Jena Univ. (Germany). Inst. fuer Ernaehrung und Umwelt); Wirth, R.; Schoene, F.; Flachowsky, G. (1995) **[Influence of various brans on the apparent digestibility of ingredients of pig diets]. Einfluss verschiedener Kleien auf die scheinbare Verdaulichkeit von Rationsbestandteilen bei Schweinen.** Proceedings of the Society of Nutrition Physiology (Germany); v. 4 p. 105. DLG. 1 table. p. 105. German. (AGRIS 95-159200).

1007 Schwarz, G. (BASF AG, Offenbach/Queich (Germany). Tierernaehrungsstation Neumuehle); Hoppe, P.P.; Schoener, F.J.; Wiesche, H.; Geerse, C. (1995) **[Experiments with broiler chickens and in vitro to investigate the efficacies of various carbohydrase enzymes in a barley/rye containing diet]. Untersuchungen an Huehnerkueken und in vitro zur Wirkung verschiedener Carbohydrasen bei Einsatz einer auf Gerste und Roggen basierenden Diaet.** Proceedings of the Society of Nutrition Physiology (Germany); v. 4 p. 55. DLG. p. 55. German. (AGRIS 95-159250).

1008 Succi, G.; Crovetto, G.M.; Tamburini, A.; Rapetti, L.; *Galassi, G. (Milan* Univ. (Italy). Istituto di Zootecnia Generale) (1993) **[Determination of the net energy of wheat silage cut at the dough maturity stage of grain]. Determinazione dell'energia netta dell'insilato di frumento raccolto alla maturazione cerosa della granella.** [Societa Italiana delle Scienze Veterinarie. 47. National meeting. Session 5. Zootechny and animal nutrition]; Riccione, Forli (Italy); 29 Sep - 3 Oct 1993. *Atti della Societa Italiana delle Scienze Veterinarie (Italy) v. 47(pt.3) p. 1733-1737.* 6 tables; 10 ref. Italian. (AGRIS 95-159111).

The nutritive value of wheat silage harvested at the dough stage of maturity of grain (35.8% DM, 9.6% CP and 53.3% NDF on DM) was determined with digestibility and calorimetric (respiration chamber) experiment on 6 wethers. DM intake was 1714 g/d (58.5 g/d/kg sup(0.75)). Apparent digestibilities (%) were: DM = 61.4: OM = 63.4; N = 62.7; NDF = 45.1; Energy = 61.2. Gaseous exchanges (L/d/kg sup(0.75)): O2 = 19.4; CO2 = 21.4; CH4 = 1.8; QR = 1.11. Retained energy was 4.8 MJ/d, that is 15.1% of energy ingested. Energy content of wheat silage (MJ/kg DM): GE = 18.7; DE = 11.4; ME = 9.8; NE sub(m) = 6.9; M.F.U. = 0.81/kg DM. C and N balances revealed an average retention of 135 g C and 5 g N/day.

1009 Sudendey, C. (Tieraerztliche Hochschule Hannover (Germany). Inst. fuer Tierernaehrung); Kamphues, J. (1995) **[Effects of enzymes (alpha-amylase, xylanase, beta-glucanase) as feed additive on digestive processes in the alimentary tract of piglets past forced feed intake]. Effekte einer Enzymzulage (alpha-Amylase, Xylanase, beta-Glucanase) auf Verdauungsvorgaenge im Magen-Darmtrakt von Absetzferkeln unter den Bedingungen einer forcierten Futteraufnahme.** Proceedings of the Society of Nutrition Physiology (Germany); v. 4 p. 108. DLG. 1 table. p. 108. German. (AGRIS 95-159173).

1010 Toure, T. (Bonn Univ. (Germany). Inst. fuer Tierernaehrung); Rodehutscord, M.; Pfeffer, E. (1995) **[Effects of water temperature, extrusion, proportion of wheat and supplementation of enzymes on digestibility of starch in rainbow trout]. Wirkung von Wassertemperatur, der Extrusion, des Weizenanteiles und des Zusatzes eines Enzymgemisches auf die Verdaulichkeit der Staerke bei der Forelle.** Proceedings of the Society of Nutrition Physiology (Germany); v. 4 p. 106. DLG. 1 table. p. 106. German. (AGRIS 95-159268).

1011 Williams, B.A. (Agricultural Univ., Wageningen (Netherlands). Dept. of Animal Nutrition); Boer, H.; Diekema, B.; Tamminga, S. (1994) **A progressive carbon balance for the in vitro fermentation of wheat straw, using the cumulative gas production technique.** Proceedings of the Society of Nutrition Physiology (Germany); v. 3 p. 184. DLG. 1 ill.; 2 ref. p. 184. English. (AGRIS 95-139357).

1012 Yan, T.; Longland, AC.; Close, WH.; Sharpe, CE.; Keal, HD. (1995) **THE DIGESTION OF DRY MATTER AND NON-STARCH POLYSACCHARIDES FROM DIETS CONTAINING PLAIN SUGAR-BEET PULP OR WHEAT STRAW BY PREGNANT SOWS.** *Animal Production. 61(Part 2):305-309.* English. [AFRC INST GRASSLAND & ENVIRONM RES DEPT PIG CHURCH LANE READING RG2 9AQ BERKS ENGLAND].

Forty days after mating, 16 pregnant sows were randomly allocated to two diets containing either sugar-beet pulp (SEP) or wheat straw (WS) each offered at two levels (1.0 or 1.5 X maintenance energy requirement (M), where M = 460 kJ digestible energy (DE) per kg(0.75) per day). Diets were iso-nitrogenous, and contained similar levels of DE together with 260 g non-starch polysaccharides (NSP) per kg dry matter (DM largely derived from either the SEP or the WS. A 7-day NSP and DM balance was made between day 60 and 100 of gestation. During lactation sows had ad libitum access to a conventional sow diet which contained neither SEP or WS. Outputs of both

fresh and dry faeces from sows given diet WS were significantly gl enter than the outputs from sows given the corresponding SEP diets ($P < 0.05$), and outputs were significantly greater at the higher feeding level for both diets ($P < 0.05$). There was a tendency for higher urinary outputs from sows given diet WS, but these were variable and not significantly different from those from sows given diet SEP. The apparent digestibility and retention of DM teas significantly greater for the SEP diet than for diet WS but were not significantly affected by feeding level. The apparent digestibilities of the total NSP and each of the individual constituent monomers were significantly higher for diet SEP than for diet WS ($P < 0.001$), but were independent of feeding level ($P > 0.05$). Xylose was the most poorly digested NSP constituent from both diets. Apparent digestibility coefficients for the remaining NSP constituents in diet SBP were greater than or equal to 0.8 and were greater than or equal to 0.52 in diet WS, with the uronic acids and mannose being rite most highly digested NSP functions from diets SEP and WS respectively. [References: 23].

N01 AGRICULTURAL ENGINEERING

1013 Porter, M.A.; Harris, T.R. (Southern Queensland Univ., Toowoomba (Australia). National Centre for Engineering in Agriculture) (1994) **Calibrating the ASTC model for use on the Darling Downs in south-eastern Queensland. [Conference abstract].** Conference on Engineering in Agriculture; Christchurch (New Zealand); 21 Aug 1994. *Agricultural Engineering Australia (Australia) p. 36.* Abstract only; 2 fig., 1 ref. English. (AGRIS 95-142079).

N20 AGRICULTURAL MACHINERY AND EQUIPMENT

1014 Broxterman, A.; Taylor, R.; Slocombe, J. (1992) **The effect of wheat seed treatments on metering rates.** *American Society of Agricultural Engineers. Meeting (USA); no. 92-1552/92-1579 8 p.* references. Paper presented at the "1992 International Winter Meeting sponsored by The American Society of Agricultural Engineers, " December 15-18, 1992, Nashville, Tennessee. Issue numbers not consecutive. English. (AGRIS 95-142293).

1015 Green, A.H.S. (Western Australian Dept. of Agriculture, Merredin. Dryland Research Inst.) (1994) **Fuel consumption and work rate with cutting height of wheat harvesters in Western Australia. [Conference abstract].** Conference on Engineering in Agriculture; Christchurch (New Zealand); 21 Aug 1994. *Agricultural Engineering Australia (Australia) p. 79.* 2 tables. English. (AGRIS 95-162889).

1016 Riethmuller, G.P. (Western Australian Dept. of Agriculture, Merridin. Dryland Research Inst.) (1994) **The influence of seed drill share size and covering implements on wheat emergence and yield on a sandy clay loam. [Conference abstract].** Conference on Engineering in Agriculture; Christchurch (New Zealand); 21 Aug 1994. *Agricultural Engineering Australia (Australia) p. 78.* English. (AGRIS 95-162801).

1017 Zeman, S.; Belak, J. (Vysoka Skola Polnohospodarska, Nitra (Slovak Republic). Katedra Mechanizacie Zivocisnej a Potravinarskej Vyroby) (1994) **[The effect of grist coarseness on energy consumption and wear of grist mill hammers]. Vplyv hrubky srotu na mernu spotrebu energie a opotrebenie kladiviek srotovnika.** *Polnohospodarstvo (Slovak Republic) v. 40(11) p. 863-871.* 3 ill., 1 table; 10 ref. Slovak. (AGRIS 95-142245).

The correlation of energy consumption at grist milling is investigated. The results show that at milling of grains (wheat and barley), energy savings in grist mill of the GM-402 type with sieve mesh diameter 5 mm represented 38 %. Heat treatment (e.g. hardening or cementing) of grist hammers is recommended due to its positive effect on the grist mill efficiency and reduction of energy consumption.

P05 ENERGY RESOURCES AND MANAGEMENT

1018 Huanca Quiroz, E.U. (1993) **[Energy investment in the barley production (Hordeum vulgare L.) in Puno]. Inversion de energia en la produccion de cebada grano (Hordeum vulgare L.) en Puno.** Universidad Nacional Agraria La Molina, Lima (Peru). Escuela de Post-Grado. Especialidad en Ingenieria Agricola. 18 ilus. 10 fig. 53 cuadros; 3 planos; 49 ref. 215 p. Spanish. (AGRIS 95-142749).

1019 Trojanowska, M. (Akademia Rolnicza, Krakow (Poland). Inst. Mechanizacji i Energetyki Rolnictwa) (1993) **[Cumulated energy for grinding wheat]. Energochlonnosc skumulowana przemialu pszenicy.** *Roczniki Nauk Rolniczych. Seria C - Technika Rolnicza (Poland);Polish Agricultural Annual. Series C - Agricultural Engineering v. 79(4) p. 75-79.* 2 tables; 6 ref. Polish. (AGRIS 95-142737).

The analysis of four technology of wheat flour production proved that the magnitude of cumulated energy consumption varied from 545 MJ/t to 667MJ/t of produced flour and it mainly depended on electric energy consumption. The estimation of energy management of mills was made and means of its rationalization were discussed.

P06 RENEWABLE ENERGY RESOURCES

1020 Albrecht, B. (Thueringer Landesanstalt fuer Landwirtschaft, Jena (Germany)) (1994) **[First results of improvement by breeding of triticale in regard of suitability as energy crop]. Erste Ergebnisse der zuechterischen Verbesserung von Triticale bezueglich seiner Eignung als Energiepflanze.** VDLUFA-Schriftenreihe (Germany); no. 38 p. 529-532. VDLUFA. 2 ill., 2 tables. p. 529-532. German. (AGRIS 95-163225).

1021 Bissuel, V. (Cerealiers de France (France)); Leygue, J.P. (1995) **[Ethanol production from cereal crops [bioethanol, diester]]. Energies vertes: des cereales dans votre moteur [bioethanol, diester].** *Perspectives Agricoles (France) (no 204) p. 11-17.* French. (AGRIS 95-142792).

1022 Buttlar, C. von (Kassel Univ. (Gesamthochschule), Witzenhausen (Germany). Inst. fuer Nutzpflanzenkunde gemaessigter, tropischer und subtropischer Regionen) (1994) **[Use of plant-genetical resources for energy production - Represented for example winter barley]. Nutzung pflanzengenetischer Ressourcen zur Energiegewinnung - dargestellt am Beispiel von Wintergerste.** VDLUFA-Schriftenreihe (Germany); no. 38 p. 677-680. VDLUFA. 3 ill.; 1 ref. p. 677-680. German. (AGRIS 95-163215).

P10 WATER RESOURCES AND MANAGEMENT

1023 Akita, O.; Suzuki, O.; Takamine, K.; Setoguchi, S.; Iwashita, Y.; Iefuji, H.; Obata, T. (1995) **SOLID-LIQUID SEPARATION IN WASTEWATER FROM A BARLEY SHOCHU DISTILLERY USING GEOTRICHUM SP M111 AND TREATMENT OF THE LIQUID COMPONENT WITH HANSENULA ANOMALA AND ACTIVATED SLUDGE [Japanese].** *Seibutsu-Kogaku Kaishi-Journal of the Society for Fermentation & Bioengineering. 73(5):397-404.* Japanese. [NATL RES INST BREWING SAIJO CHO HIGASHIHIROSHIMA 739 JAPAN].

A method was developed for the treatment of wastewater discharged from a barley shochu distillery with yeast. First, solid-liquid separation of the distillery wastewater was effectively achieved by adding cellulose powder or residue from a citric acid fermentation process and Geotrichum sp. M111 cells, which possess the ability to accelerate the aggregation of insoluble solids in wastewater. The solid concentration was lowered to 0.33% from 2.95% by this solid-liquid separation procedure. The wastewater supernatant was a suitable medium for Mill, which showed a good yield when cultured in 2-fold-diluted supernatant (1.6 x 10(8) cells/ml medium). This yield was equivalent to that in YPD medium (1.2 x 10(8) cells/ml medium). The filtrate was treated with the waste-treatment yeast strain, Hansenula anomala J45-0, as a result of which 63% of the BOD was removed. Yeast cells remaining in the treated filtrate were digested by the yeast-lytic bacterium Rarobacter faecitabidus, which has lytic ability against strain J45-0. The wastewater treated with R. faecitabidus was diluted ca. 5-fold with tap water and subjected to activated sludge treatment. The BOD concentrations in the treated wastewater were reduced to less than 80 mg/l at volumetric BOD loading rates of 0.4-0.6g/l.d. [References: 3].

P33 SOIL CHEMISTRY AND PHYSICS

1024 Agbary, A.T. (Sanaa Univ., Dhamar (Yemen). Faculty of Agriculture) (1993) **Effect of soil moisture and some fertilizer treatments on grain yield and protein content of some wheat varieties.** *Annals of Agricultural Science,*

Moshtohor (Egypt) v. 31(2) p. 761-769. 3 tables; 20 ref. English. (AGRIS 95-143393).

1025 Campbell, JIA.; Albrechtsen, M.; Sorensen, J. (1995) **LARGE PSEUDOMONAS PHAGES ISOLATED FROM BARLEY RHIZOSPHERE.** *FEMS Microbiology Ecology. 18(1):63-74.* English. [ROYAL VET & AGR UNIV DEPT ECOL & MOLEC BIOL MICROBIOL SECT ROLIGHEDSVEJ 21 DK-1958 FREDERIKSBERG C DENMARK].

Five bacteriophages infecting common fluorescent pseudomonads (Pseudomonas fluorescens and Pseudomonas putida) were isolated from barley rhizosphere soil. Morphological and molecular characteristics of the phages are described together with selected phage-host interactions. All phages belonged to the Myoviridae family with isometrical heads on contractile tails; 4 of them were unusually large and had complex protein and DNA profiles. The large phages had estimated genome sizes of 200 kb or more. Restriction enzyme analyses and DNA-DNA hybridizations showed that all isolates represented different phage species. None of the isolates were observed to establish lysogeny with the main host strain, P. putida MM1. The large phages multiplied slowly on their hosts, producing very small plaques; one-step growth experiments with one of the large phages (Psp 4) hence demonstrated a long latent period (2.5 h) and a very small burst size (10 particles). One of the large phages (Psp 3) was abundant in the rhizosphere (approx. 10(4) pfu g(-1) soil) and had a particularly broad host range which extended to both fluorescent (Pseudomonas aeruginosa, P. fluorescens, P. putida and Pseudomonas chlororaphis) and non-fluorescent (Pseudomonas stutzeri) Pseudomonas spp. occurring in soil. The ecological importance of the large Pseudomonas phages must be further studied, but their slow multiplication rates suggested a possible mechanism of balanced phage-host co-existence in the rhizosphere. [References: 24].

1026 Charcas Salazar, Hilario (1993) **[Soil crusting influence in emergence of wheat, maize and bean]. Influencia del encostramiento del suelo en la emergencia de cultivos.** Colegio de Postgraduados, Montecillo (Mexico). Centro de Edafologia. 6 ilus.; 18 tablas; 44 ref. 75 p. Spanish. (AGRIS 95-143194).

1027 Heijnen, CE.; Page, S.; Vanelsas, JD. (1995) **METABOLIC ACTIVITY OF FLAVOBACTERIUM STRAIN P25 DURING STARVATION AND AFTER INTRODUCTION INTO BULK SOIL AND THE RHIZOSPHERE OF WHEAT.** *FEMS Microbiology Ecology. 18(2):129-138.* English. [DLO IPO POB 9060 6700 GW WAGENINGEN NETHERLANDS].

The physiological state of introduced Flavobacterium strain P25 cells was determined in starvation cultures, in bulk soil, and in the rhizosphere of wheat using direct viable counts (DVC; based on cell elongation after use of nalidixic acid and substrate addition, resulting in a potential activity measurement) and the redox dye 5-cyano-2, 3-ditolyl tetrazolium chloride (CTC; based on respiration without substrate additions, resulting in an in situ activity measurement). Both methods clearly demonstrated that the metabolic activity of Flavobacterium P25 cells decreased during starvation, followed by increased activity after amendment with substrate. This confirmed the applicability of DVC and CTC methods to Flavobacterium P25. Both DVC and CTC methods showed that the percentage of active cells in an introduced Flavobacterium P25 population in rhizosphere soil was lower than that in bulk soil in the first 1-2 weeks after planting wheat seedlings. After two weeks, the percentage of metabolically active cells in the P25 population in rhizosphere soil was higher than in bulk soil. Since different aspects of cellular physiology are measured when applying DVC and CTC, the impact of variations in environmental factors on the metabolic state of introduced strains may be monitored closely by these methods. [References: 28].

1028 Mati, R. (Oblastny Vyskumny Ustav Agroekologie, Michalovce (Slovak Republic)) (1994) **[Water-air ratio relations optimization from rational management on the soil of Vychodoslovenska nizina Lowland, Slovakia]. Optimalizacia vodno-vzdusnych pomerov z aspektu racionalneho hospodarenia na podach Vychodoslovenskej niziny, Slovenska republika.** Possibilities of Irrigation Efficiency Increasing; Bratislava (Slovak Republic); 7-8 Jun 1994. *Possibilities of increasing irrigation efficiency. Proceedings from international conference. Vyskumny Ustav Zavlahoveho Hospodarstva, Bratislava (Slovak Republic); Vysoka Skola Polnohospodarska, Nitra (Slovak Republic) p. 77-80.* VUZH. 7 ref. Slovak. (AGRIS 95-163757).

The long term results of soil moisture in heavy soils of the Vychodoslovenska nizina Lowlands, Slovakia point the limiting effect of the large stock of soil water in the spring months and its deficit in the 2nd half of the vegetation period. The negative influence of the water excess in the beginning of the vegetation period manifests the most in the late sowing time of the spring crops, especially in the spring barley, the podders but also in the sugar beet and the maize. In dry and extremely dry years the limitary factor for the harvest is the long term drop of the soil moisture content, under values of the optimum water storage for plants. An important drop of the soil moisture content under optimum values in point of duration and absolute values arises also in the years with the precipitation depth at the level of the long term normal.

1029 Meek, B.D. (USDA, ARS, Soil and Water Management Research Unit, Kimberly, ID.); Carter, D.L.; Westermann, D.T.; Wright, J.L.; Peckenpaugh, R.E. (1995) **Nitrate leaching under furrow irrigation as affected by crop sequence and tillage.** *Soil Science Society of America (USA) v. 59(1) p. 204-210.* references. English. (AGRIS 95-143432).

The potential for NO3-N leaching after alfalfa (Medicago sativa L.) in irrigated crop production depends on cropping sequence and tillage practices. A 2-yr field experiment in south-central Idaho compared the NO3-N leached following alfalfa of a conventional tillage bean-bean (Phaseolus vulgaris L.) rotation with a silage corn (Zea mays L.)-winter wheat (Triticum aestivum L.) rotation in a conventional tillage or no-till system. Nitrate leaching was determined by: (i) sampling the soil solution below the root zone (1.2 and 1.5 m) using ceramic-tipped samplers and calculating the N movement from the water balance, and (ii) measuring the change in soil NO3-N at 1.35 to 4.5 m from soil samples taken in the fall and spring to 4.5 m. During the second growing season, average soil solution NO3-N concentrations (below the root zone) were 28, 4, and 10 mg L-1 for the bean-bean, corn-wheat no-till, and corn-wheat tilled treatments, respectively. The soil NO3-N in 1.35 to 3.3 m at the end of the study was 80 kg N ha-1 higher for the bean-bean treatment than for the corn-wheat treatments. The NO3-N that moved below 1.35 m during the 2 yr was 53 4 ha-1 higher for the bean-bean than for the corn-wheat treatments. The soil NO3-N in the 1.35 to 3.3 m depth after 2 yr was 21 kg ha-1 higher for the corn-wheat under conventional tillage than under the no-till system.

1030 Nievergelt, J. (Eidg. Forschungsanstalt fuer landwirtschaftlichen Pflanzenbau (FAP), Zurich Reckenholz (Switzerland)) (1995) **[Lysimeter results from 1.4.93 to 31.3.94]. Lysimeter-Ergebnisse 1. April 93 bis 31. Maerz 94.** *Agrarforschung (Switzerland) (no.5) p. 197-199.* 3 tables, 1 graph, 1 photo, 3 ref. German. (AGRIS 95-163985).

Oilseed rape followed by winter wheat and spring wheat followed by phacelia were grown in weighing lysimeters at Zurich-Reckenholz in 1993/94. Soil-stored water was depleted to a deficit of 160 mm. Good climatic conditions in spring and green manure following the arable crops raised water consumption in summer up to over 600 mm. Despite precipitation and especially leaching water rates well over the mean, nitrate leaching in winter remained below normal rates. This is thought to be due to a better precultural effect of oilseed rape and to the "biological conservation" effect of phacelia.

1031 Raun, WR.; Johnson, GV. (1995) **SOIL-PLANT BUFFERING OF INORGANIC NITROGEN IN CONTINUOUS WINTER WHEAT.** *Agronomy Journal. 87(5):827-834.* English. [OKLAHOMA STATE UNIV DEPT AGRON STILLWATER, OK 74078 USA].

The soil-plant system can limit soil profile inorganic N accumulation when N fertilizers are applied at rates greater than needed for maximum yield. Nitrogen rates that maximized grain yield and increased *soil profile* inorganic N accumulation under continuous dryland winter wheat (Triticum aestivum L.) were evaluated in four long-term experiments. Soil cores (0-210 cm) were taken in 1988 and again in 1993 from N rate treatments where wheat had been grown for more than 23 yr. Soil cores were split into 15- to 30-cm increments and analyzed for NH4-N, NO3-N, total N, and organic: C. Critical N fertilization rates were determined from linear-plateau models of wheat grain yield on annual N applied. Plateau-linear models were established for soil profile inorganic N accumulation (sum of NH4-N + NO3-N, converted to kg ha(-1)) on annual N applied. Maximum yields were observed at N rates less than that required to increase soil profile inorganic N accumulation, Annual N fertilization rates that increased inorganic N

accumulation exceeded the N requirement for maximum yields by more than 23.3 kg N ha(-1) in all experiments. Increased plant N volatilization and grain N uptake have been found when N rates exceed yield maximums. High N rates can also increase straw yield and straw N, subsequently increasing surface soil organic C and N and the potential for denitrication when wheat straw residues are incorporated. In dryland production systems, soil-plant buffering (considering the processes discussed) implies that the system buffers against (resist) soil accumulation of inorganic N, even when N rates exceed that required for maximum grain yield. [References: 36].

1032 Rucka, M. (Vyskumny Ustav Zavlahoveho Hospodarstva, Bratislava (Slovak Republic)) (1992) **[Long-term effect of irrigation and fertilization on selected agrochemical properties of soils]. Dlhodoby vplyv zavlah a hnojenia na vybrane agrochemicke ukazovatele pody.** Economic and Ecological Aspects of Irrigation; Bratislava (Slovak Republic); Sep 1994. *Economic and ecological aspects of irrigation. Proceedings of the international symposium. Vyskumny Ustav Zavlahoveho Hospodarstva, Bratislava (Slovak Republic); Zakladna Organizacia Slovenskej Polnohospodarskej Vedecko-Technickej Spolocnosti, Bratislava (Slovak Republic) p. 140-147.* VUZH. 2 tables; 12 ref. Slovak. (AGRIS 95-163890).

Field experiments were carried out on chernozem soil of south-western Slovakia to study long-term effects of irrigation, plant nutrition and fertilization on changes in selected agrochemical properties: soil humus content, total soil nitrogen, calcium carbonate, soil pH and available phosphorus, potassium and magnesium. Application of irrigation water resulted in higher intensity of soil biological processes, which in return caused a decrease in soil humus content bz 6.0 t in 18 years, i.e. 0.333 t.ha** (-1).year** (-1). Analogically, total N content fell by 1.11 t, i.e. 62 kg.ha** (-1).year** (-1). Irrigation water had no effect on other properties. Significant effect of nutrient application and nutrient combinations, especially that of N and P, on biological activity was studied.

1033 Wang Yuanhua (Kunshan Inst. of Farmal Irrigation and Drainage, Jiangsu (China)) (1994) **Study on suitable groundwater levels for wheat growth.** *Acta Pedologica Sinica (China) v. 31(4) p. 439-446.* Chinese. (AGRIS 95-143392).

P34 SOIL BIOLOGY

1034 Arora, D.S. (Maharshi Dayanand Univ., Rohtak (India). Dept. of Biosciences) (1995) **Biodelignification of wheat straw by different fungal associations.** *Biodegradation (Netherlands) v. 6(1) p. 57-60.* 16 ref. English. (AGRIS 95-143522).

1035 Franzluebbers, A.J. (Texas AandM Univ., College Station, TX.); Hons, F.M.; Zuberer, D.A. (1994) **Long-term changes in soil carbon and nitrogen pools in wheat management systems.** *Soil Science Society of America (USA) v. 58(6) p. 1639-1645.* references. English. (AGRIS 95-164222).

Crop management strategies that alter the timing, placement, quantity, and quality of crop residue input can affect the size, turnover, and vertical distribution of the active and passive pools of soil organic matter (SOM). Our objectives were to quantify long-term changes in soil organic, soil microbial biomass (SMB), and mineralizable C and N in continuous wheat (Triticum aestivum L.), continuous wheat/soybean [Glycine mar (L.) Merr.], and wheat/soybean-sorghum [Sorghum bicolor (L.) Moench.] sequences under conventional tillage (CT) and no tillage (NT) with and without N fertilizer. A Weswood silty clay loam (fine, mixed, thermic Fluventic Ustochrept) in southcentral Texas was collected from a 9-yr field study. Soil microbial biomass C (SMBC) and N (SMBN) were determined with the chloroform fumigation-incubation method and mineralizable C and N were determined from 10-d aerobic incubations at 25 degrees C. More crop residue C input was retained as soil organic C (SOC), SMBC, and mineralizable C under NT than under CT. Soil organic C, SMBC, and mineralizable C at a depth of O to 50 mm were 33 to 125% greater under NT than under CT. Increasing cropping intensity increased SOC up to 22% SMBC up to 31%, and mineralizable C up to 27% under NT. Differences in crop management systems significantly altered SMB and the associated mineralizable N level, which supplies crops with mineral N. High clay content soils of central Texas can be effectively managed to increase the active and passive pools of SOM using minimal fallow with NT.

1036 Gouzou, L. (Universite de Nancy 1 (France). Centre de Pedologie Biologie); Cheneby, D.; Nicolardot, B.; Heulin, T. (1995) **[Dynamics of the diazotroph Bacillus polymyxa in the rhizosphere of wheat (Triticum aestivum L.) after inoculation and its effect on uptake of 15N-labelled fertilizer]. [Dynamique du diazotrophe Bacillus polymyxa dans la rhizosphere du ble (Triticum aestivum L.) apres inoculation et effet sur l'absorption d'un engrais azote marque au N15].** *European Journal of Agronomy (France) v. 4(1) p. 47-554.* 35 ref. English. (AGRIS 95-143600).

1037 Griffiths, BS.; Young, IM.; Caul, S. (1995) **NEMATODE AND PROTOZOAN POPULATION DYNAMICS ON DECOMPOSING BARLEY LEAVES INCUBATED AT DIFFERENT SOIL MATRIC POTENTIALS.** *Pedobiologia. 39(5):454-461.* English. [SCOTTISH CROP RES INST DUNDEE DD2 5DA SCOTLAND].

The population dynamics of microbial-feeding nematodes and protozoa, during decomposition of added organic matter, at different soil matric potentials was studied. Dried barley leaves were mixed with soil and placed as a localised decomposable hotspot within a core of unamended sieved soil. Soils were incubated at matrix potentials of: -1 kPa, -10 kPa. -500 kPa or -1000 kPa. Migration of bacterial-feeding nematodes into the hotspot was most rapid at -10 kPa. Flagellate and ciliate protozoa only increased at -kPa, whereas amoebae increased at all matric potentials. Total protozoan biomass and numbers of nematodes in the hotspot decreased with increasing matric potential, Nematode numbers reached a maximum after 8 days in soils at -1 and -10 kPa and after 28 days in soils at -500 and -1000 kPa. There was a greater proportion of fungal-feeding nematodes, and the bacterial-feeding nematodes were Cephalobidae rather than Rhabditidae as the matric potential decreased. Increased faunal populations with time in soils equilibrated at -500 and - 1000 kPa indicated the presence of water-filled ports larger than would have been predicted from the matric potential. [References: 26].

1038 Huang Lei; Yu Hong; Wang Wei (Xinjiang Academy of Agricultural Sciences, Urumqi (China). Inst. of Microbiology) (1994) **Physiological and yield-increasing effects of applying nitrogen fixing bacteria on wheat.** *Xinjiang Agricultural Sciences (China) (no. 1) p. 32-34.* 3 tables. Chinese. (AGRIS 95-143601).

1039 Johnsongreen, PC.; Kenkel, NC.; Booth, T. (1995) **THE DISTRIBUTION AND PHENOLOGY OF ARBUSCULAR MYCORRHIZAE ALONG AN INLAND SALINITY GRADIENT.** *Canadian Journal of Botany-Revue Canadienne de Botanique. 73(9):1318-1327.* English. [UNIV MANITOBA DEPT BOT WINNIPEG MB R3T 2N2 CANADA].

The distribution and seasonal patterns of arbuscular mycorrhizal fungi activity were studied in an inland boreal salt pan site in north-central Manitoba. Semipermanent study regions were set up in each of five vegetation zones along a continuous salinity gradient. Roots of Hordeum jubatum, Distichlis stricta, Agropyron trachycaulum, Sonchus arvensis, Spartina gracilis, and other species were collected from the study regions over six time periods: April, June, July, August, and October of 1991, and May of 1992. These roots were used to quantify mycorrhizal colonization, as well as arbuscule and vesicle formation. Arbuscular mycorrhizal fungi were prevalent in the three vegetation zones with lowest soil salinity, with >40% of the observed root pieces colonized. Colonization was <2% in the other two zones, where soil salinity was consistently greater throughout the growing season. The only common pattern in the phenology of mycorrhizal activity was a low level of activity in the early spring. Mycorrhizal activity in most plant species occurred at high levels throughout the summer and fall. Differences in patterns of activity appeared to be linked to differences in phenology of root growth, and not to edaphic differences among vegetation zones. [References: 40].

1040 Kaiser, E.A. (Bundesforschungsanstalt fuer Landwirtschaft, Braunschweig (Germany). Inst. fuer Bodenbiologie); Martens, R.; Heinemeyer, O. (1995) **Temporal changes in soil microbial biomass carbon in an arable soil. Consequences for soil sampling.** *Plant and Soil (Netherlands) v. 170(2) p. 287-295.* 32 ref. English. (AGRIS 95-143634).

1041 Kaloosh, A.A. (Alexandria Univ. (Egypt). Faculty of Agriculture) (1994) **Effects of inoculation and nitrogen fertilization on yields of intercropped wheat with some legumes [faba beans, lentil, chickpea].** *Journal of*

Agricultural Sciences, Mansoura (Egypt) v. 19(9) p. 3101-3108. 4 tables; 6 ref. English. (AGRIS 95-143602).

1042 Stephens, PM.; Davoren, CW.; Hawke, BG. (1995) **INFLUENCE OF BARLEY STRAW AND THE LUMBRICID EARTHWORM APORRECTODEA TRAPEZOIDES ON RHIZOBIUM MELILOTI L5-30R, PSEUDOMONAS CORRUGATA 2140R, MICROBIAL BIOMASS AND MICROBIAL ACTIVITY IN A RED-BROWN EARTH SOIL.** *Soil Biology & Biochemistry. 27(11):1489-1497.* English. [CSIRO COOPERAT RES CTR SOIL & LAND MANAGEMENT PRIVATE BAG NO 2 GLEN OSMOND SA 5064 AUSTRALIA].

In greenhouse experiments, the ability of barley straw and the earthworm Aporrectodea trapezoides to influence the persistence of Pseudomonas corrugata 2140R and Rhizobium meliloti L5-30R, previously inoculated separately into soil, was examined. The addition of barley straw (0.62% w/w), significantly increased the numbers of both introduced bacteria ca. 1000- to 3000-fold after 29 d incubation and ca. 25- to 100-fold after 63 d incubation in soil. In the absence of barley straw, there was a significant positive linear relationship between the number of A. trapezoides (at densities equivalent to 0, 105, 315 or 525 m(-2)) and the numbers of both introduced bacteria after 29 d, but not after 63 d incubation. In contrast, in the presence of barley straw, there was a significant negative linear relationship between the number of A. trapezoides and the numbers of both introduced bacteria after 29 and 63 d incubation. By combining data from both sampling times, there was a significant linear relationship between the persistence of both introduced bacteria and changes in microbial biomass only in the presence of added barley straw. This would suggest that A. trapezoides had a selective effect upon the persistence of both introduced bacteria in the absence of barley straw, which was not manifest upon the whole microbial community. [References: 46].

1043 Swinnen, J. (Instituut voor Agrobiologisch en Bodemvruchtbaarheidsonderzoek DLO, Wageningen (Netherlands)) (1994) **Evaluation of the use of a model rhizodeposition technique to separate root and microbial respiration in soil.** *Plant and Soil (Netherlands) v. 165(1) p. 89-101.* 45 ref. English. (AGRIS 95-143593).

1044 Xu, JG.; Juma, NG. (1995) **CARBON KINETICS IN A BLACK CHERNOZEM WITH ROOTS IN SITU.** *Canadian Journal of Soil Science. 75(3):299-305.* English. [ALBERTA ENVIRONM CTR DIV BIOL SCI BAG 4000 VEGREVILLE AB T9C 1T4 CANADA].

The rates of decomposition of roots and root-derived materials are needed to assess the contribution of these materials to sequestration of organic carbon in soil. The objective of this study was to examine the kinetics of different forms of C in a Black Chernozem, with roots in situ under two barley cultivars, using C-14 pulse-labeling and incubation methods. Plants were pulse-labeled (1 d) with (CO2)-C-14 25 d after emergence. Shoots were excised, and undisturbed soil cores containing the roots of a single plant were incubated at 20 degrees C for 80 d. The experiment involved two barley cultivars, with six replications at six sampling dates (days 0, 5, 10, 25, 40 and 80). The percentage of the labile components in roots of Abee (48%) was greater than that of Samson (39%), but the half lives of the labile components (0.693 k(-1)) of the roots were not significantly different between the two barley cultivars. The decemposition-rate constants for the resistant components of the roots were also not significantly different between the two barley cultivars. This indicated that the difference between the two barley cultivars in root decomposition rate could be explained by the difference in the ratios of the labile components to the resistant components. The average half life of C-14 in roots was 41 d for Abee and 71 d for Samson. The amount of root C-14 + soil C-14 under Samson was higher than under Abee during the incubation period. These results supported our hypothesis that the cultivar that translocated more C-14-labeled carbon into roots and root-derived material has greater microbial respiration and greater C stabilization because a portion of added C remains in the soil after being transformed by microorganisms. [References: 38].

P35 SOIL FERTILITY

1045 Asmar, F. (Royal Veterinary and Agriculture Univ., Copenhagen (Denmark). Dept. of Agricultural Sciences); Singh, T.; Nielsen, G.; Nielsen, N.E. (1995) **Barley genotypes differ in activity of soluble extracellular phosphatase and depletion of organic phosphorus in the rhizosphere soil.** *Plant and Soil (Netherlands) v. 172(1) p. 117-122.* 24 ref. English. (AGRIS 95-143732).

1046 Awad, Y.H. (Ministry of Agriculture, Cairo (Egypt). Soils and Water Research Inst.); Zaid, M.S.; Ahmed, H.A. (1994) **Effect of saline water irrigation and farmyard manure application on some properties of sandy soils and on barley yield.** *Journal of Agricultural Sciences, Mansoura Univ. (Egypt) v. 19(6) p. 2065-2074.* 2 ill. 5 tables; 8 ref. English. (AGRIS 95-143731).

1047 Mehta, SC.; Grewal, KS.; Singh, M.; Singh, YP.; Singh, N. (1995) **DEPLETION OF SOIL POTASSIUM UNDER PEARL MILLET-WHEAT AND GUAR-WHEAT CROPPING SEQUENCE IN A TROPICAL SOIL IN INDIA.** *Tropical Agriculture. 72(2):114-119.* English. [HARYANA AGR UNIV CCS DEPT SOIL SCI HISAR 125004 HARYANA INDIA].

A long-term field experiment was conducted to study grain yield and the depletion of native and applied K under pearl millet-wheat and guar-wheat rotations. In the presence of P, an application of K significantly increased the grain yield in both rotations. In general K application alone, however, had no significant effect on crop yields. Total annual removals of K were significantly higher in plots receiving maximum amounts of P and K (P60K90) than the control plots (P0K0). The levels of exchangeable K decreased from 714 kg ha(-1) to 250 kg ha(-1) in control plots of the pearl millet-wheat rotation. Even after 13 years of cropping the values of exchangeable K were still above the critical limit (110 kg ha(-1)). The nonexchangeable K pool was depleted from 4460 to 1010 kg ha(-1) in 13 years of cropping of control plots. The contribution of nonexchangeable K to plant K was observed as high as 94% in untreated plots in pearl millet-wheat and 84% in guar-wheat rotations. The regression coefficients between free energy change Delta G(r) and exchangeable and nonexchangeable K, and between K fixation capacity and exchangeable and nonexchangeable K, were all negative. [References: 14].

1048 Rajput, M.; Agrawal, M.; Singh, J. (1995) **INTERACTION OF SOIL FERTILITY LEVELS AND SULPHUR DIOXIDE ON GROWTH, ASSIMILATE PARTITIONING AND YIELD OF WHEAT.** *Journal of Environmental Biology. 16(4):265-275.* English. [BANARAS HINDU UNIV DEPT BOT VARANASI 221005 UTTAR PRADESH INDIA].

Interaction of sulphur dioxide and different soil fertility levels singly and in combination on wheat plants were studied by exposing 30 days old plants at 0.15 ppm of SO2 4 hrs day(-1) for 5 days week(-1) for 8 weeks. Plants were grown at different combinations of nitrogen, phosphorus and potassium and without fertilizers. Growth parameters like shoot and root length, number of tillers, leaves, ears, leaf area and growth indices such as leaf area ratio, leaf weight ratio, root : shoot ratio, specific leaf area, relative, growth rate, net assimilation rate, total biomass and net primary productivity were computed at different stages of growth. SO2 fumigation resulted into foliar injury symptoms, significant reduction in growth parameter, biomass and in yield. Maximum inhibitory response was shown by plants grown without fertilizers. Fertilizer amendments have reduced the magnitude of reduction caused by SO2. The study suggests the use of recommended combined dose of NPK to alleviate the SO2 induced unfavourable effect on plants.

1049 Springob, G. (Hannover Univ. (Germany). Inst. of Soil Science); Lebert, M.; Graf von Reichenbach, H. (1995) **Improved correlation between soil exchangeable K and plant K contents on a tissue water basis.** *Plant and Soil (Netherlands) v. 172(1) p. 163-165.* 10 ref. English. (AGRIS 95-143726).

1050 Teebken, T. (Kiel Univ. (Germany). Inst. fuer Pflanzenbau und Pflanzenzuechtung); Guenther Borstel, O.; Sieling, K. (1994) **[Nitrogen leaching - is the estimation of leaching rate during winter based on mineral nitrogen content in soils possible? (results from SFB 192)]. N-Auswaschung - laesst sich ihre Hoehe anhand der Nmin-Veraenderungen ueber Winter abschaetzen? (Ergebnisse aus dem SFB 192).** 38. Jahrestagung der Gesellschaft fuer Pflanzenbauwissenschaften; Halle/Saale (Germany); 29 Sep - 1 Oct 1994. *Mitteilungen der Gesellschaft fuer Pflanzenbauwissenschaften (Germany) v. 7 p. 229-232.* 3 graphs, 1 table; 5 ref. German. (AGRIS 95-143750).

P36 SOIL EROSION, CONSERVATION AND RECLAMATION

1051 Er Raji, M. (North Dakota Farm Research); Cihacek, L.J. (1994) **Erosion effects on selected agronomic parameters of hard red spring wheat across a landscape.** *North Dakota farm research (USA) v. 50(3) p. 26-30.* references. English. (AGRIS 95-143872).

P40 METEOROLOGY AND CLIMATOLOGY

1052 Abawi, G.Y. (Queensland Dept. of Primary Industries (Australia). National Centre for Engineering in Agriculture) (1994) **The use of SOI [Southern Oscillation Index] in harvest management of wheat in north-eastern Australia. [Conference abstract].** Conference on Engineering in Agriculture; Christchurch (New Zealand); 21 Aug 1994. *Agricultural Engineering Australia (Australia) p. 46.* Abstract only; 1 fig., 3 ref. English. (AGRIS 95-143981).

1053 Bouzerzour, H.; Benmahamad, A. (ITGC, Setif (Algeria). Agricultural Research Station) (1993) **Environmental factors limiting barley yield in the high plateaux of eastern Algeria [Hordeum vulgare].** *RACHIS (ICARDA); Barley and Wheat Newsletter v. 12(1-2) p. 14-19.* 5 tables; 5 ref. English. (AGRIS 95-164725).

Ten barley (Hordeum vulgare L. ssp. vulgare) lines of diverse origin were sown at three seeding dates in the 1988/89 season to identify the primary environmental factors that limit barley yields in the high plateaux of eastern Algeria. Data were collected on GY and yield components, days to heading, mean minimum and maximum temperatures. Significant differences existed between varieties within sowing date and between sowing dates for GY and yield components. Significant correlation coefficients were found between GY, kernels/head, days to heading, mean minimum temperature and the difference between mean maximum and minimum temperatures of the 15 days prior to heading for early material, and seeding dates. It is deduced that low temperatures are the main limiting factor to high yield in this region. This suggests that the ongoing selection program should incorporate frost tolerance into future varieties and select material with slow primordia initiation and rapid primordia development.

1054 Menacho Casimiro, E.E. (1992) **[Temperature and rainfall forecast and establishment of agricultural timetables for Huayao - Huancayo]. Pronostico de temperatura y precipitacion y elaboracion de calendarios agricolas para Huayao - Huancayo.** Universidad Nacional Agraria La Molina, Lima (Peru). Facultad de Ciencias. Departamento de Fisica y Meteorologia. 3 graf. 55 fig. 29 cuadros; 25 ref. 153 p. Spanish. (AGRIS 95-143960).

1055 Xu Xiujuan; Shang Hongsheng; Jing Jinxue (Northwestern Agricultural Univ., Yangling, Shaanxi (China). Dept. of Plant Protection) (1994) **Study on dewfall in wheat fields.** *Acta Universitatis Agriculturalis Boreali-Occidentalis (China) v. 22(4) p. 38-42.* 5 tables; 2 ill., 5 ref. Chinese. (AGRIS 95-143936).

Q01 FOOD SCIENCE AND TECHNOLOGY

1056 Bhatty, RS. (1995) **LABORATORY AND PILOT PLANT EXTRACTION AND PURIFICATION OF BETA-GLUCANS FROM HULL-LESS BARLEY AND OAT BRANS.** *Journal of Cereal Science. 22(2):163-170.* English. [UNIV SASKATCHEWAN CTR CROP DEV SASKATOON SK S7N 5AB CANADA].

beta-Glucan was extracted with sodium hydroxide from one sample of hull-less barley (Azhul) bran and two samples of oat bran in the laboratory and from one sample of hull-less barley (Scout) bran in the pilot plant, and subsequently purified. The sodium hydroxide solvent extracted 96-98% of the beta-glucans from the four brans; beta-glucan recovery after purification varied from 73-77% in barley brans and 87-95% in oat brans. Azhul barley bran preparation contained 76% beta-glucan, 11% pentosans and about 1% protein, starch, ether extract, and ash; the preparations from oat brans contained 69-72% beta-glucan, 7-8% pentosans and less than 2% protein, starch, ether extract and ash. The pilot plant preparation from Scout barley bran contained only 50% beta-glucan and a high ash content (16%) due to poor washing of the extracted material; its protein, starch and ether extract contents were also higher. The apparent viscosity of the beta-glucans was highly concentration-dependent, the pilot plant preparation was the most viscous. The apparent molecular weight of the beta-glucans was estimated at 2 x 10(6). Calculation of power law constants of 1% beta-glucan solutions gave low consistency indices (<0.2 Pa x s) except for the pilot plant preparation (0.76 Pa x s), and a high flow behavior index (0.75-0.89). The latter values suggested low shear sensitivity of the preparations. (C) 1995 Academic Press Limited [References: 24].

Q02 FOOD PROCESSING AND PRESERVATION

1057 Addo, K.; Slepak, M.; Akoh, CC. (1995) **EFFECTS OF SUCROSE FATTY ACID ESTER AND BLENDS ON ALVEOGRAPH CHARACTERISTICS OF WHEAT FLOUR DOUGHS.** *Journal of Cereal Science. 22(2):123-127.* English. [UNIV KENTUCKY DEPT NUTR & FOOD SCI 219 FUNKHOUSER LEXINGTON, KY 40506 USA].

The effects of commercial sucrose ester emulsifiers (Ryoto, Mitsubishi-Kasei Food Corporation, Tokyo, Japan) on alveograph rheological dough properties of a commercial hard red winter (HRW) wheat flour were determined. The esters were evaluated alone or combined to produce blends of varying hydrophile-lipophile balance (HLB). In general, Alveograph dough rheological properties improved as HLB value of the sucrose ester increased. A blend of 20:80 (w/w) of S-170 and S-1670, in the presence of 3% shortening resulted in the most significant changes in Alveograph data. Addition of as little as 0.4% of the ester blend could partially replace shortening in the dough formulation. (C) 1995 Academic Press Limited [References: 11].

1058 Agu, RC.; Ugwu, AH.; Okenchi, MU.; Aneke, IB.; Anyanwu, TU. (1996) **EFFECT OF LOW KILNING TEMPERATURES ON DIASTASE AND CELLULASE DEVELOPMENT OF NIGERIAN MALTED SORGHUM (SORGHUM BICOLOR).** *Process Biochemistry. 31(1):63-68.* English. [ENUGU STATE UNIV SCI & TECHNOL FAC APPL NAT SCI PMB 01660 ENUGU NIGERIA].

Lowering the kilning temperatures of a malting sorghum variety (Sorghum bicolor) resulted in a significant increase in the level of diastase and cellulase activities of the malt. A 7.7, 8.7 and 12.4% decrease in diastase activities and 4.1, 7.3 and 12.6% decrease in cellulase activities were recorded when the kilning temperatures were raised to 35, 40 and 45 degrees C, respectively when compared with the values of these enzymes obtained for the unkilned malt. [References: 21].

1059 Ahmadi Esfahani, F.Z. (University of Sydney, Australia); Stanmore, R.G. (1994) **Values of Australian wheat and flour quality characteristics.** *Agribusiness : an international journal (USA) v. 10(6) p. 529-536.* references. English. (AGRIS 95-144177).

1060 Al Yahya, S.A. (King Saud Univ., Gassim (Saudi Arabia). Faculty of Agricultural and Veterinary Medicine) (1994) **Reconditioning overdried barley.** *Alexandria Journal of Agricultural Research (Egypt) v. 39(2) p. 21-35.* 6 ill. 3 tables; 5 ref. English. (AGRIS 95-144145).

1061 Andrews, D.C.; Caldwell, R.A. (Sydney Univ. (Australia). Dept. of Agricultural Chemistry and Soil Science); Quail, K. (Bread Research Inst. of Australia Inc., North Ryde) (1993) **The effect of potassium bromate on the sulfhydryl content of wheat proteins during baking. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 501.* Abstract only. English. (AGRIS 95-144167).

1062 Anon. (1995) **[France shows the way for use of biofuels]. Frankreich weist den Weg fuer die Verwendung von Biokraftstoffen.** *Branntweinwirtschaft (Germany) v. 135(4) p. 55-57.* German. (AGRIS 95-144328).

1063 Atalla, M.M. (National Research Centre., Cairo (Egypt). Microbial and Engzyme Chemistry Research Dept.) (1993) **Effect of chemical and microbial treatments on the quality of brewer's spent grains.** *Journal of Agricultaral Sciences, Mansoura Univ. (Egypt) v. 18(10) p. 3018-3026.* 4 tables; 19 ref. English. (AGRIS 95-164914).

1064 Bedo, Z.; Karpati, M.; Vida, G.; Kramarikkissimon, J.; Lang, L. (1995) **GOOD BREADMAKING QUALITY WHEAT (TRITICUM AESTIVUM L) GENOTYPES WITH 2+12 SUBUNIT COMPOSITION AT THE GLU-D1 LOCUS.** *Cereal Research Communications. 23(3):283-289.* English. [HUNGARIAN ACAD SCI INST AGR RES MARTONVASAR HUNGARY].

Wheats from Bankut played an important role in Hungarian wheat production from the thirties to the early sixties of this century. Their good flour quality was characterised mainly by a Brabender farinograph value of A, high gluten content and generally a 2+12. subunit at the HMW glutenin Glu-D1 locus. The breeding of wheat varieties with a similar type of quality would serve to broaden the genetic basis for the selection of good flour quality. Breeding lines with good breadmaking quality can be created not only from genotypes with 5+10 Glu-D1 subunits, but also from those with a 2+12 HMW glutenin composition. One example of this will be described below through a characterisation of the flour quality of the wheat line MvM 57-91.

1065 Blakeney, A.B. (New South Wales Agriculture, Yanco (Australia). Yanco Agricultural Inst.); Henry, R.J. (Queensland Agricultural Biotechnology Centre, St Lucia (Australia)); Thomlinson, J.D. (Bread Research Inst. of Australia Inc., North Ryde (Australia)) (1993) **Processing options for weather damaged wheat.** *Chemistry in Australia (Australia) v. 60(9) p. 484.* 1 table, 12 ref. English. (AGRIS 95-144164).

1066 Boggini, G.; Tusa, P.; Pogna, NE. (1995) **BREAD MAKING QUALITY OF DURUM WHEAT GENOTYPES WITH SOME NOVEL GLUTENIN SUBUNIT COMPOSITIONS.** *Journal of Cereal Science. 22(2):105-113.* English. [EXPTL INST CEREAL RES VIA VARESE 43 I-95123 CATANIA ITALY].

Durum wheat genotypes with some novel high M(r) (high molecular weight, HMW) and low M(r) (low molecular weight, LMW) glutenin subunits were grown in Sicily for two years of testing in order to compare their theological and baking properties with respect to commercial durum wheat cultivars. Good bread making quality, as measured by Alveograph W and P/L, Farinograph and Mixograph parameters, and loaf volume was observed in genotypes combining high M(r) subunits 2(+), 1 or 1* encoded at the Glu-A1 locus with the so-called LMW-2 subunit group encoded at the Glu-B3 locus. The cultivar Avanzi, which carries high M(r) subunit 2(+) and LMW-2-like subunits, and the cultivars Dritto and Keops, which contain novel high and low M(r) subunits, gave higher loaf volumes than control cultivars. The LMW-2 group subunits were found to be the main factor in determining dough strength (Alveograph W). The increase in the amount of high M(r) subunits in genotypes with one expressed Glu-A1 gene may account for their improved rheological and baking properties. (C) 1995 Academic Press Limited [References: 31].

1067 Chen, WZ.; Hoseney, RC. (1995) **DEVELOPMENT OF AN OBJECTIVE METHOD FOR DOUGH STICKINESS.** *Food Science & Technology-Lebensmittel-Wissenschaft & Technologie. 28(5):467-473.* English. [KANSAS STATE UNIV AGR & APPL SCI DEPT GRAIN SCI & IND MANHATTAN, KS 66506 USA].

An objective method was developed to measure dough stickiness. The texture analyser provided the required compression force and measured the tension. A cell was designed and built that caused the dough to separate from the probe surface tinder tensile stress. This is critical for the measurement of dough surface stickiness. The procedure was highly reproducible and appeared to correlate well with subjective measurements of dough stickiness. A number of factors that affected dough stickiness were studied by the developed procedure. Although many factors were shown to affect dough stickiness, none appeared to explain the increased stickiness found with certain flours. (C) 1995 Academic Press Limited [References: 22].

1068 Ciaffi, M.; Lafiandra, D.; Turchetta, T.; Ravaglia, S.; Bariani, H.; Gupta, R.; Macritchie, F. (1995) **BREADBAKING POTENTIAL OF DURUM WHEAT LINES EXPRESSING BOTH X- AND Y-TYPE SUBUNITS AT THE GLU-A1 LOCUS.** *Cereal Chemistry. 72(5):465-469.* English. [UNIV TUSCIA DIPARTIMENTO AGROBIOL & AGROCHIM I-01100 VITERBO ITALY].

Functionality and protein composition data were obtained for 13 F7 lines derived by a four-way cross, involving two different Italian cultivars (Creso and Lira), a tetraploid breeding line (A327), and an accession of Triticum dicoccoides. Three bread wheat cultivars currently grown in Italy and two durum parental cultivars were used as controls. These lines possessed one or two subunits at the Glu-A1 locus, derived from the uncommon allelic variant at the same locus of both A327 and Triticum dicoccoides. Functional quality was assessed by the sodium dodecyl sulfate (SDS) sedimentation test, theological dough tests (mixograph and alveograph), and an optimized microbaking test. Protein composition was measured by near infrared reflectance (protein content), size-exclusion HPLC, and SDS-PAGE. Rheological and baking properties were strongly associated with the allelic type of proteins encoded by the Glu-B3 and Glu-A1 loci. Lines with the best technological performances contained the Glu-A1 allele from T. dicaccoides and the allelic type LMW-2 at the Glu-B3 locus from the parental durum wheat cultivars. Results indicated that some lines had exceptionally high dough strength and approached acceptable levels for baking, with one possessing dough theological properties and baking performance as good as those of the bread wheat cultivars used as controls. [References: 25].

1069 Demuyakor, B. (Hiroshima University, Hiroshima, Japan); Ohta, Y.; Nakatani, K.; Fukui, N.; Kanagawa, K. (1994) **Brewing of beer with Sorghum vulgare malt with minimal barley malt blending.** *American Society of Brewing Chemists (USA) v. 52(3) p. 111-114.* references. English. (AGRIS 95-144438).

1070 Dougan, KD.; Muir, WE.; Jayas, DS. (1995) **FEASIBILITY OF IN-PROGRESS DRYING GUIDELINES FOR WHEAT VENTILATED WITH NEAR-AMBIENT AIR.** *Canadian Agricultural Engineering. 37(3):183-187.* English. [ATOM ENERGY CANADA LTD WHITESHELL LABS STN 46 PINAWA MB R0E 1L0 CANADA].

There are few operational guidelines to assist grain managers to predict, on a year-to-year basis, the drying behaviour of a bulk of wheat which is continuously ventilated with near-ambient air. To study the variability of the time required for the drying front to pass completely through the top of the bulk (10th imaginary layer), simulations for each weather year were stopped when the drying front reached the third and fifth layers. For each case, drying was completed using all 28 years of historical weather data (1953-80 for Winnipeg, MB). The time to complete drying to the top layer was estimated within a 10 day range when the drying front had progressed to the midpoint of the bulk. The accuracy of the estimated time for the drying-front to pass completely through the top of the bulk increased with increasing bed depth, moisture content, or later storage date. When losses in drying time occurred during periods of "poor" drying, the time lost could not be recovered during periods of "good" drying because there was a maximum rate of drying. [References: 8].

1071 Dovidio, R.; Simeone, M.; Masci, S.; Porceddu, E.; Kasarda, DD. (1995) **NUCLEOTIDE SEQUENCE OF A GAMMA-TYPE GLUTENIN GENE FROM A DURUM WHEAT - CORRELATION WITH A GAMMA-TYPE GLUTENIN SUBUNIT FROM THE SAME BIOTYPE.** *Cereal Chemistry. 72(5):443-449.* English. [UNIV TUSCIA DIPARTIMENTO AGROBIOL & AGROCHIM VIA SAN C DE LELLIS I-01100 VITERBO ITALY].

A gene coding for an apparent gamma-type glutenin subunit has been cloned from the biotype Lira 45 of the durum wheat cultivar Lira and sequenced. The nucleotide sequence of the gene from clone pTD9 showed almost perfect homology with a complete gamma-type glutenin gene of Triticum aestivum L. and with an incomplete, presumably gamma-type glutenin gene isolated from a different cultivar of Triticum durum Desf. All three genes code for proteins that have an additional cysteine residue in the N-terminal region at residue 26; there are nine cysteines in the molecule rather than the eight that are typical of gamma-gliadins. This odd cysteine makes it reasonably certain that the equivalent protein will be incorporated into glutenin polymers, because all other cysteines were homologous to those in classical gamma-gliadins, making it likely that they form the usual four intramolecular disulfide bonds characteristic of gamma-gliadins. Accordingly, the ninth (odd) cysteine should be available for intermolecular disulfide bond formation. The ability to form only a single intermolecular disulfide bond would cause the molecule to act as a chain terminator during formation of glutenin polymers. In support of this, a gamma-type glutenin was purified from a glutenin preparation derived from the same biotype (Lira 45) and characterized by N-terminal amino acid sequencing to show perfect homology at the N-terminus with the protein sequence derived from sequencing of the pTD9 clone, including the cysteine at residue 26. A computer molecular model of the protein equivalent to pTD9, based on the

sequence and on the disulfide bond arrangements found for gamma-gliadins (Kohler et al 1993), provides a hypothetical three-dimensional structure for the gamma-type glutenin subunit. [References: 22].

1072 El Makhzangy, A.; El Shawaf, A.M. (Zagazig Univ. (Egypt). Institute of Efficient productivity) (1994) **Effect of different solvents extraction on physiochemical properties of wheat germ oil.** *Journal of Agricultural Sciences, Mansoura Univ. (Egypt) v. 19(6) p. 1991-1999.* 1 ill. 4 tables; 21 ref. English. (AGRIS 95-144429).

1073 Esuoso, KO.; Bamiro, FO. (1995) **STUDIES ON THE BAKING PROPERTIES OF NON-WHEAT FLOURS .1. BREADFRUIT (ARTOCARPUS ARTILIS).** *International Journal of Food Sciences & Nutrition. 46(3):267-273.* English. [FED UNIV TECHNOL AKURE DEPT CHEM AKURE NIGERIA].

The possibility of producing bread from wheat (WF)/Breadfruit (BF), composite flour has been examined. Wheat flour was supplemented with up to 50% breadfruit flour. Chemical analysis of the breadfruit flour indicated a high starch content (80.9 +/- 0.9%), a fairly high crude fibre and ash contents (1.6 +/- 0.3; 4.2 +/- 0.3%) respectively and a low protein content (4.0 +/- 0.5%). Brabender amylograph pasting viscosity of the various flour and flour blends indicated that apart from the 100% WE 10% BF/WF blends recorded the best pasting characteristics in terms of the starch stability, gelatinization index and set back values. While the 100% BF exhibited the poorest pasting characteristics. Physical characteristics indicated that only 100% WF and 10% BF/WF were free of cracks and crumbliness, 20% and 30% BF/WF had slight cracks, while others are dense and highly cracked. This was reflected on the panellist judgment during sensory evaluation. There was no significant difference at $P < 0.05$ between the control (100% WF) and the composite bread samples up to 30% level of breadfruit flour. Others differed significantly. [References: 28].

1074 Every, D.; Gerrard, JA.; Gilpin, MJ. (1995) **BETA-AMYLASE ACTIVITY IN COMMERCIAL GLUTEN.** *Journal of the Science of Food & Agriculture. 69(2):257-263.* English. [NEW ZEALAND INST CROP & FOOD RES LTD GRAIN FOODS RES UNIT PRIVATE BAG 4704 CHRISTCHURCH NEW ZEALAND].

The nature of beta-amylase activity in commercial wheat gluten was examined. Forty-nine samples of vital wheat gluten from five countries were tested and found to contain large amounts of both 'free' (water soluble) and 'bound' (extracted with reducing agents, papain or concentrated saline) beta-amylase, although the distinction between these two categories proved somewhat arbitrary. beta-Amylase was not active at extremes of pH (<3 or >9) but activity was restored on neutralisation. Potassium cyanide reversibly inhibited both 'free' and 'bound' enzyme. 2', 3'-Epoxypropyl alpha-D-glucopyranoside irreversibly inhibited the enzyme, but competing solvolysis made this method impractical for large-scale work. Significant variation was found between the levels of beta-amylase activity in commercial gluten samples (the means of beta-amylase activity for individual countries ranged from 1.88 to 3.12 U mg(-1) gluten) but this variation was not correlated with bread-baking quality. beta-Amylase activity of gluten declined with storage, especially after 2 years, but bread-baking quality was not affected. The decline in beta-amylase activity of experimentally heat-treated gluten was related to the decline of bread-baking quality. Exceptionally low beta-amylase activity could be used as a 'marker' for gluten that has been heat damaged during the drying process. [References: 28].

1075 Gassenmeier, K.; Schieberle, P. (1995) **POTENT AROMATIC COMPOUNDS IN THE CRUMB OF WHEAT BREAD (FRENCH-TYPE) - INFLUENCE OF PRE-FERMENTS AND STUDIES ON THE FORMATION OF KEY ODORANTS DURING DOUGH PROCESSING.** *Zeitschrift fur Lebensmittel-Untersuchung und -Forschung. 201(3):241-248.* English. [DEUTSCH FORSCH ANSTALT LEBENSMITTELCHEM LICHTENBERGSTR 4 D-85748 GARCHING GERMANY].

The most important odorants in the crumbs of wheat breads (French-type) prepared according to two different dough recipes using pre-fermentation (crumb I: liquid pre-ferment, containing 0.25% yeast and 1.5% yeast in the final dough; crumb II: soft dough pre-ferment containing 15% yeast and 4.6% yeast in the final dough) were evaluated on the basis of aroma extract dilution analyses. In crumb I, exhibiting the more typical flavour, comparatively higher flavour dilution (FD) factors were found especially for 2-phenylethanol (2-PE) and 3-methylbutanol (3-MB), while in crumb II the FD factors of methional, 1-octen-3-one, 4-hydroxy-2, 5-dimethyl-3(2H)-furanone, butanoic acid and 2- and 3-methylbutanoic acid were higher than in crumb I. Quantitative studies (stable isotope dilution assays) of 2-PE and 3-MB formation, in the liquid pre-ferments containing low yeast concentrations (0.25%) revealed that anaerobic conditions and a fermentation temperature of 35 degrees C favoured the production of both odorants. Model studies, in which either the 3-MB precursors L-leucine and 3-methylbutanal or the 2-PE precursors L-phenylalanine and phenylacetaldehyde had been added to the pre-ferments, indicated that bakers yeast significantly (15-55%) converted these precursors into the respective odorant. [References: 24].

1076 Gobbetti, M.; Corsetti, A.; Devincenzi, S. (1995) **THE SOURDOUGH MICROFLORA - CHARACTERIZATION OF HOMOFERMENTATIVE LACTIC ACID BACTERIA BASED ON ACIDIFICATION KINETICS AND IMPEDANCE TEST.** *Italian Journal of Food Science. 7(2):91-101.* English. [UNIV PERUGIA FAC AGR IST MICROBIOL LATTIERO CASEARIA VIA S COSTANZO I-06100 PERUGIA ITALY].

Forty-one strains of Lactobacillus plantarum, L. farciminis, L. alimentarius, L. acidophilus and L. delbrueckii subsp. delbrueckii isolated from Italian wheat sourdoughs and 5 ATCC type strains (one per species) were characterized on the basis of 7 parameters of acidification kinetics and 3 impedance test parameters. Statistical cor relations were found between the total change of conductance and the latency phase of acidification and between the maximum rate of conductance and acidification. Data from 6 parameters of acidification kinetics were evaluated by using Principal Component Analysis which indicated the differences between strains and allowed them to be divided into 4 groups. Almost all the type strains showed a different acidification activity with respect to the strains isolated from the sourdoughs. These differences were confirmed during sourdough fermentation using representative strains of the different groups. [References: 21].

1077 Gothwal, PP.; Shukla, IC. (1995) **EFFECT OF REFINED WHEAT FLOUR (MAIDA) AND SUGAR ON THE BROWNING OF MILK, KHOA AND KHOA-BASED SWEETS.** *Journal of Food Science & Technology-Mysore. 32(4):301-304.* English. [CENT FOOD TECHNOL RES INST REG CTR LUCKNOW 227105 UTTAR PRADESH INDIA].

Refined wheat flour [maida], at a level of 8%, increased browning index (20 to 22%) during heat treatment in both cow and buffalo milks. At 10% level, maida caused increase in browning index in burfi (13%), in Kalakand (13%) and in milk pera as well as milk cake (18%). Milk, with sugar at 6, 8 and 10% levels, and sterilized at 1.05 kg/cm(2) for 15 min, showed no browning, though prolonged heating caused intense browning. as compared to samples with no added sugar. Sugar at 15-35%, based on the weight of khoa, produced less browning in burfi and kalakand. as compared to that at 4%. Different mix formulations were found to alter the proteins, fat and total carbohydrate contents of gulabjamun. The frying temperature of gulabjamun had a significant effect on fat uptake. Higher total solids tended to increase browning In khoa and khoa-based sweet preparations.

1078 Gu, D.; Sokhansanj, S. (1992) **Experimental study of airflow distribution and drying of wheat.** *American Society of Agricultural Engineers. Meeting (USA); no. 926526 23 p.* references. Paper presented at the "1992 International Winter Meeting sponsored by The American Society of Agricultural Engineers, " December 15-18, 1992, Nashville, Tennessee. English. (AGRIS 95-144172).

1079 Gustavsson, M.; Wahlund, K.G.; Wannerberger, L.; Nylander, T. (Lund Univ. (Sweden). Kemicentrum); MacRitchie, F. (1994) **Size characterization of ultra-high-molecular-weight wheat proteins using asymmetrical flow FFF.** Livsmedel 94; Goeteborg (Sweden); 26-27 Oct 1994. *[Food 94. Workshops and poster sessions] p. C11.* English. (AGRIS 95-164920).

1080 Hassan, A.M. (Mansoura Univ. (Egypt). Faculty of Agriculture) (1993) **Influence of adding sweet potatoes paste to wheat flour on the properties of bread.** *Journal of Agricultural Sciences, Mansoura Univ. (Egypt) v. 18(4) p. 1088-1097.* 2 fig. 27 ref. English. (AGRIS 95-165061).

1081 Herald, TJ.; Gnanasambandam, R.; Mcguire, BH.; Hachmeister, KA. (1995) **DEGRADABLE WHEAT GLUTEN FILMS - PREPARATION, PROPERTIES AND APPLICATIONS.** *Journal of Food Science. 60(5):1147 ff.* English. [KANSAS STATE UNIV AGR & APPL SCI DEPT FOODS NUTR MANHATTAN, KS 66502 USA].

Degradable films from spray-dried (SD) and flash-dried (FD) wheat gluten prepared at various pHs, salt levels, temperatures, and shearing times were compared. Differences were observed in properties of the films related to processing conditions. Films prepared from SD wheat gluten were thicker, and had higher tensile strengths and Young's moduli. SD wheat gluten solutions applied as coating material resulted in Grade A-quality shell eggs maintaining quality for 30 days at room temperature. Additionally, SD wheat gluten coating increased the water stability of starch-based packaging. [References: 25].

1082 Hickman, DR.; Roepstorff, P.; Shewry, PR.; Tatham, AS. (1995) **MOLECULAR WEIGHTS OF HIGH MOLECULAR WEIGHT SUBUNITS OF GLUTENIN DETERMINED BY MASS SPECTROMETRY.** *Journal of Cereal Science. 22(2):99-103.* English. [UNIV BRISTOL LONG ASHTON RES STN DEPT AGR SCI INST ARABLE CROPS RES BRISTOL BS18 9AF AVON ENGLAND].

High molecular weight (HMW) subunits of glutenin, corresponding to those for which full length gene sequences are available, were purified and their M(r)s determined by mass spectrometry [matrix-assisted laser desorption ionisation (MALDI)]. In general, the M(r)s determined were within the experimental error of the techniques employed [at the mass range of the high molecular weight (HMW) prolamins, error similar to 500 Da]. Two subunits, 1Dx2 and 1By9, however, showed M(r)s approximately 900 Da higher and 1700 Da lower, respectively, than expected from their gene sequences. These data confirm that the HMW subunits are not extensively glycosylated and also demonstrate the utility of mass spectrometry for determining the M(r)s of prolamins. (C) 1995 Academic Press Limited [References: 24].

1083 Jones, BL.; Marinac, LA. (1995) **A COMPARISON OF BARLEY AND MALT POLYPEPTIDES THAT INHIBIT GREEN MALT ENDOPROTEINASES.** *Journal of the American Society of Brewing Chemists. 53(4):160-166.* English. [USDA ARS CEREAL CROPS RES UNIT MADISON, WI 53705 USA].

The brewing quality of a wort is strongly affected by its amino acid/peptide/protein ratio, which in turn is determined by the endoproteinases active during malting and mashing. In addition to the multiple endoproteinases present in germinating barley and malt, we previously showed that inhibitors of these enzymes, which will affect the rate and extent of protein hydrolysis, occur in ungerminated barley. We are characterizing these inhibitors to determine how important they are to the malting and brewing processes. Contrary to reports by other researchers, this study demonstrates that similar inhibitors are also present in kilned malt, at levels about 2.5 times higher than those of barley. Both barley and malt contain two classes of inhibitors, I-a and I-b. We have now separated the I-a fractions (containing Low-molecular-weight, proteinaceous compounds) from barley and malt into multiple forms by ion exchange chromatography. The separated I-a fractions specifically inhibited the activities of particular electrophoretically separated green malt endoproteinases. All of the barley I-a fractions restricted the activities of the same green malt endoproteinases, as did all of those from malt. This probably indicates that all of the barley inhibitors are similar, and that the same is also true for the malt inhibitors. I-a fractions from barley suppressed only cysteine class proteinases, while those from malt inhibited a serine proteinase, in addition to the cysteine proteinases. [References: 11].

1084 Jones, BL.; Marinac, LA. (1995) **BARLEY LTP1 (PAPI) AND LTP2 - INHIBITORS OF GREEN MALT CYSTEINE ENDOPROTEINASES.** *Journal of the American Society of Brewing Chemists. 53(4):194-195.* English. [USDA ARS CEREAL CROPS RES UNIT 501 WALNUT ST MADISON, WI 53705 USA].

1085 Karpati, M.; Brieber, K.; Kuroczi, LG.; Czirak, L.; Lasztity, R. (1995) **RELATIONSHIP BETWEEN HIGH MOLECULAR WEIGHT SUBUNITS OF GLUTENIN AND BREADMAKING QUALITY OF HUNGARIAN GROWN WHEATS.** *Acta Alimentaria. 24(1):47-54.* English. [TECH UNIV BUDAPEST DEPT BIOCHEM & FOOD TECHNOL PF 91 H-1501 BUDAPEST HUNGARY].

HMW glutenin subunits spectra of 72 bread-wheat cultivars grown in Hungarian were studied using SDS-polyacrylamide gel electrophoresis. The quality of varieties was determined based on Valorigraph test, glutenin quantity and quality, Hagberg's falling number and baking test. In the 72 wheat cultivars 12 different permutations of HMW glutenin subunits were found. The cultivars have been evaluated by HMW glutenin subunit quality score (Glu-1 quality score). Highly significant correlations were found by statistical analyses of results. The highest linear correlation coefficients were obtained for the correlation of Glu-1 quality score Valorigraph value and baking test loaf volume ($r = 0.690$, $p < 0.001$ and $r = 0.573$, $p < 0.001$, respectively). The evaluation method used can be a useful tool for screening test in breeding programs.

1086 Kastenmueller, A. (1995) **[Modern mills and their characteristics. Part 1: A new flour mill in Austria. Part 2: Molino di Cordovado in Italy]. Neuere Muehlen und ihre Besonderheiten. Teil 1: Eine neue Muehle in Oesterreich. Teil 2: Molino di Cordovado in Italien.** *Muehle + Mischfuttertechnik (Germany) v. 132(1) p. 11-12, (2) p. 24-25.* 14 ill. German. (AGRIS 95-144161).

1087 Knuckles, BE.; Chiu, MCM. (1995) **BETA-GLUCAN ENRICHMENT OF BARLEY FRACTIONS BY AIR CLASSIFICATION AND SIEVING.** *Journal of Food Science. 60(5):1070-1074.* English. [USDA ARS WESTERN REG RES CTR 800 BUCHANAN ST ALBANY, CA 94710 USA].

Barley (Steptoe, Crystal and/or Waxbar) was dry milled and fractionated by small scale air classifiers and batch or continuous feed sifters to produce beta-glucan-rich fractions. Sieving of barley (all cultivars) yielded fines fractions containing 88-90% starch and a final coarse enriched fraction containing 40-45% total dietary fiber including 16-19% beta-glucans and up to 82 mu g/g total tocols. The enriched fraction was 20-25% (by wt) of the dehulled barley. The highest beta-glucan content by air classification was 9% due to ineffective separation of fines (particles <45 mu m). Dry fractionation of barley produced a value added enriched product enhanced in factors (ie. tocols, dietary fiber, beta-glucans) which slow oxidation, lower cholesterol, moderate glycemic response and which provide unique functional properties in food systems. [References: 50].

1088 Kokini, JL.; Cocero, AM.; Madeka, H. (1995) **STATE DIAGRAMS HELP PREDICT RHEOLOGY OF CEREAL PROTEINS.** *Food Technology. 49(10):74 ff.* English. [RUTGERS STATE UNIV CTR ADV FOOD TECHNOL DEPT FOOD SCI POB 231 NEW BRUNSWICK, NJ 08903 USA].

1089 Kovacs, MIP.; Noll, JS.; Dahlke, G.; Leisle, D. (1995) **PASTA VISCOELASTICITY - ITS USEFULNESS IN THE CANADIAN DURUM WHEAT BREEDING PROGRAM.** *Journal of Cereal Science. 22(2):115-121.* English. [AGR & AGRI FOOD CANADA 195 DAFOE RD WINNIPEG MB R3T 2M9 CANADA].

The usefulness of pasta disc viscoelasticity to predict pasta cooking quality in the durum wheat breeding program was evaluated. Cooked pasta disc viscoelasticity (PDV) was calculated from the creep curve of the viscoelastogram. Two sets of samples with different quality characteristics were tested for protein content, sedimentation volume (SV), Mixograph mixing characteristics, cooked gluten viscoelasticity (CGV) and cooked pasta disc viscoelasticity. Pearson correlation coefficients indicated that cooked pasta disc visoelasticity was associated with Mixograph values, SV and CGV, but not with protein content. The results indicate that the PDV test is useful in breeding programs because it requires small quantities of sample, it is simple and more closely mimics theological tests used on the final product, pasta. The optimal conditions for measuring PDV are discussed. (C) 1995 Academic Press Limited [References: 24].

1090 Lang, W. (University of Saskatchewan, Saskatoon, SK.); Sokhansanj, S.; Irudayara, J.; Sosulski, F.W. (1992) **Drying of wheat and canola: experiment and simulation with shrinkage.** *American Society of Agricultural Engineers. Meeting (USA); no. 92-6560/92-6587 17 p.* references. Paper presented at the "1992 International Winter Meeting sponsored by the American Society of Agricultural Engineers," December 15-18, 1992, Nashville, Tennessee. Issue numbers not consecutive. English. (AGRIS 95-144174).

1091 Larsson, H.; Eliasson, A.C. (Lund Univ. (Sweden). Kemicentrum) (1994) **Phase separation of wheat flour dough studied by ultracentrifugation.** Livsmedel 94; Goeteborg (Sweden); 26-27 Oct 1994. *[Food 94. Workshops and poster sessions] p. C9.* English. (AGRIS 95-165059).

1092 Li, H.; Hanna, M.A.; Ghorpade, V. (1993) **Effects of chemical modifications on soy and wheat protein films.** *American Society of Agricultural Engineers. Meeting (USA); no. 936529 12 p.* references. Paper presented at the "1993 International Winter Meeting sponsored by The American Society of Agricultural Engineers, " December 14-17, 1993, Chicago, Illinois. English. (AGRIS 95-144171).

1093 Marklinder, I.; Johansson, L. (1995) **SOUR DOUGH FERMENTATION OF BARLEY FLOURS WITH VARIED CONTENT OF MIXED-LINKED (1-]3), (1-]4) BETA-D-GLUCANS.** *Food Microbiology. 12(5):363-371.* English. [UPPSALA UNIV DEPT DOMEST SCI DAG HAMMARSKJOLDS VAG 21 S-75237 UPPSALA SWEDEN].

The possibility of making sour doughs from barley flour was investigated Three flours with different content of mixed-linked (1-->3), (1-->4) beta-D-glucans were fermented spontaneously and with two kinds of starter cultures: Lactobacillus plantarum (A) and Lactobacillus brevis (B). All three flours supported sour dough fermentation both spontaneously and with the use of starter cultures. The latter simplified the procedure and produced finished sour doughs in a shorter time. The chemical composition of the flour influenced pH and acidity in the final sour doughs regardless of starter cultures. The total amount of beta-glucans in the sour doughs decreased during the fermentation and to a higher extent by starter culture B (ranging from 18-31%) than by starter culture A (ranging from 10-20%). (C) 1995 Academic Press Limited. [References: 17].

1094 McCormick, K.M.; Panozzo, J.F. (Victorian Dept. of Agriculture, Horsham (Australia). Inst. for Dryland Agriculture) (1993) **Screening wheat pasting properties using a software driven Rapid Visco Analyzer [flour, starch]. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 510.* Abstract only. English. (AGRIS 95-144168).

1095 McMaster, G.J. (Bread Research Inst. of Australia Inc., North Ryde); Ross, A.S.; Cheetham, N.S.W. (New South Wales Univ., Kensington (Australia). School of Chemistry) (1993) **The effects of dextrans of differing molecular weights on paste and gel properties of wheat starch and quality of oriental noodles. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 500.* Abstract only. English. (AGRIS 95-144166).

1096 Morita, N.; Nakamura, M. (Osaka Prefecture Univ., Sakai (Japan). Dept. of Agricultural Chemistry); Hamauzu, Z.; Toyosawa, I. (Mukogawa Women's Univ., Nishinomiya (Japan). Dept. of Food Science) (1993) **Effect of calcium gluconate on the physical properties of wheat flour dough and on the breadmaking in a domestic breadmaking apparatus. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 499.* Abstract only. English. (AGRIS 95-144472).

1097 Moss, R.; McCorquodale, J. (Bread Research Inst. of Australia Inc., North Ryde) (1993) **Investigation of the effect of mill variables on starch damage, flour quality and baking performance. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 499.* Abstract only. English. (AGRIS 95-144165).

1098 Pan, H.; Payne, F.A.; Barth, M.; Langlois, B.E. (1992) **CO2 puffing of wheat.** *American Society of Agricultural Engineers. Meeting (USA); no. 926539 14 p.* references. Paper presented at the "1992 International Winter Meeting sponsored by The American Society of Agricultural Engineers, " December 15-18, 1992, Nashville, Tennessee. English. (AGRIS 95-144173).

1099 Rhee, C. (Korea University, Seoul (Republique de Coree). College of Natural Resources, Department of Food Technology); Choi, S.G. (1994) **[The effect of water activity, freezing rate, and temperature on retrogradation of gelatinized wheat flour and cooked rice]. Effet de l'activite d'eau, du taux de congelation et de la temperature sur la retrogradation de la farine de ble gelatinise et du riz cuit.** Science et Technique du Froid (France); no. 3 p. 173-183. IIF. 5 ref., 6 graph. p. 173-183. English. (AGRIS 95-144457).

1100 Romaniuk, M. (University of Saskatchewan, Saskatoon, Sask., Canada); Sokhansanj, S.; Wood, H.C. (1993) **Barley seed recognition using a multi-layer neural network.** *American Society of Agricultural Engineers. Meeting (USA); no. 93-6541/93-6569 20 p.* references. Paper presented at the "1993 International Winter Meeting sponsored by the American Society of Agricultural Engineers, " December 14-17, 1993, Chicago, Illinois. Issue numbers not consecutive. English. (AGRIS 95-144147).

1101 Sacher, B. (1995) **[On the technological possibilities to influence the valuable properties of wheat malts]. Ueber die technologischen Moeglichkeiten zur Beeinflussung der wertbestimmenden Eigenschaften des Weizenmalzes.** *Brauwelt (Germany) v. 135(22-23) p. 1111-1114.* German. (AGRIS 95-144170).

1102 Sacher, B.; Back, W. (1995) **[Malts, worts and beers of barleys and wheats of the 1994 crops]. Malze, Wuerzen und Biere aus Gersten und Weizen des Jahrgangs 1994.** *Brauwelt (Germany) v. 135(18) p. 876-884, 897-898.* 7 ill., 12 tables. German. (AGRIS 95-144435).

1103 Shehata, N.A. (Ain Shams Univ., Cairo (Egypt). Women's College) (1992) **Organoleptic and biological study on cinamon peanut cookies made from wheat flour and peanut flour.** *Annals of Agricultural Science, Moshtohor (Egypt) v. 30(1) p. 401-410.* 5 tables; 20 ref. English. (AGRIS 95-144481).

1104 Shewry, PR.; Tatham, AS.; Barro, F.; Barcelo, P.; Lazzeri, P. (1995) **BIOTECHNOLOGY OF BREADMAKING - UNRAVELING AND MANIPULATING THE MULTI-PROTEIN GLUTEN COMPLEX [Review].** *Bio-Technology. 13(11):1185-1190.* English. [UNIV BRISTOL LONG ASHTON RES STN DEPT AGR SCI INST ARABLE CROPS RES BRISTOL BS18 9AF AVON ENGLAND].

Breadmaking is one of humankind's oldest technologies, being established some 4, 000 years ago, The ability to make leavened bread depends largely on the visco-elastic properties conferred to wheat doughs by the gluten proteins, These allow the entrapment of carbon dioxide released by the yeast, giving rise to a light porous structure, One group of gluten proteins, the high molecular weight (HMW) subunits, are largely responsible for gluten elasticity, and variation in their amount and composition is associated with differences in elasticity (and hence quality) between various types of wheat, These proteins form elastomeric polymers stabilized by inter-chain disulphide bonds, and detailed studies of their structures have led to models for the mechanism of elasticity, This work has also provided a basis for direct improvement of wheat quality by transformation with additional HMW subunit genes. [References: 36].

1105 Silverio, J.; Eliasson, A.C. (Lund Univ. (Sweden). Kemicentrum) (1994) **The effect of oils on the gelatinization and retrogradation of wheat starch.** Livsmedel 94; Goeteborg (Sweden); 26-27 Oct 1994. *[Food 94. Workshops and poster sessions] p. C4.* English. (AGRIS 95-165057).

1106 Stolz, P.; Vogel, RF.; Hammes, WP. (1995) **UTILIZATION OF ELECTRON ACCEPTORS BY LACTOBACILLI ISOLATED FROM SOURDOUGH .2. LACTOBACILLUS PONTIS, L-REUTERI, L-AMYLOVORUS, AND L-FERMENTUM.** *Zeitschrift fur Lebensmittel-Untersuchung und -Forschung. 201(4):402-410.* English. [TECH UNIV MUNICH LEHRSTUHL TECH MIKROBIOL D-85350 FREISING GERMANY].

The metabolism of maltose and the use of electron accepters has been investigated in strains of lactobacilli which are known to be stable elements in sourdoughs, which, traditionally, have been used for a long time. The metabolic features of Lactobacillus sanfrancisco have been described by us in a previous communication. Similar principles have been detected for the competitiveness of L. pontis, L. reuteri, L. fermentum and L. amylovorus, as well as species-specific characteristics. Based on these findings the metabolic key reactions have been identified and the use of electron accepters present in sourdough are presented in a schematic overview. In contrast to L.

sanfrancisco, these species can not use oxygen as an electron acceptor, and the length of their lag phase was not affected by agitation. Malate and fumarate were reduced to succinate, and fructose was used, depending on the species, as an electron acceptor, carbon source or both. All heterofermentative sourdough lactobacilli efficiently split maltose using maltose phosphorylase. Glucose was excreted, which induced glucose repression in competing indigenous micro-organisms, without affecting the maltose metabolism of sourdough lactobacilli. Lactobacilli generate additional adenosine 5'-triphosphate (ATP) from acetyl phosphate in the presence of electron accepters. These special features are suggested to represent a general principle which accounts for the prevalence of specific heterofermentative lactobacilli which are propagated over long periods present in sourdough fermentations. [References: 33].

1107 Suchet, P. (Ecole Nationale Superieure de Meunerie et des Industries Cerealieres, Paris (France). Sciences Biologiques) (1995) **[Effect of the cleaning and preparation of wheats on the health quality of mill products]. Influence du nettoyage et de la preparation des bles sur la qualite sanitaire des produits de mouture.** Journees ENSMIC [Ecole nationale superieure de meunerie et des industries cerealieres]; Paris (France); 1994. *Industries des Cereales (France) (no 91) p. 18-26.* 9 ref., 6 tableaux, 11 graph. French. (AGRIS 95-164919).

1108 Swanston, JS. (1995) **EFFECTS ON BARLEY GRAIN SIZE, TEXTURE AND MODIFICATION DURING MALTING ASSOCIATED WITH THREE GENES ON CHROMOSOME 1.** *Journal of Cereal Science. 22(2):157-161.* English. [SCOTTISH CROP RES INST DUNDEE DD2 5DA SCOTLAND].

Previous studies have suggested that the presence of the three genes waxy (wx), short-awned (lk2) and naked (n) have an additive effect in increasing beta-glucan content. In the genetic background considered in this paper, apparent additive effects were observed in decreasing grain size and increasing water uptake during steeping. Effects of approximately similar magnitude on milling energy and thousand corn weight were observed for wx and lk2, but these were not consistent across seasons. The waxy gene was associated with a much larger deleterious effect on characters concerned with endosperm modification during malting than lk2. A combination of wx and n did not demonstrate additive effects on milling energy, hot water extract or cell wall modification. It was postulated that removal of the husk reduced milling energy and facilitated water uptake. (C) 1995 Academic Press Limited [References: 21].

1109 Tran Minh Tam (1993) **[Influence of barley malt that is grown in Vietnamese climate conditions on growth and development of Saccharomyces calbergensis]. Anh huong cua malt dai mach trong trong nuoc den sinh truong cua nam men Saccharomyces calbergensis.** *Nong Nghiep Cong Nghiep Thuc Pham (Viet Nam) (no.2) p. 72-74.* 4 tables. Vietnamese. (AGRIS 95-165219).

1110 Vani, B.; Zayas, JF. (1995) **FOAMING PROPERTIES OF SELECTED PLANT AND ANIMAL PROTEINS.** *Journal of Food Science. 60(5):1025-1028.* English. [KANSAS STATE UNIV AGR & APPL SCI DEPT FOOD & NUTR MANHATTAN, KS 66506 USA].

The foaming properties of proteins are important in predicting their functionality in aerated foods. In model aqueous systems, foam expansion (FE) and foam stability (FS) of commercial plant proteins, wheat germ protein flour (WGPF), corn germ protein flour (CGPF), and soy flour (SF), were compared with those of nonfat dried milk (NFDM) and egg white powder (EWP) at 1, 2, 4, 6, and 8% using one- and two-way analyses of variance. The effects of pH 4, 5, 6, 7, and 8 on FE and FS of WGPF were also measured. The highest overall FE and FS were obtained for EWP. Among plant proteins, FE and FS were maximum for CGPF and SF, respectively. FS was lowest for NFDM. Except for SF, FE and FS increased with increasing protein concentration. The FE and FS of WGPF were highest at pH 8, lowest at pH 7, and intermediate at pH 4-6. [References: 40].

1111 Wannerberger, L.; Nylander, T.; Eliasson, A.C. (Lund Univ. (Sweden). Kemicentrum) (1994) **Interfacial properties of gliadin fractions.** Livsmedel 94; Goeteborg (Sweden); 26-27 Oct 1994. *[Food 94. Workshops and poster sessions] p. C10.* English. (AGRIS 95-164921).

1112 Yetneberk, S. (Institute of Agricultural Research, Addis Abeba (Ethiopia)); Wondimu, A. (Ethiopian Nutrition Inst., Addis Abeba (Ethiopia)) (1995) **Utilization of cool-season food legumes in Ethiopia [Pisum sativum, Lens culinaris, Cicer arietinum, Lathyrus sativus, Vicia faba].** First National Cool-season Food Legumes Review Conference; Addis Abeba (Ethiopia); 16-20 Dec 1993. *Cool-season food legumes of Ethiopia [Pisum sativum, Lens culinaris, Cicer arietinum, Lathyrus sativus, Vicia faba]. Telaye, A. (Institute of Agricultural Research, Debre Zeit (Ethiopia)); Bejiga, G. (Alemaya Univ. of Agriculture, Addis Abeba (Ethiopia)); Saxena, M.C. (ICARDA, Aleppo (Syria)); Solh, M.B. (ICARDA, Cairo (Egypt). Nile Valley Regional Program) (eds.). Institute of Agricultural Research, Addis Abeba (Ethiopia); International Center for Agricultural Research in the Dry Areas, Aleppo (Syria); Nile Valley Regional Program (ICARDA), Cairo (Egypt); Swedish Agency for Research Cooperation with p. 60-75.* ICARDA. 5 tables; 24 ref. English. (AGRIS 95-164957).

A study of composite flour from cereal and food legumes indicated that a 20 legume content in the mixture produced good products. Mixtures of malt barley and chickpea, with high nutritional values, are used as weaning and supplementary foods. Grain legumes are processed by dehulling and cooking. Dehulling with a mini-dehuller reduced milling loss due to broken seeds or scouring and gave uniform splits. Cooking time of improved cultivars grown in different locations ranged from 11 to 75 minutes after 16 hours of soaking. Some of the factors affecting cookability of food legumes are grain size and lignification between the cell wall and the middle lamella. The time required for cooking is affected by the mineral composition of the soil. By-products of food legumes are used for animal feed or burned for fuel.

1113 Zhang, NY.; Jones, BL. (1995) **DEVELOPMENT OF PROTEOLYTIC ACTIVITIES DURING BARLEY MALTING AND THEIR LOCALIZATION IN THE GREEN MALT KERNEL.** *Journal of Cereal Science. 22(2):147-155.* English. [UNIV WISCONSIN DEPT AGRON 1575 LINDEN DR MADISON, WI 53706 USA].

The water-insoluble storage proteins of barley seeds reside in the starchy endosperm tissue. This tissue, when expressed from germinating barley, has a pH of 4.8. The hydrolysis of storage proteins during germination (malting) occurs mainly in the endosperm, so proteinases that are located in endosperm and are active at pH 4.8 are probably important to the storage protein hydrolytic process. This study reports our continued investigations of the endoproteinases of germinating barley (Hordeum vulgare L., cv. Morex) with a two-dimensional gel separation method that uses isoelectric focusing (IEF) and non-denaturing polyacrylamide gel electrophoresis (PAGE) in gels containing incorporated substrate protein. We identified the endoproteinases that were active at pH 4.8 and determined when they appeared during germination and where they were located in 4-day germinated barley (green malt). A total of nine cysteine, four aspartic, and two serine class proteolytic activities that were active at pH 4.8 were extracted from the endosperm tissue of green malt. It seems probable that some or all of these endosperm endoproteinases, especially proteinases C7, C8, C11, D3, E3 and E4, are the ones most intimately involved in hydrolyzing the storage proteins during malting. (C) 1995 Academic Press Limited [References: 12].

1114 Zhu Songming (Zhejiang Agricultural Univ., Hangzhou (China). Coll. of Technology); Wu Chunjiang (1994) **Study on material movement in a paddle blower.** *Journal of Zhejiang Agricultural University (China) v. 20(4) p. 349-353.* 6 ill., 4 ref. Chinese. (AGRIS 95-144169).

Q03 FOOD CONTAMINATION AND TOXICOLOGY

1115 Edward, S.L.; Hill, A.S.; Skerritt, J.H. (Commonwealth Scientific and Industrial Research Organisation, North Ryde (Australia). Div. of Plant Industry); Desmarchelier, J. (Commonwealth Scientific and Industrial Research Organisation, Canberra (Australia). Div. of Plant Industry); Gore, P.J. (Bread Research Inst. of Australia Inc., North Ryde) (1993) **Persistence of grain protectant residues into milling fractions, breads and noodles [wheat; barley]. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 502-503.* Abstract only. English. (AGRIS 95-144866).

1116 Furlong, EB.; Soares, LMV.; Lasca, CC.; Kohara, EY. (1995) **MYCOTOXINS AND FUNGI IN WHEAT STORED IN ELEVATORS IN THE STATE OF RIO GRANDE DO SUL, BRAZIL.** *Food Additives & Contaminants. 12(5):683-688.* English. [UNIV ESTADUAL CAMPINAS FAC ENGN ALIMENTOS BR-13081970 CAMPINAS SP BRAZIL].

Samples of wheat harvested from 1988 to 1990 and stored in elevators in the south of Brazil (12 Brazilian, 4 Argentinian and 2 Uruguayan) were analysed in 1990 for 14 mycotoxins: deoxynivalenol (DON), nivalenol, diacetoxyscirpenol (DAS), T-2 and HT-2 toxins, T-2 triol, 7-2 tetraol, aflatoxins B-1, B-2, G(1), G(2), ochratoxin A (OCHRA A), zearalenone and sterigmatocystin. One sample (1988 harvest) was contaminated with OCHRA A (0.04 mu g/g) and three other samples (1990 harvest) were contaminated with DON (0.40 mu g/g), DAS (0.30 mu g/g), T-2 (two samples, 0.35 and 0.36 gamma g/g) and T-2 tetraol (1.68 mu g/g). Fusarium graminearum Schwabe was found in the 1990 samples with a relative incidence ranging from 1 to 22% and predominated in Argentinian and Uruguayan wheat (1990 harvest). Fusarium dimerum Penzig (8-75%) was the main Fusarium sp. in Brazilian wheat from the 1990 harvest.

1117 Lew, H. (Bundesanstalt fuer Agrarbiologie, Linz (Austria)) (1995) **[Mycotoxins in grains and consequences for processing]. Mykotoxinbelastung von Getreide und Konsequenzen fuer seine Verarbeitun g.** *Getreide Mehl und Brot (Germany) v. 49(1) p. 16-19.* 1 graph, 8 tables; 22 ref. German. (AGRIS 95-144982).

1118 Liu Qiankai; Zhu Guonian (Zhejiang Agricultural Univ., Hangzhou (China). Dept. of Plant Protection) (1994) **Study on the residue and dissipation of esfenvalerate on the wheat.** *Journal of Zhejiang Agricultural University (China) v. 20(4) p. 359-362.* 3 ill., 6 ref. Chinese. (AGRIS 95-144867).

1119 Livingstone, A.S.; Sandhu, J.S.; Malleshi, N.G. (Central Food Technological Research Institute, Mysore (India)) (1992) **Microbiological evaluation of malted wheat, chickpea, and weaning food based on them.** *Journal of Tropical Pediatrics (United Kingdom) v. 38(2) p. 74-77.* 13 ref. English. (AGRIS 95-165571).

1120 Lu, P.; Marquardt, R.R.; Frohlich, A.A.; Mills, J.T. (Department of Animal Science, University of Manitoba, Winnipeg, Manitoba R3T 2N2 (Canada)) (1994) **Detection of Penicillium aurantiogriseum by ELISA utilizing antibodies produced against its exoantigens.** *Microbiology (Reading) (United Kingdom) v. 140(12) p. 3267-3276.* 39 ref. English. (AGRIS 95-165332).

1121 Lura, M.C.E.; Gonzalez, A.M.; Beccaria, A.J.; Latorre, M.G.; Nepote, A.F.; Rico, M. (Universidad Nacional del Litoral, Santa Fe (Argentina)) (1994) **[Isolation, identification and determination of the toxicogenic capacity of fungi that contaminate cereals and alimentary products]. Aislamiento, identificacion y determinacion de la capacidad toxicogenica de hongos contaminantes de cereales y productos alimenticios.** *Boletin Micologico (Chile) v. 9(1-2) p. 103-108.* 21 ref. Spanish. (AGRIS 95-165319).

1122 Mueller, C. (1995) **[Possibilities for valuation of hygienic conditions of malting barley and malt]. Moeglichkeiten zur Bewertung des Gesundheitszustandes von Braugerste und Malz.** *Brauwelt (Germany) v. 135(21) p. 1036, 1038, 1051-1054.* 4 ill., 6 tables; 11 ref. German. (AGRIS 95-144862).

1123 Quiroga, N.; Resnik, S.; Pacin, A.; Martinez, E.; Pagano, A.; Riccobene, I.; Neira, S. (1995) **NATURAL OCCURRENCE OF TRICHOTHECENES AND ZEARALENONE IN ARGENTINE WHEAT.** *Food Control. 6(4):201-204.* English. [UNIV BUENOS AIRES FAC CIENCIAS EXACTAS & NAT DEPT IND CIUDAD UNIV RA-1428 BUENOS AIRES DF ARGENTINA].

A survey of the natural occurrence of trichothecenes and zearalenone in samples from Buenos Aires and Santa Fe provinces, Argentina, was carried out in six different crops during harvest. Among 1056 samples analysed, 524 (49.62%) were contaminated with trichothecenes and zearalenone. Deoxynivalenol was detected in all of the contaminated samples, 3-Acetyl DON in 22 samples and zearalenone in 78. In 1986, T-2 toxin (20 samples), HT-2 toxin (18), neosolaniol (16) and diacetoxyscirpenol (26) were also found. The results suggest that when meteorological conditions favour contamination it is necessary to carry out strict controls on harvest time. [References: 21].

1124 Trigostockli, DM.; Curran, SP.; Pedersen, JR. (1995) **DISTRIBUTION AND OCCURRENCE OF MYCOTOXINS IN 1993 KANSAS WHEAT.** *Cereal Chemistry. 72(5):470-474.* English. [KANSAS STATE UNIV AGR & APPL SCI DEPT GRAIN SCI & IND MANHATTAN, KS 66506 USA].

Wheat samples from various locations in Kansas were tested for mold invasion by plating on agar medium and then analyzing for the presence of deoxynivalenol, zearalenone, and aflatoxin B-1 using thin-layer chromatography. In eastern Kansas, 29 of 30 samples (96%) were invaded with Fusarium graminearum and the mean percentage of invaded kernels was 33% in northeast, 16% in east central, and 15% in southeast districts. The highest level of invasion observed was 75% on a sample from northeast Kansas. Deoxynivalenol was detected in 23 of 116 samples analyzed (20%) and was correlated highly ($r = 0.839$, $P < 0.001$) with the level of invasion by F: graminearum. Zearalenone was detected only in one sample from northeast Kansas. Cool, wet weather during 1993 was an important factor affecting invasion and toxin formation by F. graminearum. The level of mycotoxin in 1993 Kansas wheat was relatively low. [References: 28].

1125 Yoshizawa, T.; Jin, YZ. (1995) **NATURAL OCCURRENCE OF ACETYLATED DERIVATIVES OF DEOXYNIVALENOL AND NIVALENOL IN WHEAT AND BARLEY IN JAPAN.** *Food Additives & Contaminants. 12(5):689-694.* English. [KAGAWA UNIV FAC AGR DEPT BIORESOURCE SCI MIKI KAGAWA 76107 JAPAN].

Thirty-four samples of domestic wheat and barley grains, collected from eight prefect;res of different locations in Japan and previously determined to be positive for deoxynivalenol (DON), nivalenol (NN) and/or zearalenone (ZEA), were analysed for acetylated derivatives of DON and NIV by gas chromatography-mass spectrometry. In addition to DON and NIV 3-acetyldeoxynivalenol (3-ADON), 15-acetyldeoxynivalenol (15-ADON) and 4-acetylnivalenol (4-ANIV) were found in 25, 4 and 14 samples, respectively. A regional difference in the DON and NIV contamination of Japanese wheat and barley was suggested: DON was the major trichothecene in the northern district and NN in the central districts, whereas in the southern districts the DON level was similar to or slightly higher than the NIV level. 3-ADON occurred together with DON in almost all prefectures examined, whereas 15-ADON was found only in samples from northern districts. In addition, a high correlation ($r = 0.974$, $n = 23$) between levels of DON and its acetates (3-ADON and 15-ADON) was noted. These results may also suggest the possibility of a geographic difference in the distribution of different chemotypes of Fusarium species producing these trichothecenes in Japan.

Q04 FOOD COMPOSITION

1126 Al Kanhal, M.A.; Al Mohizea, I.S.; Al Othaimeen, A.I.; Khan, M.A. (Department of Community Health, College of Applied Medical Sciences, King Saud University, Riyadh 11433, PO Box 10219 (Saudi Arabia)) (1994) **Nutritive value of some wheat based dishes consumed in the Kingdom of Saudi Arabia.** *Ecology of Food and Nutrition (United Kingdom) v. 32(3/4) p. 219-226.* 32 ref. English. (AGRIS 95-165598).

1127 Anderson, WK.; Crosbie, GB.; Lemsom, K. (1995) **PRODUCTION PRACTICES FOR HIGH PROTEIN, HARD WHEAT IN WESTERN AUSTRALIA.** *Australian Journal of Experimental Agriculture. 35(5):589-595.* English. [WESTERN AUSTRALIA DEPT AGR BARON HAY COURT S PERTH WA 6151 AUSTRALIA].

Field experiments were conducted at 18 sites over 4 years in the eastern and north-eastern wheatbelt of Western Australia where average annual rainfall is <400 mm, to investigate suitable techniques for the production of high protein (>13%) wheat in an area that traditionally produces grain of a much lower average protein percentage. Wilgoyne yielded as well as, or better than, any of the cultivars accepted into the Special Hard (SH) grade in Western Australia but 5-10% less than cultivars suitable for the Australian Standard White (ASW) grade. Differences between cultivars were greatest at the optimum sowing time in late May. Lower yields in early May were attributed to water stress during early growth or to frost damage during grain filling. The addition of nitrogen (N) fertiliser to crops sown after 1 June was less effective in increasing grain yield and grain protein than N added to earlier sowings. Most crops that produced >13% protein followed medic or

field peas. The addition of N fertiliser was seldom required to produce this concentration of protein in crops that followed medic or peas. Crops following pasture with a low legume content or wheat had lower grain protein concentrations. Friable red-brown earth soils in a medic or pea rotation were able to achieve the required grain protein, but other combinations were not extensively tested. From these experiments, cultivars with inherently small grains due to their propensity to produce high levels of small grain screenings (whole grain through a 2-mm, slotted sieve) may be less able to increase yields economically by increasing kernel numbers per unit area under conditions in Western Australia. [References: 12].

1128 Anon. (1995) **Analytica EBC-supplement. EBC method 3.1.1. moisture (barley).** *Monatsschrift fuer Brauwissenschaft (Germany) v. 48(5-6) p. 198-199.* English. (AGRIS 95-145157).

1129 Attia, N.Y.A. (Zagazig Univ., Moshtohor (Egypt). Faculty of Agriculture) (1992) **New approach for using wheat germ in cookie production.** *Annals of Agricultural Science, Moshtohor (Egypt) v. 30(3) p. 1273-1286.* 7 tables; 25 ref. English. (AGRIS 95-165726).

1130 Aubrecht, E.; Toth, A. (1995) **INVESTIGATION OF GLIADIN CONTENT OF WHEAT FLOUR BY ELISA METHOD.** *Acta Alimentaria. 24(1):23-29.* English. [CENT FOOD RES INST HERMAN OTTO UT 15 H-1022 BUDAPEST HUNGARY].

In our work the gliadin content of 9 Hungarian wheat varieties (Nartonvasari) was investigated by sandwich ELISA method. The immunochemical method was satisfactory to measure the gliadin content since the wheat flour samples were extracted with different solvents and components that could disturb the reproducibility of ELISA test were exhaustively removed. The gliadin content of wheat varieties was determined by adopted ELISA test, the estimated quantity of gliadin was higher than that measured by gravimetry.

1131 Baitinger, A. (1995) **[Quality management systems according to DIN ISO 9000 ff for flour mills. 2nd part: Standardization conformable description of milling operations by example of the quality management element process control]. QM-Systeme nach DIN ISO 9000 ff. fuer Muehlenbetriebe. Teil 2: Normenkon forme Beschreibung der Betriebsablaeufe in einer Muehle am Beispiel des QM-Elementes Prozesslenkung.** *Muehle + Mischfuttertechnik (Germany) v. 132(2) p. 21-23.* 5 graphs. German. (AGRIS 95-145184).

1132 Batey, I.L.; Barry, J.B. (Commonwealth Scientific and Industrial Research Organisation, North Ryde (Australia). Div. of Plant Industry) (1993) **Barley starch and malting quality. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 511.* Abstract only. English. (AGRIS 95-145155).

1133 Bernabe, M.; Jimenez Barbero, J.; Planas, A. (1994) **The conformation of the tri- and tetrasaccharide produced in the hydrolysis of barley glucan with the enzyme endo-1, 3-1, 4-beta-glucan 4-glucanohydrolase from *Bacillus licheniformis*.** *Journal of carbohydrate chemistry (USA) v. 13(5) p. 799-817.* references. English. (AGRIS 95-145160).

The solution conformation of the tri- and tetrasaccharide obtained by enzymatic degradation of glucan has been analysed using molecular mechanics and dynamics calculations and nuclear magnetic resonance data. The overall shape of both compounds is fairly similar and may be described by an equilibrium formed by conformers included in the low energy regions for both glycosidic linkages. The interglycosidic torsion angles for these conformers are phi H = 15 +/- 45 degrees and psi H = 20 +/-30 degrees for both beta(1- > 4) linkages and phi H = 40 +/- 15 degrees and psi H = 20 +/- 35 degrees for the corresponding beta(1- > 3)-linked moiety.

1134 Betker, S.E.; Quail, K.; McGuirk, M. (Bread Research Inst. of Australia Inc., North Ryde) (1993) **Wheat or barley malt flour - which produces better bread?. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 509.* Abstract only. English. (AGRIS 95-145195).

1135 Borghi, B. (Istituto Sperimentale per la Cerealicoltura, San Angelo Lodigiano (Italie)); Giordani, G.; Corbellini, M.; Vaccino, P.; Guermandi, M.; Toderi, G. (1995) **[Influence of crop rotation, manure and fertilizers on bread making quality of wheat (Triticum aestivum L.)]. [Influence de la rotation culturale, des engrais organiques et mineraux sur la qualite boulangere du ble (Triticum aestivum L.)].** *European Journal of Agronomy (France) v. 4(1) p. 37-45.* 45 ref., 5 graph. English. (AGRIS 95-145185).

1136 Buckee, G.K.; Benard, M. (1995) **[Determination of the moisture content of barley. Submitted on behalf of the Analysis Committee of the European Brewery Concention]. Determination de l'humidite de l'orge.** *Monatsschrift fuer Brauwissenschaft (Germany) v. 48(5-6) p. 191-193.* 2 tables; 3 ref. English. (AGRIS 95-145156).

1137 Chen, XJ.; Schofield, JD. (1995) **DETERMINATION OF PROTEIN-GLUTATHIONE MIXED DISULFIDES IN WHEAT FLOUR.** *Journal of Agricultural & Food Chemistry. 43(9):2362-2368.* English. [UNIV READING DEPT FOOD SCI & TECHNOL POB 226 READING RG6 6AP BERKS ENGLAND].

An HPLC method was adapted for measurement of protein-glutathione mixed disulfides (PSSG) in flour and flour protein fractions. It involves extraction of unbound glutathione with perchloric acid (PCA), release of glutathione from PSSG by dithiothreitol (DTT) reduction, and separation and quantification of the carboxymethylated and dinitrophenylated peptide by HPLC on amino-bonded phase silica. PSSG levels ranged from 70 to 150 nmol/g in flours from different wheat cultivars. PSSG also varied among flour protein fractions obtained by Osborne fractionation. Glutenin had the highest value (897 nmol/g of protein) and albumin a somewhat lower value (796 nmol/g of protein). Levels in globulin and gliadin were considerably lower (239 and 76 nmol/g of, protein, respectively). SDS-unextractable glutenin macropolymer preparations also had high levels (1062 nmol/g of protein, cv. Glenlea; 1538 nmol/g of protein, cv. Bussard). Availability of this methodology for GSH, GSSG, and PSSG analysis provides a powerful tool for elucidating the importance of glutathione in flour and dough systems. [References: 23].

1138 Chiba, M.; Minamisawa, M.; Kawano, S.; Iwamoto, M. (1995) **PRINCIPAL COMPONENT ANALYSIS (PCA) APPLIED TO NEAR INFRARED SPECTRA FOR CLASSIFYING WHEAT FLOURS.** *Journal of the Japanese Society for Food Science & Technology-Nippon Shokuhin Kagaku Kogaku Kaishi. 42(10):796-801.* English. [JAPAN GRAIN INSPECT ASSOC CENT RES LAB 2-17-3 ARAI ICHIKAWA CHIBA 27201 JAPAN].

The method was developed to perform principal component analysis (PCA) using widely used NECTM PC on near infrared spectra taken by IBMTM PC. As the application of this method, wheat flours with different processing qualities were classified. Four kinds of commercially available wheat flours such as bread making four, Chinese noodle making flour, Japanese noodle making flour, and confectionery making flour were analyzed. The NIR spectra of 18 samples were recorded from 1100 to 2500 nm and the d(2) log (1/R) at several informative wavelengths were selected as variables for PCA. Principal components were calculated using the 11 d(2)log (1/R) values at the wavelengths where standard deviation of d(2) log (1/R) were large and downward peaks of d(2) log (1/R) were observed. On the plane-with axes of the first and the third principal components, four kinds of wheat flours were clearly classified. On examination of the eigenvector of the first and the third principal components, and the chemical constituents and physical properties of samples, it can be thought that the first principal component relates to sample particle sizes, and the third one relates starch contents, . As a result, it can be concluded that near infrared spectroscopy has a possibility to classify wheat hours with different processing qualities using PCA. [References: 5].

1139 Cleemput, G.; Bleukx, W.; Vanoort, M.; Hessing, M.; Delcour, JA. (1995) **EVIDENCE FOR THE PRESENCE OF ARABINOXYLAN HYDROLYSING ENZYMES IN EUROPEAN WHEAT FLOURS.** *Journal of Cereal Science. 22(2):139-145.* English. [TNO NUTR & FOOD RES INST POB 360 3700 AJ ZEIST NETHERLANDS].

Water extracts of hour samples prepared from six sound European wheat varieties hydrolyse p-nitrophenyl-beta-D-xylopyranoside and p-nitrophenyl-alpha-L-arabino-furanoside and, in addition, release soluble, dyed fragments from azurine crosslinked xylan. Incubation of water soluble wheat

arabinoxylan with water extracts of flour results in the release of low molecular weight fractions consisting mainly of arabinose and xylose and small proportions of oligosaccharides as detected by high performance anion exchange chromatography. Gel permeation profiles of the incubation mixtures show a clear breakdown of the arabinoxylan. (C) 1995 Academic Press Limited [References: 35].

1140 Converso, DA.; Fernandez, ME. (1995) **PEROXIDASE ISOZYMES FROM WHEAT GERM - PURIFICATION AND PROPERTIES.** *Phytochemistry. 40(5):1341-1345.* English. [UNIV BUENOS AIRES FAC FARM & BIOQUIM JUNIN 956 RA-1113 BUENOS AIRES DF ARGENTINA].

Several cationic peroxidase isozymes were identified in wheat germ. Three of them were purified to homogeneity. The pure enzymes share many properties: they show near identical spectroscopic properties and they are glycoproteins with very similar M(r) values of ca 35 000. They differed, however, in their catalytic behaviour: two of them, C-1 and C-2, oxidized pyrogallol, ascorbic acid and indole acetic acid with the same requirements, turnover number and optimum pH. The other enzyme, C-3, showed in very case a higher activity. The oxidation of indole acetic acid by C-3 was not influenced by Mn2+ or resorcinol. C-3-catalysed oxidation of ascorbic acid was inhibited by hydroxylamine as has been reported for ascorbate peroxidases. [References: 23].

1141 Eckert, R. van (Forschungsinst. der Ernaehrungswirtschaft, Wien (Austria)) (1994) **[Determination of gluten absence in food products]. Nachweis der Glutenfreiheit von Lebensmitteln.** *Lebensmittelchemie (Germany) v. 48(6) p. 131.* 6 ref. German. (AGRIS 95-145319).

1142 Eerlingen, RC.; Delcour, JA. (1995) **FORMATION, ANALYSIS, STRUCTURE AND PROPERTIES OF TYPE III ENZYME RESISTANT STARCH.** *Journal of Cereal Science. 22(2):129-138.* English. [KATHOLIEKE UNIV LEUVEN FOOD CHEM RES UNIT B-3001 HEVERLEE BELGIUM].

During the retrogradation of starch a fraction becomes resistant to amylolytic enzymes. This undigestible fraction is described as enzyme resistant starch (RS) type III. RS type III is composed of short linear segments of alpha-(1-4)-glucans arranged in an A or B-type crystalline structure and is thermally very stable. Different factors have an impact on the formation (crystallisation) of these structures. Apart from the starch type, which defines the amylose/amylopectin ratio, polymer chain length and lipid content, process conditions following starch gelatinisation and the presence of other components, have an influence on the amount and on the quality of RS formed. Several in vitro and in vivo procedures to quantify RS have been used. However, RS levels may be affected by the analytical procedure. (C) 1995 Academic Press Limited [References: 64].

1143 Eggum, BO.; Brunsgaard, G.; Jensen, J. (1995) **THE NUTRITIVE VALUE OF NEW HIGH-LYSINE BARLEY MUTANTS.** *Journal of Cereal Science. 22(2):171-176.* English. [NATL INST ANIM SCI RES CTR FOULUM POB 39 DK-8830 TJELE DENMARK].

Four new high-lysine barley mutants, the mother variety 'Sultan', and the cultivar 'Lysimax' with the high-lysine gene lys3a were grown in a field trial in 1992 at Riso, Denmark. Yield and 1000 kernel weights were measured. The material was analyzed for protein, fat, starch, soluble non-starch polysaccharides, insoluble non-starch polysaccharides, lignin, beta-glucans, sugars, energy and amino acids. The nutritive value was evaluated in balance experiments with rats. The mutants yielded less than the mother cultivar 'Sultan' in the range 80-96%. Thousand kernel weights were also lower than for the mother cultivar. The protein concentration was higher in the mutants, with the highest value of 14.2% vs 12.9 in 'Sultan'. The fat content was usually higher in the mutants, with the highest value of 5.3% vs 3.9% for 'Sultan'. The starch content varied considerably, from 51.2%-60.3% for the mutants, while 'Sultan' contained 58-2%. The level of dietary fibre was usually higher in the mutants compared to the level in 'Sultan' (19.7%). beta-glucan and sugar contents varied among the mutants, with values higher and lower than in 'Sultan'. 'Sultan' contained 3.31 g lysine/16 g N vs 4.73 g N in one of the mutants. The higher lysine content resulted in an 11.6% unit increase (P<0.05) in biological value (77.6% for 'Sultan' vs 88.2% for this mutant). The protein digestibility was usually higher (P<0.05) in 'Sultan' (87.1%). Energy digestibility was slightly lower (P<0.05) in the mutants compared to the value for 'Sultan' (84-1%). [References: 25].

1144 Gore, P.J.; Mugford, D.C. (Bread Research Inst. of Australia Inc., North Ryde) (1993) **Quality of Australian wheat and flour: a history from the perspective of the Bread Research Institute of Australia. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 506.* Abstract only. English. (AGRIS 95-145420).

1145 Hubik, K. (1995) **THE EFFECT OF FERTILIZATION AND YEAR ON THE BREAD WHEAT QUALITY [Slovak].** *Rostlinna Vyroba. 41(11):521-527.* Slovak. [ZEMEDELSKY VYZKUMMY USTAV HAVLICKOVA 2787 CR-76741 KROMERIZ CZECH REPUBLIC].

Wheat is the most widely growing cereal species all over the world. A major part of its production is assigned to human consumption. Therefore, a great attention has been paid to bread-making quality of grain for milling and baking processing in both monographs and world conferences. The main aim of the study was to evaluate bread-making quality parameters in a set of five Czech and Slovak model varieties under conditions favourable for bread wheat production of high quality during a five-year period. Bread wheat varieties Ilona, Viginta, Hana, Sparta and Samanta were grown in the sugar beet-growing region of Kromeriz in 1990 to 1994. Agronomic practices were applied according to the standard methodology; a course of split application of pure nutrients in different years is illustrated in Figs 1. Bread-making quality was analysed in the varieties investigated and data on individual parameters were processed using the STATGRAPHIC program. Average values of the quality parameters of tested varieties through five years are presented in Figs 2 to 11. An analysis of variance was used to determine effects of the variety and the year on individual quality parameters (Tab. I). A mean square ratio (Tab. I) suggests a dominant effect of the year on bulk density, protein content and grain hardness. A correlation analysis was used to find potential relationships among the parameters investigated (Tab. II). The analysis revealed a number of statistically highly significant correlations (P = 0.01 and 0.05) among bread-making quality parameters. A significant negative correlation was found between a falling number value and a degree of softening farinographs curve. This finding is very important and confirms the legitimacy of introducing this method into the practice and necessity of using only wheats with minimum falling number of 200 s for milling and baking purposes. In this set, a positive correlation between protein content and simultaneously wet gluten content and nitrogen rates was found (Tab. III). However, it is necessary to note that besides nitrogen applied as pure nutrients, nitrogen from soil reserves affected protein synthesis in grain. In that case, weather conditions, or rainfall, and potential water stress played an important role. Another factor affecting protein synthesis and accumulation in grain is a transport of nitrogen nutrients through a stem. This fact is supported by a very highly positive, highly significant correlation among rates of potassium nutrients and protein and wet gluten content in grain. The particular findings in this study show, that technological quality of wheat is not a simple matter. Therefore, proper studies are necessary to determine all the factors which affect it.

1146 Huebner, FR.; Bietz, JA. (1995) **RAPID AND SENSITIVE WHEAT PROTEIN FRACTIONATION AND VARIETAL IDENTIFICATION BY NARROW-BORE REVERSED-PHASE HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY.** *Cereal Chemistry. 72(5):504-507.* English. [USDA ARS NATL CTR AGR UTILIZAT RES 1815 N UNIV ST PEORIA, IL 61604 USA].

For wheat varietal identification by reversed-phase high-performance liquid chromatography (RP-HPLC), gliadins are typically extracted from approximate to 50 mg of flour with 70% ethanol. Aliquots 10-15 mu l are analyzed on 15- or 25-cm x 4.6-mm (i.d.) columns at 1.0 ml/min for approximate to 1 hr. A gradient of increasing acetonitrile concentration, containing trifluoroacetic acid, is commonly used to elute proteins. However, such solvents are expensive, and present a disposal problem. Smaller RP-HPLC columns offer shorter analysis times, reduced flow rates, decreased disposal problems, and lower cost per analysis. The ability of such columns to fractionate gliadins and to differentiate cultivars was investigated. Using a 3.2-mm x 15-cm C-4 column, flow rate, sample size, analysis time, and solvent consumption were reduced by half, while preserving excellent resolution of extracted proteins. Gliadins can also be extracted from as little as 1-2 mg of flour or ground endosperm. With a 2.1-mm x 15-cm C-4 column

(Vydac), further reductions of flow rates and analysis time (about one fourth that of a standard column) are possible, while maintaining excellent resolution. Under these conditions, solvent use is about one eighth that of standard RP-HPLC analyses. To further reduce analysis time and sample consumption, gradient times can be reduced to as little as one tenth that of standard columns, and separations can be done in only 9-10 min. Some resolution is sacrificed for such rapid analyses; while this is often acceptable, it may sometimes prevent differentiation of genetically similar cultivars that are otherwise identifiable. Similar RP-HPLC procedures can be used to analyze reduced subunits of glutenins. The ability to perform such rapid, high-resolution analyses of small samples, with low solvent consumption, suggests that narrow-bore RP-HPLC may become especially useful for selection and identification during wheat breeding. [References: 18].

1147 Jacobs, H.; Eerlingen, RC.; Clauwaert, W.; Delcour, JA. (1995) **INFLUENCE OF ANNEALING ON THE PASTING PROPERTIES OF STARCHES FROM VARYING BOTANICAL SOURCES.** *Cereal Chemistry. 72(5):480-487.* English. [KATHOLIEKE UNIV LEUVEN FOOD CHEM LAB KARDINAAL MERCIERLAAN 92 B-3001 HEVERLEE BELGIUM].

Pea, potato, wheat, and rice starches were annealed for 24 hr. Differential scanning calorimetry data were collected; pasting characteristics were determined using the Brabender Viscoamylograph and the Newport Scientific Rapid Visco-Analyser (RVA); and amylose leaching during heating in the viscoamylograph was examined. Differential scanning calorimetry data showed an increased gelatinization temperature and enthalpy, and a narrower gelatinization temperature range for all starches. Viscoamylograph viscosity curves showed that annealing resulted in an increased peak viscosity (except for potato starch), and an increased viscosity upon cooling. The amount of amylose leached from the granules was not linked to viscosity changes. Less amylose was leached from the granules of annealed pea and potato starches. The amount of solubilized amylose was practically unchanged (slightly decreased) after the annealing treatment for rice starch, whereas annealed wheat starch showed a slightly increased leaching of amylose. Except for pea starch, RVA results were comparable to the results from the viscoamylograph. In a dimethyl sulfoxide (DMSO) and water mixture (92.5:7.5, w/w), viscosity changes were not consistent for all annealed starches. For annealed pea, wheat, and rice starches, the onset of solubilization occurred at lower temperatures. The increased peak viscosity was attributed to a higher rigidity and resistance to shear of the starch granules. For annealed potato starch, the viscosity was decreased. A higher rigidity and increased resistance to heat and shear of the starch granules are probably the main causes of the viscosity changes due to annealing, both in water and in a DMSO-water mixture. [References: 35].

1148 Johansson, E.; Svensson, G. (1995) **CONTRIBUTION OF THE HIGH MOLECULAR WEIGHT GLUTENIN SUBUNIT 21-ASTERISK TO BREADMAKING QUALITY OF SWEDISH WHEATS (VOL 72, PG 287, 1995).** *Cereal Chemistry. 72(5):512.* English. [SWEDISH UNIV AGR SCI DEPT PLANT BREEDING RES S-26831 SVALOV SWEDEN].

1149 Kim, HR.; Bushuk, W. (1995) **CHANGES IN SOME PHYSICOCHEMICAL PROPERTIES OF FLOUR PROTEINS DUE TO PARTIAL REDUCTION WITH DITHIOTHREITOL.** *Cereal Chemistry. 72(5):450-456.* English. [UNIV MANITOBA DEPT FOOD SCI WINNIPEG MB R3T 2N2 CANADA].

Changes in protein solubility, patterns of sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE), and weight of SDSinsoluble gel protein and its theological properties during reduction of wheat flour proteins by dithiothreitol (DTT) were investigated for two Canadian hard red spring wheats of diverse strength. SDS-PAGE results for the water-soluble protein fraction showed that changes in solubility and gel protein properties with gradually increasing reduction resulted from increasing differential release of water-soluble glutenin oligomers (fragments of polymeric glutenin comprising several subunits). Oligomers contained mainly y-type high M(r) glutenin subunits (8 and 10 for Glenlea and 9 and 10 for Katepwa) or B-type low M(r) glutenin subunits. The protein of Katepwa flour (strong) released water-soluble oligomers at a lower DTT concentration than did the protein of Glenlea (extra strong). With increasing DTT concentration, the amount of the y-type subunits (indicated by SDS-PAGE band intensity) and the solubility of total protein in SDS solution increased, whereas the gel protein weight and its elasticity decreased. The results showed that the proteins of the extra strong Glenlea flour were more resistant to reduction by DTT than were the proteins of the weaker Katepwa flour. The implication of these results in the molecular basis of wheat flour strength for breadmaking is discussed. [References: 25].

1150 Kling, C.I. (Univ. Hohenheim (Germany). Landessaatzuchtanstalt) (1995) **[Winterhardiness and quality in durumwheat (Triticum durum Desf.)]. Winterfestigkeit und Qualitaetsauspraegung bei Durumweizen (Triticum durum Desf.).** *Getreide Mehl und Brot (Germany) v. 49(1) p. 6-9.* 6 tables; 18 ref. German. (AGRIS 95-145193).

1151 Konik, C.M.; Moss, R. (Bread Research Inst. of Australia Inc., North Ryde); Mikkelsen, L.M. (Royal Veterinary and Agricultural Univ., Copenhagen (Denmark)) (1993) **Small scale tests for predicting yellow noodle quality [wheat starch]. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia), 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 502.* Abstract only. English. (AGRIS 95-145434).

1152 Kraszewski, A.W.; Nelson, S.O. (1993) **Microwave resonator for sensing moisture content and mass of wheat kernels.** *American Society of Agricultural Engineers. Meeting (USA); no. 936536 16 p.* references. Paper presented at the "1993 International Winter Meeting sponsored by The American Society of Agricultural Engineers, " December 14-17, 1993, Chicago, Illinois. English. (AGRIS 95-145204).

1153 Kuhn, M. (Univ. Hohenheim, Stuttgart (Germany). Inst. fuer Lebensmitteltechnologi e); Grau, H.; Wagner, S. (1995) **[Inositolphosphates in cereals and pseudocereals]. Inositolphosphate in Cerealien und Pseudocerealien.** *Getreide Mehl und Brot (Germany) v. 49(1) p. 54-57.* 13 graphs; 12 ref. German. (AGRIS 95-145191).

1154 Mani, K.; Eliasson, A.C.; Traegaardh, C. (Lund Univ. (Sweden). Kemicentrum) (1994) **Viscosity of wheat flour doughs.** Livsmedel 94; Goeteborg (Sweden); 26-27 Oct 1994. *[Food 94. Workshops and poster sessions] p. C3.* English. (AGRIS 95-165734).

1155 Marklinder, I.; Haglund, Aa. (Uppsala Univ. (Sweden). Inst. foer Hushaallsvetenskap); Johansson, L.; Ruderus, H. (1994) **Swedish loaf made from fermented barley flour - consumer preferences.** Livsmedel 94; Goeteborg (Sweden); 26-27 Oct 1994. *[Food 94. Workshops and poster sessions] p. A26.* English. (AGRIS 95-165740).

1156 McCleary, B.V. (Megazyme Aust. Pty Ltd., Warriewood (Australia)) (1993) **Measurement of alpha-amylase in weather damaged wheat and barley.** *Chemistry in Australia (Australia) v. 60(9) p. 485.* 2 fig., 9 ref. English. (AGRIS 95-145194).

1157 Merx, H. (Bundesanstalt fuer Getreide , Kartoffel und Fettforschung in Detmold und Muenster, Detmold (Germany)); Seibel, W.; Rabe, E. (1994) **[Influence of germination parameters on the vitamin content and the microbiological quality of "Spriesskorn" (rye and wheat). - 1. Part.: State of research]. Einfluss von Keimungsparametern auf den Vitamingehalt und die mikrobiologische Qualitaet von Spriesskorn (Roggen und Weizen). - 1. Mitt.: Stand der Forschung.** *Getreide Mehl und Brot (Germany) v. 48(5) p. 17-20.* 3 tables; 53 ref. German. (AGRIS 95-145410).

1158 Merx, H. (Bundeanstalt fuer Getreide , Kartoffel und Fettforschung in Detmold un d Muenster, Detmold (Germany)); Seibel, W.; Roecken, W.; Menden, E. (1995) **[Influence of germination parameters on the vitamin content and the microbiological quality of "Spriesskorn" (rye and wheat). - 3rd part: Steps against microbial growth]. Einfluss von Keimungsparametern auf den Vitamingehalt und die mikrobiologische Qualitaet von Spriesskorn. 3. Mitt.: Massnahmen zur Retardieru ng der mikrobiellen Entwicklung.** *Getreide Mehl und Brot (Germany) v. 49(1) p. 35-39.* 4 tables 22 ref. German. (AGRIS 95-145200).

1159 Moore, G. (Academy of Grain Technology, Werribee (Australia)); Sing, W. (Prime Wheat Assoc. Ltd, Narrabri (Australia)) (1993) **Analyzing wheat for protein content using a Leco Nitrogen-Protein Determinator - a collaborative study. [Conference paper].** 43. Royal Australian Chemical

Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 512.* Abstract only. English. (AGRIS 95-145196).

1160 Novotna, D.; Prihoda, J.; Brozova, K. (Vysoka Skola Chemickotechnologicka, Prague (Czech Republic). Ustav Chemie a Technologie Sacharidu) (1995) **Quality characters of wheat flour granulation fractions.** *Potravinarske Vedy (Czech Republic) v. 13(3) p. 213-224.* 6 graphs; 9 ref. English. (AGRIS 95-145427).

In order to study an effect of flour granulation on its characters, 15 different commercial wheat flours T530 were fractionated on a laboratory sieve each to six fractions. Besides, seven of these flours were separeted to two parts, on one sieve only. Moisture, ash content, falling number, protein content, wet gluten, gluten index, 4nd sedimentation value were determined to characterize quality of any of flour fractions as well as original non-fractionated flours. The following relations were testified using regression analysis: 1. flour particle size versus analytical data, 2. between some of the couples of analytical characters. Significant and in some cases non-linear relations between particle size and some of the quality characters were proved.

1161 Pommer, G. (Bayerische Landesanstalt fuer Bodenkultur und Pflanzenbau Freising Muenchen, Freising (Germany)) (1994) **[Cultivation of baking wheat in organic farming systems]. Pflanzenbau - Backweizen aus Oeko-Landbau.** *Bayerisches Landwirtschaftliches Wochenblatt (Germany) v. 184(39) p. 23-24.* 2 ill., 2 tables. German. (AGRIS 95-145198).

1162 Ralph, J.; Grabber, JH · Hatfield, RD. (1995) **LIGNIN-FERULATE CROSS-LINKS IN GRASSES - ACTIVE INCORPORATION OF FERULATE POLYSACCHARIDE ESTERS INTO RYEGRASS LIGNINS.** *Carbohydrate Research. 275(1):167-178.* English. [USDA ARS US DAIRY FORAGE RES CTR 1925 LINDEN DR W MADISON, WI 53706 USA].

Active incorporation of ferulate polysaccharide esters into ryegrass lignins has been demonstrated by NMR spectroscopy of uniformly C-13-labeled ryegrass. Observation, in the HMBC spectrum, of products of ferulate at its 8-position coupling with hydroxycinnamyl alcohols at the P-position (producing 8-beta'-linked structures) is proof that ferulate-lignin radical cross-coupling reactions occur in vivo. Correlations of H-alpha' (hydroxycinnamyl alcohol moiety) with guaiacyl and syringyl 1-, 2-, and 6-aromatic carbons in 8-beta' structures indicates that ferulates couple with both coniferyl and sinapyl alcohol monomers. As notable as the presence of this and other ferulate products is the absence of coupling of ferulate at its 8-position with the 5- and O-4-positions of lignin units. Such structures were significant when ferulate was biomimetically incorporated into a synthetic lignin. Since hydroxycinnamyl alcohols couple almost exclusively at their P-position in cross-coupling reactions, the 8-5' and 8-O-4' structures would only be formed by coupling with higher lignin oligomers (with no side-chain conjugation). Exclusive reaction of ferulates with lignin monomers is the first real evidence that ferulate polysaccharide esters in grasses are acting as initiation or nucleation sites for lignification and are critical entities in directing cell-wall cross-linking during plant growth and development. [References: 26].

1163 Reyes de la Cruz, V.J.; Gutierrez G, M.L. (Universidad Nacional del Centro, Huancayo (Peru). Facultad de Industrias Alimentarias) (1993) **[Chemical physical study of the fermentation, using imported and national wheat, for breadmaking]. Estudio fisico quimico de la fermentacion, utilizando trigo importado y nacional, en la elaboracion de pan.** *[Summary of investigations supported by FUNDEAGRO [Foundation for the Development of Agriculture] 1988-1992]. Resumen de investigaciones apoyadas por FUNDEAGRO [Fundacion para el Desarrollo del Agro] 1988-1992. Quevedo Iturri, F.; Arroyo Vergara, R. (eds.). Proyecto Transformacion de la Tecnologia Agropecuaria (TTA), Lima (Peru). Fondo para el Aumento de Oportunidades de Investigacion; Fundacion para el Desarrollo del Agro, Lima (Peru) v. 1: p. 169-170.* Spanish. (AGRIS 95-145188).

1164 Rychener, M. (Bundesamt fuer Landwirtschaft, BLW, Bern (Switzerland). HauptabteilungPflanzenbau, Sektion Qualitaet); Nemeth, N. (1995) **[A *simple und rapid* method for determination of water sorption of wheat]. Eine einfache und rasche Methode zur Abschaetzung der Wasseraufnahme von Weizen.** *Muehle + Mischfuttertechnik (Germany) v. 132(4) p. 53-54.* 1 graph. German. (AGRIS 95-145202).

1165 Schulman, AH.; Tomooka, S.; Suzuki, A.; Myllarinen, P.; Hizukuri, S. (1995) **STRUCTURAL ANALYSIS OF STARCH FROM NORMAL AND SHX (SHRUNKEN ENDOSPERM) BARLEY (HORDEUM VULGARE L).** *Carbohydrate Research. 275(2):361-369.* English. [UNIV HELSINKI INST BIOTECHNOL POB 45 KARVAAMOKUJA 3A SF-00014 HELSINKI FINLAND].

The shx shrunken endosperm mutation of barley is the only one described. with its primary effect on Type I, primer-independent soluble starch synthase (SSS). The mutant produces grains with only 31% of the normal dry weight of starch, associated with a decrease in A-granule dimensions. We investigated the structure of shx and normal cv. Bomi barley amylose and amylopectin. Surprisingly, both amylose and amylopectin from the two genotypes were very similar in all aspects examined. These findings are discussed in the light of the potential roles for the various forms of SSS and branching enzyme. [References: 48].

1166 Schwimmer, S. (1995) **FIFTY-ONE YEARS OF FOOD RELATED ENZYME RESEARCH - A REVIEW [Review].** *Journal of Food Biochemistry. 19(1):1-25.* English. [USDA WESTERN REG RES CTR 800 BUCHANAN ST ALBANY, CA 94710 USA].

1167 Shatadal, P.; Jayas, D.S.; Hehn, J.L.; Bulley, N.R. (1993) **Classification and feature measurements on touching kernels of wheat and barley.** *American Society of Agricultural Engineers. Meeting (USA); no. 933031 9 p.* references. Paper presented at the "1993 International Summer Meeting sponsored by The American Society of Agricultural Engineers, " June 20-23, 1993, Spokane, Washington. English. (AGRIS 95-145203).

1168 Sundberg, B. (1995) **Barley for food. Technological and nutritional studies with emphasis on carbohydrates.** Sveriges Lantbruksuniv., Uppsala (Sweden). *Rapport - Sveriges Lantbruksuniversitet, Institutionen foer Livsmedelsvetenskap (Sweden); no. 15 69 p.* Bibliography: p. 58-69. A dissertation bound with a collection of 7 reprints. SLU-LMV-R--15-SE. English. (AGRIS 95-145153).

1169 Symons, M.H.; Arends, A.M.; Marschke, R.J. (Queensland Dept. of Primary Industries, Hamilton (Australia). International Food Research Inst.); Henry, R.J. (Queensland Dept. of Primary Industries, St Lucia (Australia). Queensland Agricultural Biotechnology Centre); Lance, R.M.; MacLeod, L.; Evans, E. (Waite Agricultural Research Inst., Glen Osmond (Australia)) (1993) **Development of enzyme linked immunosorbent assays for the quantification of barley enzymes. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 510.* Abstract only. English. (AGRIS 95-145154).

1170 Tripodi, M.A.; Puri, V.M.; Manbeck, H.B. (1993) **Constitutive models for wheat flour parameter determination and model validation.** *American Society of Agricultural Engineers. Meeting (USA); no. 934067 15 p.* references. Paper presented at the "1993 International Summer Meeting sponsored by The American Society of Agricultural Engineers and The Canadian Society of Agricultural Engineering, " June 20-23, 1993, Spokane, Washington. English. (AGRIS 95-145430).

1171 Wang Zhongde; Wang Fengyi; Song Shilian (Dalian Industry of Light, Liaoning (China). Dept. of Food Engineering) (1994) **Studies on infrared spectrometry of the complex of soybean and barley hull dietary fiber and Fe (II), Zn (II), Mg (II).** *Food and Fermentation Industries (China) (no. 1) p. 8-12, 50.* 3 tables; 10 ill., 11 ref. Chinese. (AGRIS 95-145225).

1172 Yousif, AK.; Morton, ID.; Mustafa, AI. (1995) **LIGHT AND SCANNING ELECTRON MICROSCOPY OF WHEAT-PASTE DOUGH AND BREAD.** *Arab Gulf Journal of Scientific Research. 13(2):275-292.* English. [UNIV JORDAN FAC AGR DEPT NUTR & FOOD TECHNOL AMMAN JORDAN].

Light (LM) and scanning electron (SEM) microscopy were used to follow the changes that occur during dough mixing and baking and to compare the structure of wheat and mixed wheat - date paste doughs and bread. Date

paste (4, 8 and 12%) was used as a partial replacement for wheat flour in the bread dough formula. The well developed gluten protein in doughs containing 4% date paste or 3%, sucrose were identified by microscopic examination. Rupture and discontinuities in the 12% date paste supplemented doughs were also apparent. Crumb examinations indicated gelatinization. The association between starch and gluten protein and the liberation or separation of the strach granules from the protein matrix could be seen. Whereas adding 4% date paste to the bread formula improved the bread crumb structure. 12% paste had an adverse effect.

1173 Zeller, F.J. (Technische Univ. Muenchen, Freising Weihenstephan (Germany). Inst. fuer Pflanzenbau und Pflanzenzuechtung) (1995) **[The use of biochemical and molecular genetical methods in the identification of wheat gluten proteins]. Nutzung biochemisch- und molekular-genetischer Methoden zur Identifizierung der Kleberproteine des Weizens.** *Getreide Mehl und Brot (Germany) v. 49(1) p. 3-5.* 2 tables; 21 ref. German. (AGRIS 95-145199).

Q05 FOOD ADDITIVES

1174 Ben Amar Rekik, R. (Centre de Biotechnologie de Sfax (Tunisie)); Bejar, S. (1994) **[Crossflow microfiltration on mineral membranes of glucose syrups of wheat starch hydrolysis: performance and efficacy]. Microfiltration tangentielle sur membranes minerales de sirops de glucose d'hydrolysats de ble: performances et efficacite.** *Industries Alimentaires et Agricoles (France) v. 111(5) p. 268-274.* 13 ref., 8 graph. French. (AGRIS 95-165913).

1175 Hu, R. (Bundesanstalt fuer Getreide , Kartoffel und Fettforschung in Detmoldund Muenster, Detmold (Germany)); Nierle, W.; Seibel, W. (1994) **[Changes of protein quality in extruded cereal products, alone and in combination with soy]. Veraenderungen der Proteinqualitaet in Getreideextrudaten mit und ohne Sojazusatz.** *Lebensmittelchemie (Germany) v. 48(6) p. 131-132.* German. (AGRIS 95-145704).

1176 Mueller, U. (C. Siebrecht Soehne GmbH Co. KG, Hannover (Germany)) (1995) **[Less is sometimes more. Production of high quality wheat rolls with baking additives without emulgators]. Weniger ist manchmal mehr. Qualitativ hochwertiges Weizenkleingebaeck laesst sich auch mit emulgatorfreien Backmitteln herstellen.** *Brot und Backwaren (Germany) v. 43(1-2) p. 28-30.* 1 ill., 1 graph; 5 ref. German. (AGRIS 95-145701).

Q51 FEED TECHNOLOGY

1177 Habib, G.; Shah, SBA.; Inayat, K. (1995) **GENETIC VARIATION IN MORPHOLOGICAL CHARACTERISTICS, CHEMICAL COMPOSITION AND IN VITRO DIGESTIBILITY OF STRAW FROM DIFFERENT WHEAT CULTIVARS.** *Animal Feed Science & Technology. 55(3-4):263-274.* English. [AGR UNIV PESHAWAR NWFP DEPT ANIM NUTR PESHAWAR PAKISTAN].

Straw from 15 wheat genotypes was evaluated to determine the effect of genotype on the nutritive value of straw for ruminants and if the nutritional components of the straw were related to its morphological characteristics. All the genotypes were grown in 3 replicates under the same agronomic conditions at the research farm of Agricultural University Peshawar. Genotypes strongly influenced ($P < 0.001$) the nutrient composition of the straw except the crude protein contents. There were large differences ($P < 0.001$) among the genotypes in the in vitro dry matter digestibility (IVDMD) of straw varying from 36.40 to 48.36%. Among the chemical components of straw, fiber fractions and NFE were significantly related to IVDMD. Significant differences ($P < 0.001$) due to genotype were found in the botanical fractions of wheat straw. Leaf proportion was highly correlated with IVDMD ($r = 0.84$, $P < 0.001$) and accounted for most of the variation in the digestibility of straw. The morphological characteristics were mostly unrelated to chemical components of the straw except crude fiber, ADF and NDF which showed negative correlations with leaf proportion and positive relationships with stem diameter and stem proportion. No relationship between grain yield and straw IVDMD was found and was genotype dependent which suggested that it should be possible to select wheat varieties that produce high quality straw without sacrifying grain yield. Increase in grain production was associated with enhanced straw yield ($P < 0.001$). These observations demonstrate that wheat varieties can be identified which combine the desirable characteristics of high grain yield and high yield of superior quality straw. Among the 15 wheat genotypes, Pirsibaq-91 produced straw of higher digestibility (45.60%) and at the same time gave maximum yield of both grain and straw (3.83 and 6.90 tons per hectare, respectively). Other varieties which also combined desirable characteristics and ranked second in order of merit, included Khyber-79, Khyber-87, LU26S, Layalpur-73 and Yecora. [References: 15].

Q52 FEED PROCESSING AND PRESERVATION

1178 **[Production of fodders from leguminous plants, cereals and rape and their use in animal feeding]. Produkcja pasz z roslin straczkowych zboz i rzepaku oraz ich wykorzystanie w zywieniu zwierzat** (1993) *2. Scientific Seminar: Production of fodders from leguminous plants, cerealas and rape and their use in animal feeding; Pulawy (Poland); 26 May 1993.* Instytut Uprawy Nawozenia i Gleboznawstwa, Pulawy (Poland); Instytut Zootechniki, Balice (Poland). Dzial Wydawnictw Naukowych IUNG. fig., tables; ref.; Distributed 1994. 139 p. Polish. (AGRIS 95-145804).

Seminar subject matter deals in particular with effects of some elements of agrotechnique of cereals on its yields and quality and with estimation of nutritional value of grain of triticale, rye and barley in animal feeding; effects of agrotechnique on nutritional value of leguminous plant and usage of their seed as well as seeds and ground grain of rape seed in feeding of calves, pigs, sheep and rabbits.

1179 Adoglabessa, T.; Owen, E. (1995) **ENSILING OF WHOLE-CROP WHEAT WITH CELLULASE-HEMICELLULASE BASED ENZYMES .1. EFFECT OF CROP GROWTH STAGE AND ENZYME ON SILAGE COMPOSITION AND STABILITY.** *Animal Feed Science & Technology. 55(3-4):335-347.* English. [UNIV BOTSWANA & SWAZILAND BOTSWANA COLL AGR PRIVATE BAG 0027 GABORONE BOTSWANA].

Whole-crop wheat was harvested at the heading, mealy-ripe, medium-dough and hard-dough stages of grain development corresponding to crop dry matter (DM) contents of 310 g DM kg(-1), 405 g DM kg(-1), 520 g DM kg(-1) and 680 g DM kg(-1), respectively. Crop from each harvest was either untreated or treated with one of two enzyme additives (Clampzyme or Deezyme) at three application rates of 333, 667 and 1000 ml t(-1) DM and 1000, 1334 and 1667 ml t(-1) DM (low, medium and high level) for Clampzyme and Deezyme, respectively. Crop from each harvest was ensiled in 5.0 kg quantities in polythene-bag silos, and sealed either immediately or after 24 h. Contents of DM, acid detergent fibre, neutral detergent fibre and in vitro digestible organic matter increased with advancing maturity, but contents of nitrogen, water-soluble carbohydrates and fermentation products decreased. Silage stability, as measured by silo DM loss when exposed, also increased as crops matured. Compared with untreated crop, enzyme treatment increased lactic and acetic acid contents and decreased pH, but these effects were more pronounced in less mature crops. Neither fibre content nor in vitro digestible organic matter content were affected by enzyme treatment; increasing levels of enzyme did not affect silage composition. An interesting finding was that delaying silo sealing by 24 h improved fermentation and improved the aerobic stability of silages. Albeit using small-scale silos, it is concluded that whole-crop wheat may be harvested at DM contents of up to 700 g DM kg(-1) (hard-dough stage) and be effectively preserved by ensiling. Addition of cellulase-hemicellulase-based enzymes would enhance fermentation when ensiling less mature (less than 500 g DM kg(-1)) wheat. [References: 34].

1180 Adoglabessa, T.; Owen, E. (1995) **ENSILING OF WHOLE-CROP WHEAT WITH CELLULASE-HEMICELLULASE BASED ENZYMES .2. EFFECT OF CROP GROWTH-STAGE AND ENZYME ON SILAGE INTAKE, DIGESTIBILITY AND LIVE-WEIGHT GAIN BY STEERS.** *Animal Feed Science & Technology. 55(3-4):349-357.* English. [AFRC INST GRASSLAND & ENVIRONM RES MAIDENHEAD SL6 5LR BERKS ENGLAND].

Whole-crop winter wheat was harvested at the mealy-ripe and hard-dough stages of grain development corresponding to crop dry matter: (DM) contents of 427 g DM kg(-1) and 678 g DM kg(-1) respectively. Crop from each harvest was dither untreated or treated with one of two enzyme additives (Clampzyme or FSO2) and then ensiled for at least 60 days, in 7 t capacity bunker silos. Clampzyme was applied at 667 ml t(-1) DM and FSO2

at 1000 ml t(-1) DM. The six silages were fed individually and ad libitum to 270-300 kg live weight (W) Hereford X Friesian steers over 56 days [d], using 8 animals per silage. Steers were also fed 0.5-0.8 kg d(-1) of soyabean-mineral supplement. Digestibility was measured by total collection of faeces using 5 steers per treatment. All silages were well-preserved. For the parameters measured, there was no interaction (P > 0.05) between crop growth stage and enzyme treatment. Crop growth stage did not affect (P > 0.05) silage intake *(mealy-ripe, 25.5 g DM (kg W d)(-1); hard-dough, 25.3 g DM (kg W d)(-1))*. Both diet organic matter digestibility (P < 0.05) (694, 665 g kg(-1)) and growth rate (P < 0.01) (0.9, 0.8 kg d(-1))were higher in steers fed mealy-ripe compared to hard-dough silage. Enzyme additives did not affect (P > 0.05) intake, digestibility or growth rate. [References: 26].

1181 Atanasova, R.; Khadzhinikolova, L.; Grozev, G. (Institut po Sladkovodno Ribov"dstvo, Plovdiv (Bulgaria)) (1995) **[Studies of preserved grain fodder application in carp breeding. 1. Effect of the preserving methods on the microflora and quality of moist grain]. Prouchvaniya v"rkhu prilozhenieto na konserviranite z"rneni furazhi v sharanov"dstvoto. 1. Vliyanie na metodite na konservirane v"rkhu mikroflorata i kachestvoto na vlazhno z"rno.** Selskostopanska Akademiya, Sofia (Bulgaria). Ministerstvo na Zemedelieto i Khranitelnata Promishlenost. *Selskostopanska Nauka i Proizvodstvo (Bulgaria); Agricultural Science and Production v. 33(1) p. 33-36.* 4 tables; 9 ref. Bulgarian. (AGRIS 95-145803).

Four experiments of preserving moist maize and barley grain by silaging and chemical conservation were conducted. A quantity of 2.4 t grain with moisture from 21.80 to 27.30 was chemically treated by the Bulgarian conservent "Pentacyl-80".It was found that the course of microorganism development in stored moist grain had three phases: reduction, stagnation and rise, the method of preserving having an effect on the duration of the individual phases. In silaged grain the period of the reduction phase was by 30 to 60 days longer, the phase of stagnation was 90 to 120 days shorter as compared to chemically preserved grain where these periods were 7 to 200 days respectively.

1182 Benghedalia, D.; Kabala, A.; Miron, J.; Yosef, E. (1995) **SILAGE FERMENTATION AND IN VITRO DEGRADATION OF MONOSACCHARIDE CONSTITUENTS OF WHEAT HARVESTED AT TWO STAGES OF MATURITY.** *Journal of Agricultural & Food Chemistry. 43(9):2428-2431.* English. [AGR RES ORG VOLCANI CTR INST ANIM SCI METAB UNIT IL-50250 BET DAGAN ISRAEL].

Wheat plants (Triticum aestivum) were harvested at the bloom and soft-dough stages and ensiled in laboratory silos, and the effect of stage of maturity on the recovery of soluble and cell wall components and on the in vitro digestibility of monosaccharide residues was examined. A total of 8-9% neutral detergent fiber (NDF) monosaccharides residues was solubilized and partly utilized during ensilage. Glucose and galactose were the most fermentable sugars among the ND soluble monosaccharides. Fructose was equally fermented in both silages, but the higher recovery of reducing sugars in the soft-dough silage as compared with the bloom silage (44.1 vs 26.8) indicates the possible participation of starch in the fermentation process of the former. Generally, the silages were less digestible than the source materials, but the difference was larger in the bloom treatment. Thus, a gap of 8.1 percentage units in total NDF monosaccharide digestibility (D) between the source materials was reduced to 5.5 units between the silages. The decline in the D values of the monosaccharide residues of the whole plant following ensilage was 11.5 and 6.0 percentage units for the bloom and soft-dough stages, respectively. The D of total monosaccharide residues of whole plant material was equal within, the source materials but was 5.3 percentage units higher in the soft-dough silage than in the bloom one. *Digestibility* measurement at the monosaccharide level of source materials and silages offers a sharp tool for determining the optimal stage for harvesting wheat for silage. [References: 24].

1183 Cha, S.H.; Cho, J.H. (Hanil Foods Company, Ltd., Seoul (Korea Republic)); Chung, K.S. (Korea Food Research Institute, Sungnam (Korea Republic). Division of Food Biotechnology); Chang, P.S.; Yi, Y.H. (Seoul National Polytechnic University, Seoul (Korea Republic). Department of Food Engineering) (1995) **Proximate composition and microbial content change of broiler waste silage by mixing with wheat bran and oven-drying.** *Korean Journal of Food Science and Technology (Korea Republic) v. 27(1) p. 63-67.* 1 illus.; 5 tables; 20 ref. Korean. (AGRIS 95-145775).

1184 Heidenreich, E. (Internationale Forschungsgemeinschaft Futtermitteltechnik e.V., Braunschweig (Germany). Forschungsinst. Futtermitteltechnik); Sundermeier, T. (1995) **[Developments in feedstuff crushing]. Entwicklung in der Futtermittelzerkleinerung.** 21. IFF-Seminar; Braunschweig (Germany); Oct 1994. *Kraftfutter (Germany) v. 78(4) p. 161-164, 166-168, 170.* 8 ill., 3 tables. German. (AGRIS 95-145753).

1185 Khadzhinikolova, L.; Atanasova, R.; Grozev, G. (Institut po Sladkovodno Ribov"dstvo, Plovdiv (Bulgaria)) (1995) **[Studies of preserved cereal forage application in carp breeding.2. Use of moist grain in the rations of two-summer-old carp (Cyprinus carpio l.)]. Prouchvaniya v"rkhu prilozhenieto na konservirani z"rneni furazhi v sharanov"dstvoto 2. Izpolzvane na vlazhno z"rno v dazhbite za dvuleten sharan (Cyprinus carpio L.).** Selskostopanska Akademiya, Sofia (Bulgaria). Ministerstvo na Zemedelieto i Khranitelnata Promishlenost. *Selskostopanska Nauka i Proizvodstvo (Bulgaria); Agricultural Science and Production v. 33(2-3) p. 42-44.* 3 tables; 11 ref. Bulgarian. (AGRIS 95-145776).

An experiment was conduced in net cells containing 210 two-summer-old carps, divided into three variants each in two replications.The barley used was with 21.80 moisture and was stored after the methods of silaging (II variant) or following chemical preservation with 0.65 Pentacyl-80 (III variant).The control consisted of dried grain with 14.20 residual moisture (Ivariant).Pentasil-80 used for chemical preservation of moist grain had no negative effect on carp gain and health condition, a fact which makes possible its application in fish breeding.

1186 Liu Li (Zhejiang Forstry Coll., Linan (China)) (1995) **Conversion of protein in the production of high protein feeds from barley grain residue.** *Journal of Zhejiang Forestry College (China) v. 12(1) p. 40-45.* 4 tables; 1 ill., 6 ref. Chinese. (AGRIS 95-145752).

1187 Lu, ZX.; Kumakura, M. (1995) **ENZYMATIC HYDROLYSIS OF WHEAT STRAW IRRADIATED BY ELECTRON BEAM IN PRESENCE OF PERACETIC ACID SOLUTION.** *Isotopenpraxis. 31(1):151-160.* English. [NISHI TOKYO UNIV DEPT BIOSCI KITATSURU YAMANASHI 40901 JAPAN].

Radiation pretreatments of wheat straw in the presence of peracetic acid solutions were carried out using an electron beam accelerator, in which the effects of various treatment conditions on the enzymatic hydrolysis were investigated in detail. As irradiation dose was increased, the effect of a combination of peracetic acid and irradiation on the enzymatic hydrolysis was remarkable. The combination of irradiation and pulverization was effective for reducing the size of wheat straw. The enzymatic hydrolysis of wheat straw irradiated with high irradiation doses (500 kGy above) was accelerated by a water-washing treatment after irradiation. [References: 15].

1188 Matthias, J. (1994) **[Preserving of grain with propionic acid?]. Getreide mit Propionsaeure konservieren?** *Top agrar (Germany) (no.6) p. 50-51, 53-55.* 7 ill., 2 tables. German. (AGRIS 95-165963).

1189 Moss, AR.; Givens, DI.; Garnsworthy, PC. (1995) **THE EFFECT OF SUPPLEMENTING GRASS SILAGE WITH BARLEY ON DIGESTIBILITY, IN SACCO DEGRADABILITY, RUMEN FERMENTATION AND METHANE PRODUCTION IN SHEEP AT TWO LEVELS OF INTAKE.** *Animal Feed Science & Technology. 55(1-2):9-33.* English. [CTR DAIRY RES FEED EVALUAT UNIT ADAS STRATFORD UPON AVON CV37 9RQ ENGLAND].

Two experiments are reported which examined the digestibility, in sacco degradability, rumen fermentation and methane production of grass silage unsupplemented or supplemented with rolled barley at three ratios and two planes of nutrition. Grass silage was given with rolled barley to four mature wether sheep using forage:concentrate (F:C) ratios of 1.00, 0.75, 0.50, and 0.25 (dry matter (DM) basis)at near to maintenance (experiment 1) and 1.5 X maintenance (experiment 2) in two consecutive latin square designs. All diets within plane of nutrition were designed to be isoenergetic and all animals received a mineral/vitamin supplement. The diets were fed for 28 d, with rumen fluid sampling on day 12. Apparent digestibility and rumen degradability (in sacco) of diet organic matter (OM) were measured and methane produced was measured in open-circuit respiration chambers for four consecutive 24 h periods. Apparent digestibility of organic matter

(OMD) increased linearly (P < 0.001) in both experiments with decreasing F:C ratio (0.74, 0.79, 0.83, 0.88 and 0.72, 0.75, 0.78, 0.82 for experiments 1 and 2 respectively). Decreasing F:C ratio depressed the effective degradability of silage OM from polyester fibre bags in both experiments (quadratic effect P < 0.05) and also for barley in experiment 1 (quadratic effect P < 0.05). Rumen pH was significantly decreased with decreasing F:C ratio in both experiments as was the total mean VFA concentration. The molar proportions of acetate and propionate tended to decrease and that of butyrate increased with decreasing F:C ratio. Over the range of barley inclusion in this study there were no associative effects on methane production (l d(-1)) in experiment 1 (37.2, 41.5, 41.9, 44.0 l d(-1) for F:C ratio 1.00, 0.76, 0.51 and 0.26 respectively), but the opposite was true at the higher level of intake (methane l d(-1), 54.1, 60.1, 58.0, 50.1 for F:C ratios 1.00, 0.78, 0.54, 0.28 respectively). Rumen stoichiometry could not be used to explain the change in methane production. Increased level of intake reduced methane production (1 kg(-1) organic matter apparently digested) regardless of F:C ratio. Expressing methane relative to the efficiency of digestion, or the efficiency of animal production, enables the potential for reduction of methane generation by starch supplementation and/or level of intake to be realised. [References: 51].

1190 Saenz Laguna C, Fernando (1993) **[Effect of adding lactostimulating microelements and fermentable sugars on the silage process]. Efecto de microelementos lactoestimulantes y azucares de facil fermentacion en el proceso de ensilaje.** Chile Univ., Santiago (Chile). Esc. de Agronomia. 34 ref. 156 p. Spanish. (AGRIS 95-165968).

The effect of adding lactostimulating microelements such as manganese and fermentable sugars on the nutrition and fermentative quality of diverse silages was studied. Alfalfa crops, humid naturalized pasture and wheat were used as forages. Eight factorially distributed treatments with four replications each one were designed. These consisted of the combination of two sugar beet molasses levels (0 and 5% of the green forage (MV)) and four manganese levels, applied as MnSO4 (0, 50, 100 and 200 g Mn per ton of MV). The harvested forages were chopped every 2 cm; the above indicated additives were added to them. Then, the forages were ensiled in 1.3 lt glass microsilos which were kept closed for six months. Both prior and after ensiling, the following parameters were measured: DM, ash, total nitrogen, NDF, soluble carbohydrates, total and lactomicroorganisms, DOM, pH, and weight of the ensiled forage. In addition, the contents of the followings elements were determined at silo opening: lactic, acetic, propionic, butyric, valeric, isovaleric, and caproic acids; ethanol, methanol, propyl alcohol and ammonium-N. The results demonstrated that molasses significantly favored (P< 0.05) the fermentative characteristics in the treatments where it was applied. Manganese did it so applied at 100 g/ton of MV. In some parameters such as DOM, soluble carbohydrates, and total nitrogen, the effect of an interaction of molasses with the microelements was observed. The quality of the ensiled forages varied depending upon the crop in question. Thus, alfalfa tended to show an inferior quality to that of the temperate pasture and wheat, while the latter showed the best nutritive quality.

1191 Sun, RC.; Lawther, JM.; Banks, WB. (1995) **INFLUENCE OF ALKALINE PRE-TREATMENTS ON THE CELL WALL COMPONENTS OF WHEAT STRAW.** *Industrial Crops & Products. 4(2):127-145.* English. [UNIV WALES CTR BIOCOMPOSITES SCH AGR & FOREST SCI BANGOR LL57 2UW GWYNEDD WALES].

The effects of alkaline pre-treatments of wheat straw have been examined in detail. In particular, treatments with increasing amounts of sodium hydroxide at a range of temperatures and exposure times have been investigated. A number of other alkaline or oxidizing agents have also been utilized and briefly assessed. Optimal conditions for delignification and dissolution of hemicellulosic polysaccharides were found to be pre-treatment with 1.5% sodium hydroxide for 144 h at 20 degrees C. This resulted in release of 60% and 80% of lignin and hemicellulose, respectively. The residues of the pre-treated wheat straw were sequentially extracted with 0.25% ammonium oxalate for the isolation of pectin, acidic sodium chlorite solution for delignification and 24% potassium hydroxide with 2% boric acid (2 h at 20 degrees C) for the determination of remaining hemicellulose and alpha-cellulose. The yields were determined by gravimetric analysis and expressed as a proportion of the starting material. It was found that xylose was the major sugar constituent in all the hemicellulose fractions and the hydrolysates obtained from pre-treatment, while glucose and galactose were present as minor components. The content of arabinose was higher in all the pre-treatment hydrolysates than in hemicellulose fractions isolated from the residues, whereas the relative amount of xylose in remaining hemicellulose was higher than in the hydrolysates material. The content of uronic acid and the range of molecular weights both in remaining hemicellulose and in hydrolysate fractions were also studied. The contents of phenolic acids and aldehydes remaining both in 0.5 h pre-treated (1.5% sodium hydroxide) wheat straw hemicellulose and cellulose were 0.15%. [References: 33].

1192 Weinberg, ZG.; Ashbell, G.; Hen, Y.; Azrieli, A. (1995) **THE EFFECT OF CELLULASE AND HEMICELLULASE PLUS PECTINASE ON THE AEROBIC STABILITY AND FIBRE ANALYSIS OF PEAS AND WHEAT SILAGES.** *Animal Feed Science & Technology. 55(3-4):287-293.* English. [AGR RES ORG VOLCANI CTR DEPT STORED PROD FORAGE PRESERVAT & BY PROD RES UNIT IL-50250 BET DAGAN ISRAEL].

The effect of applying increasing levels of cellulase and hemicellulase plus pectinase (Celluclast(R) and Viscozyme(R), Novo, Denmark) to peas and wheat silages was studied under laboratory conditions. The enzymes were applied at 0.02, 0.1 and 0.2% each, corresponding to 0.3, 1.5 and 3.0 NCU (Novo cellulase units) of Celluclast, and 0.024, 0.12 and 0.24 FBG (fungal beta-glucanase units) of Viscozyme per gram of fresh crop. All treatments were enriched with a lactic acid bacteria inoculum, applied at 10(4) colony-forming units per gram of forage. The following parameters of final silages (45 days) had a significant (P < 0.05) linear regression on log (enzyme concentration +1): pH, residual sugars, lactic acid, NDF (neutral detergent fibre) and ADF (acid detergent fibre). When enzyme levels increased from 0 to 0.2%, the NDF and ADF contents decreased from 355 and 317 to 303 and 255 g kg(-1), respectively, in the pea silages, and they decreased from 568 and 357 to 522 and 340 g kg(-1), respectively, in the wheat silages. Enzyme treatments resulted in enhanced aerobic deterioration in both pea and wheat silages. This was evident from higher yeast and mould counts, more intensive CO2 production and visible mould growth during exposure to air for 5 days. [References: 15].

1193 Williams, CC.; Froetschel, MA.; Ely, LO.; Amos, HE. (1995) **EFFECTS OF INOCULATION AND WILTING ON THE PRESERVATION AND UTILIZATION OF WHEAT FORAGE.** *Journal of Dairy Science. 78(8):1755-1765.* English. [UNIV GEORGIA DEPT ANIM & DAIRY SCI GR-30602 ATHENS GREECE].

Wheat forage was harvested at an early head stage of maturity and ensiled in 12 900-kg experimental silos at three percentages of DM (20.8% for direct-cut forage and 27.9 or 39.3% for wilted forage) either with or without application of a lactic acid bacterial inoculant. The objective was to test the efficacy of the inoculant to alter silage fermentation, preservation, and nutritive value of wheat forage ensiled at different moisture percentages because of wilting. Wilting enhanced DM preservation and decreased fermentation end products. Inoculation made the fermentation more homolactic but did not enhance DM preservation. Silage rations (80% DM as silage) were fed at 1.8% of BW/d to six ruminally and abomasally fistulated steers (350 kg) in an experiment with a Latin-square design and a 3 x 2 factorial arrangement of treatments. Digestive responses to silage diets were not influenced by inoculation. Intake was depressed with direct-cut silage rations. Wilting improved fiber digestibility and was associated with changes in ruminal contents and fermentation end products. Wilting appears to be more effective than inoculation as a postharvest management tool to improve small grain silage. [References: 29].

Q54 FEED COMPOSITION

1194 Ahmad, I. (1993) **Bioavailability of phosphorus in cereals and cereal by-products for poultry.** University of Agriculture, Faisalabad (Pakistan). Dept. of Animal Nutrition. UAF. 6 ills., 11 tables, 96 ref. 90 p. English. (AGRIS 95-145878).

1195 Anke, M. (Jena Univ. (Germany). Biologisch Pharmazeutische Fakultaet. Inst. fuer Ernaehrung und Umwelt); Groppel, B.; Glei, M. (1994) **[The influence of cutting time on macro and trace element contents of forage]. Der Einfluss des Nutzungszeitpunktes auf den Mengen- und Spurenelementgehalt des Gruenfutters.** *Wirtschaftseigene Futter (Germany) v. 40(2-3) p. 304-319.* 13 tables; 40 ref. German. (AGRIS 95-145844).

1196 Giraldez, F.J.; Mantecon, A.R. (Consejo Superior de Investigaciones Cientificas, Leon (Espana). Estacion Agricola Experimental); Chaso, M.A.; Manso, T. (1994) **[The effect of basal diet and feeding frequency on ruminal activity]. Efecto del tipo de dieta y de la frecuencia de alimentacion sobre la actividad degradativa rumial.** *Investigacion Agraria. Produccion y Sanidad Animales (Espana) v. 9(3) p. 245-259.* 4 tab., 3 fig.; 36 ref. Spanish. (AGRIS 95-166054).

1197 Moser, M. (Hohenheim Univ., Stuttgart (Germany). Inst. fuer Tierproduktion in den Tropen und Subtropen); Borowy, N.K.; Becker, K. (1995) **[Relationship between lignin content and 24h gas production from different morphological fractions of barley straw]. Beziehung zwischen Ligningehalt und der 24h Gasbildung verschiedener morphologischer Fraktionen von Gerstenstroh.** Proceedings of the Society of Nutrition Physiology (Germany); v. 4 p. 102. DLG. p. 102. English. (AGRIS 95-166015).

1198 Ullah, N. (1993) **Nutritive value of wheat straw as affected by cultivars under the same agronomical conditions in Peshawar District[Pakistan].** University of Agriculture, Faisalabad (Pakistan). Dept. of Animal Nutrition. UAF. 15 tables, 69 ref. 88 p. English. (AGRIS 95-145834).

1199 Vares, T.; Kalsi, M.; Hatakka, A. (1995) **LIGNIN PEROXIDASES, MANGANESE PEROXIDASES, AND OTHER LIGNINOLYTIC ENZYMES PRODUCED BY PHLEBIA RADIATA DURING SOLID-STATE FERMENTATION OF WHEAT STRAW.** *Applied & Environmental Microbiology. 61(10):3515-3520.* English. [UNIV HELSINKI DEPT APPL CHEM & MICROBIOL POB 27 SF-00014 HELSINKI FINLAND].

The white rot fungus Phlebia radiata 79 (ATCC 64658) produces lignin peroxidase (LiP), manganese peroxidase (MnP), glyoxal oxidase (GLOX), and laccase in the commonly used glucose low-nitrogen liquid medium. However, the enzymes which this fungus utilizes for selective removal of lignin during degradation of different lignocellulosic substrates have not been studied before. Multiple forms of LiP, MnP, GLOX, and laccase were purified from P. radiata culture extracts obtained after solid-state fermentation of wheat straw. However, the patterns of extracellular lignin-modifying enzymes studied were different from those of the enzymes usually found in liquid cultures of P. radiata. Three LiP isoforms were purified. The major LiP isoform from solid-state cultivation was LiP2. LiP3, which has usually been described as the major isoenzyme in liquid cultures, was not expressed during straw fermentation, New MnP isoforms have been detected in addition to the previously reported MnPs. GLOX was secreted in rather high amounts simultaneously with LIP during the first 2 weeks of growth, GLOX purified from P. radiata showed multiple forms, with pIs ranging from 4.0 to 4.6 and with a molecular mass of ca, 68 kDa. [References: 45].

1200 Wagner, F. (1995) **[Actual aspects from animal nutrition and knowledge of feeds 11 - New publications to piglets feeds]. Aktuelles aus Tierernaehrung und Futtermittelkunde 11 - Neue Veroeffentlichungen zum Ferkelfutter.** *Muehle + Mischfuttertechnik (Germany) v. 132(3) p. 41-42, 44.* 5 tables. German. (AGRIS 95-145896).

Q55 FEED ADDITIVES

1201 Jeroch, H.; Schurz, M.; Skindzera, A.; Muller, A.; Volker, L. (1995) **THE INFLUENCE OF ENZYME ADDITIONS TO A BARLEY-BASED RATION ON THE FATTENING PERFORMANCE OF MUSCOVY DUCKS.** *Archiv fur Geflugelkunde. 59(4):223-227.* English. [UNIV HALLE WITTENBERG INST TIERERNAHRUNG & VORRATSHALTUNG EMIL ABDERHALDEN STR 25B D-06108 HALLE GERMANY].

Three growth experiments were conducted with male Muscovy ducks over the whole production period (77 days) to evaluate the influence of carbohydrase enzyme supplementation of barley based diets on fattening performance and carcass quality. Enzyme addition resulted in large improvements in liveweight gain in the starter phase (3-16%) which declined with time (0-5% after 77 days). Since the higher growth rates were connected with increased feed intake (starter period: 4-13%, whole period: 1-7%), advantages in feed to *gain ratio* were observed within the Ist period only. The meat quality parameters were not clearly influenced. There was a tendency for an increased percentage of breast meat in the enzyme fed ducks. Some results of dissection suggest a higher fat content of the carcass for these groups. [References: 21].

1202 Nagaraja, TG.; Godfrey, SI.; Winslow, SW.; Rowe, JB. (1995) **RESPONSES IN CILIATED PROTOZOA AND RUMEN FERMENTATION IN SHEEP SUPPLEMENTED WITH BARLEY PLUS VIRGINIAMYCIN.** *Australian Journal of Agricultural Research. 46(6):1137-1147.* English. [KANSAS STATE UNIV AGR & APPL SCI DEPT ANIM SCI CALL HALL MANHATTAN, KS 66506 USA].

An experiment was conducted to determine the changes in the population of ciliate protozoa and the pattern of rumen fermentation in sheep fed a supplement of barley grain on its own or containing virginiamycin. There were three treatment groups with a total of 25 sheep housed in individual pens. All animals were fed chaffed wheaten hay to a maximum of 1.4 kg head(-1) day(-1). One group received no grain supplement (n = 5), one barley grain (n = 10) and the third barley plus virginiamycin (40 g/t grain; n = 10). The amount of grain was gradually increased over a period of 5 days to a maximum of 700 g of barley or barley plus virginiamycin on day 5. Grain (700 g/head) was then fed twice weekly for a further 18 days. Samples of rumen fluid were taken on days 1, 2, 3, 5*, 6, 9*, 12*, 23* and 24 (* signifies days when 700 g barley was fed). In sheep supplemented with barley the population density of ciliate protozoa was increased ($P < 0.01$) from day 3 of the 5 day introduction to grain (approximately 170 x 10(4) protozoa/ml at day 5), but the increase was not sustained when grain was fed at intervals of 3 or 4 days. In sheep supplemented with barley plus virginiamycin, the population density of ciliate protozoa was increased significantly ($P < 0.01$) only at days 5 and 6 of the experiment (approximately 100 x 10(4) protozoa/ml at day 5). Sheep supplemented with barley plus virginiamycin at day 5 had a higher concentration of L-lactate ($P < 0.05$) at 6 and 12 h and propionate ($P < 0.05$) at 6, 9, 12 and 24 h than sheep supplemented with barley alone. It was concluded that virginiamycin was inhibitory to protozoa during the introduction to grain, and L-lactate accumulation in the rumen of sheep supplemented with barley plus virginiamycin may be a result of altered fermentation associated with reduced numbers of protozoa. [References: 34].

1203 Pisarski, R.; Wojcik, S. (Akademia Rolnicza, Lublin (Poland). Inst. Zywienia Zwierzat) (1994) **[Efficacy of glucanase depending on the composition of feed for broiler chicken]. Effektywnosc glukanazy w zaleznosci od skladu mieszanki paszowej dla kurczat brojlerow.** *Biuletyn Naukowy Przemyslu Paszowego (Poland); Bulletin Scientific of Feed Industry v. 33(2) p. 17-27.* 5 tables; 20 ref. Polish. (AGRIS 95-166095).

Added glucanase has no effect on reached body weight in first period of rearing but a significant increase of growth was noted in the final time. Efficacy of glucanase depended on the kind of cereal and the addition of fat in feed. Added glucanase did not improve the feed utilization but some interaction cereal x glucanase were observed. The slaughtering indices did not show any impact of added glucanase on dressing percentage, meatness or fatness of chickens carcass. No interaction of glucanase with cereals or fat were evinced.

Q60 PROCESSING OF NON-FOOD OR NON-FEED AGRICULTURAL PRODUCTS

1204 Leygue, J.P. (Institut Technique des Cereales et des Fourrages, Paris (France)); Le Bras, A. (1995) **[Wheat starch quality for industry]. Amidonnerie de ble, l'emergence de nouveaux besoins qualitatifs?** *Perspectives Agricoles (France) (no 203) p. 7-10.* French. (AGRIS 95-145968).

Q70 PROCESSING OF AGRICULTURAL WASTES

1205 Atalla, M.M. (National Research Centre., Cairo (Egypt). Microbial and Enzyme Chemistry Research Dept.) (1993) **Cellulases and single cell proteins from wheat straw by fungi.** *Journal of Agricultaral Sciences, Mansoura Univ. (Egypt) v. 18(10) p. 3027-3035.* 5 ill. 4 tables; 25 ref. English. (AGRIS 95-166269).

S20 PHYSIOLOGY OF HUMAN NUTRITION

1206 Sangha, J.K.; Dhaliwal, A.K. (Department of Foods and Nutrition, Punjab Agricultural University, Ludhiana 141 004 (India)) (1994) **Iron retention in young women fed chickpea (Cicer arietinum) and milk-supplemented wheat diets at two levels of energy.** *Ecology of Food and Nutrition (United Kingdom) v. 32(3/4) p. 105-111.* 13 ref. English. (AGRIS 95-166450).

S30 DIET AND DIET-RELATED DISEASES

1207 McIntosh, G.H.; Le Leu, R.K.; Royle, P.J. (Commonwealth Scientific and Industrial Research Organisation, Adelaide (Australia). Div. of Human Nutrition) (1993) **Barley bran and the prevention of colon cancer. [Conference paper].** 43. Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 505.* Abstract only. English. (AGRIS 95-146541).

T01 POLLUTION

1208 Beaver, T. (Washington State University, Pullman, WA.) (1994) **Pilot study of coal ash compost.** *Compost science and utilization (USA) v. 2(3) p. 18-21.* references. English. (AGRIS 95-146667).

1209 Breve, M.A. (North Carolina State University, Raleigh, NC.); Skaggs, R.W.; Gilliam, J.W.; Parsons, J.E.; Evans, R.O.; Jennings, G.D. (1992) **Monitoring nitrogen movement under a wheat field with water table management.** *American Society of Agricultural Engineers. Meeting (USA); no. 92-2611/92-2629 21 p.* references. Paper presented at the "1992 International Winter meeting sponsored by the American Society of Agricultural Engineers, " December 15-18, 1992, Nashville, Tennessee. Issue numbers not consecutive. English. (AGRIS 95-146835).

1210 El Seoud, M.A.A.; Frost, M. (1994) **Metabolism and degradation of (14)C-parathion methyl applied to leaves of soybean and wheat plants grown under sterile conditions.** Atomic-Energy Authority, Inshas (Egypt). Agricultural Dept. of Soils and Water Research. *Nachrichtenblatt des deutschen Pflanzenschutzdienstes (Germany) v. 46(9) p. 195-198.* 3 tables; 18 ref. English. (AGRIS 95-166983).

Climatic chamber experiments were achieved to study the metabolic behaviour of 14C-parathion methyl applied to leaves of soybean and wheat plants. The experiments were carried out under aseptic controlled conditions to exclude the interference of microorganisms. The radiolabelled pesticide was applied to soybean and wheat plants after a growth period of two and three weeks, respectively. 48 hours after application, the radioactivity was measured in the plant tissues as well as the different parts of the experimental system. TLC and radio scanning were carried out for the radioactive compounds extracted from the plant tissues. Generally, 14C-parathion methyl showed relatively moderate persistence in the studied plants. However, both soybean and wheat exhibited some differences with regard to their metabolism for the tested pesticide. A comparison was conducted between the data obtained from the experiments with intact plants and the corresponding results gained from analogous cell culture experiments.

1211 Kluge, R. (Staatliche Landwirtschaftliche Untersuchungs und Forschungsanstalt Augustenberg, Karlsruhe (Germany)) (1994) **[Effect of green forage chop on heavy metal contents of soil and plant - Results of a pot experiment with spring barley]. Wirkung von Gruenguthaecksel auf Schwermetallgehalte in Boden und Pflanze - Ergebnisse eines Gefaessversuches zu Sommergerste.** VDLUFA-Schriftenreihe (Germany); no. 38 p. 931-934. VDLUFA. 6 ill.; 2 ref. p. 931-934. German. (AGRIS 95-166989).

U10 MATHEMATICAL AND STATISTICAL METHODS

1212 Bartova, L. (Vysoka Skola Polnohospodarska, Nitra (Slovak Republic). Katedra Statistiky) (1994) **[Prognosis for agricultural crop yields taking into account their random character]. Prognozovanie urod so zohladnenim faktorov nahodnosti.** *Vedecke Prace Vyskumneho Ustavu Zavlahoveho Hospodarstva v Bratislave (Slovak Republic) (no.21) p. 183-191.* 3 tables; 5 ref. Slovak. (AGRIS 95-167322).

The approach to yield prognosis based on the analysis of trend, cyclic and random components of the time series of field crop yields is presented. A net-like prognosis of yields, with determined random selection of realization. considers their random character and is used consequently in economic and mathematical models with discrete outputs.

1213 Husar, J. (Ekonomicka Univ., Bratislava (Slovak Republic). Katedra Operacneho Vyskumu a Ekonometrie) (1994) **[Agricultural system modelling, useing the Lotus 1-2-3 system]. Modelovanie polnohospodarskeho systemu s vyuzitim Lotusu 1-2-3.** *Vedecke Prace Vyskumneho Ustavu Zavlahoveho Hospodarstva v Bratislave (Slovak Republic) (no.21) p. 119-125.* 2 tables. Slovak. (AGRIS 95-167321).

The problem of automatic calculation of irrigation rates and communication of obtained database with the linear programming model was addressed. The simulation of possible precipitation and that of consequent irrigation water makes it possible to obtain variable solutions, securing the optimum utilization of limiting sources. The simulation of possible precipitation is shown on a small model considering 5 crops and 9 conditions, 6 of which apply to irrigation regimes from the 4th to 9th month. An extract of calculations can be seen on the screen in the Lotus 1-2-3 system. The first part of the screen shows the calculations of irrigation rates and the second one presents the model of linear programming and its communication with the database of irrigation rate calculation.

1214 Jaros, M. (Szkola Glowna Gospodarstwa Wiejskiego, Warszawa (Poland). Katedra Inzynierii Procesow Rolniczych) (1993) **[Mathematical model of drying a single kernel of wheat with variable coefficient of the internal water diffusivity]. Matematyczny model konwekcyjnego suszenia pojedynczego ziarna pszenicy ze zmiennym wspolczynnikiem wewnetrznej dyfuzji wody.** *Roczniki Nauk Rolniczych. Seria C - Technika Rolnicza (Poland);Polish Agricultural Annual. Series C - Agricultural Engineering v. 79(3) p. 119-127.* 4 fig.; 11 ref. Polish. (AGRIS 95-147115).

This model is an analytical model based on the general theory of drying farm crops by convection. A method of quasinumerical solution of the water diffusion was developed. The model of convection drying of kernel of wheat is presented by the solution of the equation with the boundary condition of the first kind. Also an analysis of the systematic and relative errors referred to the servis of the diffusion equation was carried out. Grain drying experiments confirmed the proposed grain drying model.

1215 Kolev, B. (Nauchnoizsledovatelski Institut po Pochvoznanie i Agroekologiya "N. Pushkarov", Sofia (Bulgaria)) (1994) **[Utilization of a simulation model of winter wheat productivity]. Prilozhenie na imitatsionen model za produktivnostta na zimna pshenitsa.** Selskostopanska Akademiya, Sofia (Bulgaria). *Rasteniev"dni Nauki (Bulgaria): Plant Science v. 31(5-6) p. 14-16.* 1 table; 4 ref. Bulgarian. (AGRIS 95-167319).

1216 Pauly, J. (Zentrum fuer Agrarlandschafts und Landnutzungsforschung, Muencheberg (Germany). Inst. fuer Landnutzungssysteme. Abt. Produktionssysteme); Wurbs, A.; Werner, A. (1994) **[Simulation of cereal growth with various cropping patterns by means of multivariate methods]. Moeglichkeiten zur Abbildung des Wachstumsverhaltens von Getreidebestaenden unterschiedlicher Anbauverfahren mittels multivariater Verfahren.** 38. Jahrestagung der Gesellschaft fuer Pflanzenbauwissenschaften; Halle/Saale (Germany); 29 Sep - 01 Oct 1994. *Mitteilungen der Gesellschaft fuer Pflanzenbauwissenschaften (Germany) v. 7 p. 65-68.* 3 graphs; 4 ref. German. (AGRIS 95-147104).

1217 Singh, M.; Malhotra, R.S.; Ceccarelli, S. (ICARDA, Aleppo (Syria)) (1995) **Precision of mean of lines selected from populations of breeding material. Project 4: spring barley and project 12: dry peas.** International Center for Agricultural Research in the Dry Areas, Aleppo (Syria). ICARDA. 1 table; 2 appendixes. 22 p. English. (AGRIS 95-167288).

This report provides the standard error of means of breeding lines selected for rank from their evaluation in randomized complete blocks.

1218 Takac, J. (Vyskumny Ustav Zavlahoveho Hospodarstva, Bratislava (Slovak Republic)) (1994) **[Verification of the DAISY model - the grain yield simulation]. Verifikacia modelu DAISY - simulovanie urod obilnin.** *Vedecke Prace Vyskumneho Ustavu Zavlahoveho Hospodarstva v Bratislave (Slovak Republic) (no.21) p. 95-104.* 3 tables; 3 ref. Slovak. (AGRIS 95-167320).

Verification of the Danish DAISY simulative model was carried out on the basis of experimental data from the monitoring area Lehnice, Slovakia. Grain yield results of the DAISY model simulation runs were compared to the observed results. The comparison showed the concordance between simulated and observed grain yields.

U30 RESEARCH METHODS

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1220 Nota, G.; Spagna Musso, S.; Naviglio, D.; Romano, R. (Naples Univ., Portici (Italy). Dipartimento di Scienza degli Alimenti); Di Matteo, M. (Salerno Univ. (Italy). Dipartimento di Ingegneria Chimica e Alimentare) (1995) **[Rapid evaluation of fat content of wheat flour by means of instrumental techniques]. Determinazione rapida del grasso nelle farine e nelle semole mediante tecniche strumentali.** *Rivista Italiana delle Sostanze Grasse (Italy) v. 72(6) p. 263-268.* 5 tables; 5 graphs. Italian. (AGRIS 95-167353).

1221 Sapirstein, H.D. (Manitoba Univ., Winnipeg (Canada). Food Science Dept.) (1993) **Digital image analysis and its applications in cereal science and industry [wheat]. [Conference paper].** Royal Australian Chemical Institute Cereal Chemistry Conference; Coogee, N.S.W. (Australia); 12 Sep 1993. *Chemistry in Australia (Australia) v. 60(9) p. 498.*stract only. English. (AGRIS 95-147161).

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(March 1996)

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ISSN 1405-1672