November—December, 1995 Vol. 1 No. 6

Literature Update on

Wheat, Barley, and Triticale



CIMMYT

ICARDA

Distribution Restricted to Developing Countries Only.

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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

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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.

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.



Roger Rowe
Acting Director General, CIMMYT



Adel El-Beltagy
Director General, ICARDA

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).

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A50 AGRICULTURAL RESEARCH

4171 **CIMMYT in 1994, modern maize and wheat varieties: Vital to sustainable agriculture and food security** (1995) Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). *CIMMYT in 1994 (CIMMYT) 24 p.* CIMMYT. 1 map; 1 table; 10 graphs., 33 illus. 40 ref. English. (AGRIS 95-095506).

4172 **CIMMYT maize program, strategic plan: 1995 and beyond** (1995) Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). CIMMYT. 21 p. English. (AGRIS 95-095505).

4173 **[CIMMYT in 1993: Helping the poor through innovative agricultural research]. CIMMYT en 1993: Ayudar à los pobres mediante investigacion agricola innovadora** (1994) Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). *CIMMYT en 1993 (CIMMYT) 24 p.* CIMMYT. 2 tables; 3 graphs., 15 illus. Spanish. (AGRIS 95-095501).

4174 **[CIMMYT maize program, strategic plan: 1995 and beyond]. Programa de maiz, plan estrategico: 1995 y mas alla** (1995) Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). CIMMYT. 21 p. Spanish. (AGRIS 95-095507).

4175 Bell, M.A.; Muhtar, H.A.; Stewart, J.A.; Gonzalez C, F. (Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). Wheat Program) (1994) **Assessment and development of an agricultural research station: Physical and personnel needs.** *CIMMYT Wheat Special Report (CIMMYT); no. 35 13 p.* CIMMYT. 7 tables; 1 graph., 4 ref. English. (AGRIS 95-095504).

The agricultural research station plays a vital role in the generation of both new knowledge and appropriate technologies for farmers. However, despite the importance and complexity of running research stations, there is very little information available on how to develop new stations or improve existing ones. This special report is divided into two parts. The first deals with a procedure that can be used to evaluate the physical needs "of" and "for" a station. The procedure involves four steps: 1) establishing the needs "for" and "of" an experiment station based on the present and projected requirements of the research programs; 2) reviewing requirements with administrators and scientists; 3) preparing a detailed conceptual plan, and 4) preparing a detailed working plan. The second part deals with some of the management and personnel needs of a station. Management of a station is generally far more complex than most people realize, simply because they do not see the range of activities that a station manager has to handle.

4176 Bell, M.A.; Raab, R.; Violic, A.D. (Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). Wheat Program) (1994) **Setting research priorities for agronomic research: A case study for wheat in Chalco, Mexico.** *CIMMYT Wheat Special Report (CIMMYT); no. 33 17 p.* CIMMYT. 1 map; 10 tables; 9 ref. English. (AGRIS 95-095510).

Although identifying crop production problems, setting research priorities, and identifying appropriate technological alternatives are fundamental to the success of a research program, these activities rarely receive the attention warranted. In this report, a simple three-step procedure for defining research needs is illustrated using a case study for wheat production in the High Valley of Mexico. The major agronomic limitations identified were soil fertility, variety, weed control and plant stand. Analysis of the problems highlighted that additional research was not always necessary to recommend changes in cultural practices. For example, problems of variable plant stand and high seeding rates could be directly reduced by changing the method of seed incorporation. The methodology highlights the advantages of a multidisciplinary approach to ensure priority problems are selected based on a predetermined set of criteria, namely: problems 1) are of economic and/or social importance, 2) are relevant to the client (i.e., the farmer), 3) consider environmental and long term issues, and 4) have viable solutions.

D50 LEGISLATION

4177 Hayes, PM.; Corey, AE.; Dovel, R.; Verhoeven, M.; Kronstad, WE. (1995) **REGISTRATION OF MARANNA BARLEY.** *Crop Science. 35(5):1504.* English. [OREGON STATE UNIV DEPT CROP & SOIL SCI CORVALLIS, OR 97331 USA].

4178 Hayes, PM.; Corey, AE.; Verhoeven, M.; Kolding, M.; Kronstad, WE. (1995) **REGISTRATION OF KOLD BARLEY.** *Crop Science. 35(5):1503.* English. [OREGON STATE UNIV DEPT CROP & SOIL SCI CORVALLIS, OR 97331 USA].

4179 Kibite, S. (1995) **REGISTRATION OF AC MICHAEL WHEAT.** *Crop Science. 35(5):1513-1514.* English. [AGR & AGRIFOOD CANADA LACOMBE RES CTR LACOMBE AB T4L 1W1 CANADA].

4180 Kuhn, D. (1995) **[Barley and malt in the European cereal market order. Interpretations of laws and orders 1994]. Gerste und Malz in der Europaeischen Getreidemarktordnung. Erlaeuterungen zu den Gesetzen und Verordnungen 1994.** *Brauwelt (Germany) v. 135(5-6) p. 200-205.* 2 tables. German. (AGRIS 95-106938).

4181 Mckendry, AL.; Berg, JE.; Tague, DN.; Kephart, KD. (1995) **REGISTRATION OF ERNIE WHEAT.** *Crop Science. 35(5):1513.* English. [UNIV MISSOURI DEPT AGRON COLUMBIA, MO 65211 USA].

4182 Taylor, GA.; Bowman, HF.; Wichman, DM.; Carlson, GR.; Eckhoff, JL.; Mcguire, CF.; Stallknecht, GF.; Kushnak, GD.; Stewart, VR.; Jackson, GD.; Hockett, EA.; Bruckner, PL. (1995) **REGISTRATION OF JUDITH WHEAT.** *Crop Science. 35(5):1512-1513.* English. [MONTANA STATE UNIV DEPT PLANT SOIL & ENVIRONM SCI BOZEMAN, MT 59717 USA].

E10 AGRICULTURAL ECONOMICS AND POLICIES

4183 Molina Hernandez, Pedro (1994) **[Economic cycles in agriculture: Analysis of sorghum, wheat and corn for the period 1953-1991 in Mexico]. Ciclos economicos en la agricultura: (analisis de los cultivos sorgo, trigo y maiz a nivel nacional periodo 1953-1991).** Universidad Autonoma Chapingo (Mexico). Departamento de Economia Agricola. 70 p. Spanish. (AGRIS 95-095907).

4184 Urena Gonzalez, Ildefonso (1993) **[Evaluation of the food supply capacity of Jalisco state]. Evaluacion de la capacidad alimentaria del estado de Jalisco.** Universidad Autonoma Chapingo (Mexico). Departamento de Irrigacion. mapas; grafs. 130 p. Spanish. (AGRIS 95-095906).

E11 LAND ECONOMICS AND POLICIES

4185 Garrison, C.O.; Dicks, M.R.; Adam, B.D. (1994) **Estimating the impact of Conservation Reserve Program contract expiration on corn and wheat prices.** *Agricultural and resource economics review (USA) v. 23(1) p. 94-99.* references. English. (AGRIS 95-096050).

E14 DEVELOPMENT ECONOMICS AND POLICIES

4186 Byerlee, D. (Centro Internacional de Mejoramiento de Maiz y Trigo, (CIMMYT), Mexico, DF (Mexico). Economics Program) (1994) **Modern varieties, productivity, and sustainability: Recent experience and emerging challenges.** CIMMYT. 9 tables; 11 graphs., 122 ref. 26 p. English. (AGRIS 95-096139).

The contribution of modern varieties of the three major cereal crops (rice, wheat, and maize) in the post-Green Revolution period, especially during the past decade or so, is reviewed in light of recent changes in the technical, economic, and institutional environment in which agricultural development strategies are being framed. Particular emphasis is given to the interactions of MVs with input intensification, input efficiency, and sustainability. Economic and institutional issues in restructuring plant

breeding programs for the most efficient use of resources, in both the public and private sectors at the national and international level, are reviewed.

4187 Lopez Pereira, M.A. (Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). Economics Program) (1994) **Impacts of research on maize for subtropical, midaltitude, and highland regions and prospects for the future.** *The subtropical, midaltitude, and highland maize subprogram. Bjarnason, M. (ed.) (Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). Maize Program) p. 96-104.* CIMMYT. 7 tables; 1 ref. English. (AGRIS 95-096140).

E16 PRODUCTION ECONOMICS

4188 Altieri, Miguel A. (California Univ., Berkeley (USA). Div. of Biological Control); Benito, Carlos; Faeth, Paul; Gomez lobo, Andres; Tomic, Tonci; Valenzuela, Jorge (1994) **[Sustainable agriculture, a simulation case for Chile]. Agricultura sustentable, un caso de simulacion para Chile.** Talca Univ., (Chile). 40 ref. 92 p. Spanish. (AGRIS 95-096246).

4189 Antunes, M.P.S.; Bagulho, F. (Estacao Nacional de Melhoramento de Plantas, Elvas (Portugal)) (1992) **[The repercussion on national agriculture of wheats from the ENMP (Estacao Nacional de Melhoramento de Plantas - National Plant Breeding Station) [Portugal]]. Repercussao dos trigos da ENMP [Estacao Nacional de Melhoramento de Plantas] na agricultura nacional.** [International Symposium on Plant Breeding]; Elvas (Portugal); 27-29 May 1992. *Melhoramento (Portugal) v. 33(1) p. 169-180.* issued 1994; 5 graphs. 3 tables; 3 ref. Portuguese. (AGRIS 95-107545).

4190 Ducros, D. (Institut National de la Recherche Agronomique, Toulouse (France). ESR. Station d'Economie et Sociologie rurales) (1994) **[Crop yields and factor demand for wheat production in France in 1992 and 1993]. Rendements en grandes cultures et demande de facteurs. Application a la production du ble tendre en region parisienne en 1992 et 1993.** Universite Toulouse-1, Toulouse (France); Institut National de la Recherche Agronomique, Toulouse (France). ESR. Station d'Economie et Sociologie rurales. 68 p. French. (AGRIS 95-096270).

4191 Mehier, C. (Institut Technique des Cereales et des Fourrages, Paris (France)) (1995) **[USA: evolution of wheat production costs]. USA, l'evolution des couts de production du ble.** *Perspectives Agricoles (France) (no 200) p. 92-95.* 12 graph. French. (AGRIS 95-096225).

4192 Nasr, M. (Ain Shams Univ., Cairo (Egypt). Faculty of Agriculture) (1994) **Gross margin calculation of selected crops [wheat, rice, broad bean, lentil and soybean] for seed production.** *Menofiya Journal of Agricultural Research (Egypt) v. 19(6 part 2) p. 3429-3455.* 8 tables; English. (AGRIS 95-107453).

4193 Neumayer, A. (1994) **[Wheat qualities and prices in Austria]. Weizen - wie geht es weiter ?** *Inform (Austria) v. 2 p. 8-9.* German. (AGRIS 95-107523).

E20 ORGANIZATION, ADMINISTRATION AND MANAGEMENT OF AGRICULTURAL ENTERPRISES OR FARMS

4194 Baird, R.; Shaner, G.; Mansfield, C. (1994) **Summary of 1992-1993 wheat large plot foliar spray trials in southwestern Indiana.** *Station bulletin (USA); no. 686 8 p.* English. (AGRIS 95-096487).

4195 Kaniuczak, Z.; Lisowicz, F. (Instytut Ochrony Roslin, Rzeszow (Poland). Terenowa Stacja Doswiadczalna); Sniezek, G. (Wojewodzka Stacja Kwarantanny i Ochrony Roslin, Rzeszow (Poland)) (1994) **[Profitability of chemical control of diseases and pests of winter wheat in south-eastern Poland in the years 1990-92]. Oplacalnosc chemicznego zwalczania chorob i szkodnikow pszenicy ozimej w poludniowo-wschodniej Polsce w latach 1990-92.** 33 Research Session of Institute of Plant Protection; Poznan (Poland); 1993. *Materials of the 33rd Research Session of Institute of Plant Protection. Pt. 2. Posters. Pruszynski, S.; Lipa, J.J. (eds.). Instytut Ochrony Roslin, Poznan (Poland) p. 14-19.* Panstwowe Wydawnictwo Rolnicze i Lesne. 3 tables; 8 ref. Polish. (AGRIS 95-107834).

In the last years the price of many pesticides in Poland had grown up very rapidly so the cost of spray treatments was unprofitable in comparison to wheat prices. This relation was better for many farms in the year of 1992. The reason of negative economic effects was a weak development and a lower harmfulness of agrophages - especially diseases - under conditions of advanced drought.

4196 Repka, J.; Danko, J. (Vysoka Skola Polnohospodarska, Nitra (Slovak Republic). Katedra Fyziologie Rastlin) (1994) **[Energy efficiency of spring barley cultivation system using large-scale production technologies]. Energeticka efektivnost pestovania jacmena jarneho vo velkovyrobnych technologiach.** *Polnohospodarstvo (Slovak Republic) v. 40(9) p. 651-659.* 4 tables; 9 ref. Slovak. (AGRIS 95-096343).

The energy analysis of spring barley cultivation under large-scale production conditions during 1986-1989 in agro-climatical conditions of Nitra area, Slovakia, was done. The average of the supplemental energy input was 18.98 GJ.ha** (-1). The highest part of energy input is taken by fertilizers (35.91 %), fuels (22.67 %) and seeds (19.37 %). The energy output from the grain production is 58.15 GJ.ha** (-1) and from the production of above-ground dry biomass is 115.82 GJ.ha** (-1). The values of energy coefficient were 4.06 for grain and 7.15 for above-ground biomass. Spring barley canopy utilized the energy of photosynthetically active radiation with coefficient 0.83 or 1.47 %, respectively.

4197 Willett, G.S.; Gary, W.J. (1992) **1992 Crop enterprise budgets winter wheat: summer fallow rotation, northern Walla Walla County, Washington.** *Extension bulletin (USA); no. 1724 13 p.* English. (AGRIS 95-107785).

E21 AGRO-INDUSTRY

4198 **CIMMYT 1993/94 world maize facts and trends - Maize seed industries, revisited: Emerging roles of the public and private sectors** (1994) Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). *CIMMYT World Maize Facts and Trends (CIMMYT) 56 p.* CIMMYT. 16 tables; 17 graphs., 94 ref. English. (AGRIS 95-096639).

This report analyzes interactions between public and private sector organizations in the world maize seed industry, with emphasis on the developing world. The analysis includes the share of total maize seed sales in 1992 by different kinds of seed enterprises and by different types of seed (hybrids, open pollinated varieties) and its origin (public or private sector breeding programs). Since the mid-1980s, private organizations in most developing countries have maintained and strengthened their position as the major producers and distributors of maize seed, while maize seed production and distribution by the public sector have tended to diminish. However, public breeding systems are still very important in maize seed industries; more than 50 per cent of all the seed sold in developing countries in 1992 was of public origin. Over the next 10-20 years, the developing world seed industry will continue to evolve towards stronger public-private sector collaboration. Although schemes for direct production and distribution of maize seed by the public sector are largely a thing of the past, public breeding systems will remain important for fostering the development of domestic private seed enterprises and small-scale seed producers, and conducting research directed at small-scale farmers.

4199 Burnquist, H.L. (comp.) (1994) **[Trade freedom: a development factor of the agricultural sector]. Liberalizacao comercial: um fator de desenvolmento do setor agricola.** Instituto de Pesquisa Economica Aplicada, Brasilia, DF (Brazil). *Estudos de Politica Agricola - Instituto de Pesquisa Economica Aplicada (Brazil); no. 14 216 p.* Portuguese. (AGRIS 95-096637).

4200 Lopez Pereira, M.A.; Filippello, M.P. (Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). Economics Program) (1994) **Maize seed industries, revisited: Emerging roles of the public and private sectors.** CIMMYT World Maize Facts and Trends (CIMMYT) p. 1-25. CIMMYT. 15 tables; 12 graphs. p. 1-25. English. (AGRIS 95-096640).

E40 COOPERATIVES

4201 Anon. (1994) **How does your wheat-sorghum cooperative measure up?** *Farmer cooperatives (USA) v. 61(6) p. 21.* English. (AGRIS 95-107978).

E70 TRADE, MARKETING AND DISTRIBUTION

4202 Bouton, C.A. (1993) **The flour war: gender, class, and community in late Ancien Regime French society.** Pennsylvania State University Press. ill. bibliographical ref. (p. [271]-301) and index. 307 p. English. (AGRIS 95-097040).

4203 Clark, J.S.; Klein, K.K. (1994) **The relationship between prices stabilization and cycles in the Canadian wheat market.** *Agricultural and resource economics review (USA) v. 23(1) p. 22-28.* references. English. (AGRIS 95-096938).

4204 Krause, J.H.; Wilson, W.W.; Dooley, F.J. (1994) **The impact of tariffs on U.S. exports of value-added wheat products.** *Agricultural economics report (USA); no. 323 17 p.* Dept. of Agricultural Economics, Agricultural Experiment Station, North Dakota State University. ill. bibliographical ref. (p. 15). Cover title. "December 1994.". English. (AGRIS 95-096943).

4205 Lutgen, L.H. (1993) **Wheat basis patterns from selected sites in northeast Nebraska.** *E.C (USA); no. 93-896-B 3 p.* English. (AGRIS 95-108171).

4206 Lutgen, L.H. (1993) **Wheat basis patterns from selected sites in southeast Nebraska.** *E.C (USA); no. 93-897-B 4 p.* English. (AGRIS 95-108172).

4207 Lutgen, L.H. (1993) **Wheat basis patterns from selected sites in western Nebraska.** *E.C (USA); no. 93-898-B 4 p.* English. (AGRIS 95-108173).

4208 Riley, P.; Schwartz, S. (1994) **World grain trade to slip again in 1994/95.** *Agricultural outlook (Washington, D.C. : 1975) (USA) (no. 210) p. 16-20.* English. (AGRIS 95-108174).

4209 Seibel, W. (Bundesanstalt fuer Getreide , Kartoffel und Fettforschung in Detmold und Muenster, Detmold (Germany)) (1994) **[International durum wheat situation in the economic cereal years 1992/93 and 1993/94]. Internationale Durumweizensituation in den Getreidewirtschaftsjahren 1992/93 und 1993/94.** *Getreide Mehl und Brot (Germany) v. 48(6) p. 3-7.* 30 tables; 18 ref. German. (AGRIS 95-096939).

4210 Treu, H. (1995) **[The acceptance price for alcohol from triticale]. Der Uebernahmepreis fuer Alkohol aus Triticale.** *Alkohol-Industrie (Germany) v. 108(3) p. 53-54.* German. (AGRIS 95-108170).

E71 INTERNATIONAL TRADE

4211 Anon. (1994) **[Barley]. Orges.** *BIOS (France) v. 25(248) p. 29-44.* 10 tableaux. French. (AGRIS 95-097177).

4212 Anon. (1993) **[Barley [production, international trade]]. Orges [production, commerce international].** *BIOS (France) v. 24(6-7) p. 7-23.* 9 tableaux. French. (AGRIS 95-097176).

4213 de Smet, S. (Office National Interprofessionnel des Cereales, Paris (France)) (1994) **[Perspectives of the world and domestic markets of wheat]. Perspectives du marche exterieur et interieur du ble.** 45. Journees de l'ENSMIC; Paris (France); 24-25 Nov 1994. *Industries des Cereales (France) (no 90) p. 37-42.* 8 graph. French. (AGRIS 95-097180).

4214 Manjavacas, M.; Navarro, A. (1995) **[World panorama of hard wheat]. Panorama mundial del trigo duro.** *Vida Rural (Espana) (no.15) p. 42-44.* 6 cuadros. Spanish. (AGRIS 95-097178).

4215 Normand, P. (Compagnie Continentale (France)) (1994) **[Wheats of the European Union]. Les bles dans l'Union europeenne.** 45. Journees de l'ENSMIC; Paris (France); 24-25 Nov 1994. *Industries des Cereales (France) (no 90) p. 2-6.* 15 tableaux. French. (AGRIS 95-097179).

F01 CROP HUSBANDRY

4216 **Grain protein management. [Field Day papers]** (1994) *62. Annual Field Day. Mallee Research Station; Walpeup, Vic. (Australia); 6 Oct 1994.* Victorian Dept. of Agriculture, Walpeup (Australia). Mallee Rearch Station. Department of Agriculture. not for publication; Vic. Dept. of Agriculture. 48 p. English. (AGRIS 95-108716).

Papers presented at the field day concentrate on the contributions of legumes, and the control of adventitious grasses, to the maintenance of protein levels of wheat grain in the drier areas of Victorian cereal growing. Broader issues addressed also include aspects of the law as it applies to the family farm; safety on the farm; herbicide residues in the wheat belt; and sheep management.

4217 **HORDEUM VULGARE (BARLEY) CV BRINDABELLA** (1995) *Australian Journal of Experimental Agriculture. 35(3):425.* English.

4218 **[Standard yields for yield survey districts, counties and the whole of Sweden in 1995]. Normskoerdar foer skoerdeomraaden, laen och riket 1995. Rapport fraan de objektiva skoerdeuppskattningarna** (1995) Statistiska Centralbyraan, Stockholm (Sweden). *Statistiska Meddelanden. Serie J, Jordbruk, Skogsbruk och Fiske (Sweden); no. 15.1 22 p.* SCB. Chiefly tables. Swedish. (AGRIS 95-108747).

4219 **TRITICUM AESTIVUM SPP VULGARE (BREAD WHEAT) CV CASCADES** (1995) *Australian Journal of Experimental Agriculture. 35(3):410-411.* English.

4220 **TRITICUM AESTIVUM SPP VULGARE (BREAD WHEAT) CV CURRAWONG** (1995) *Australian Journal of Experimental Agriculture. 35(3):412.* English.

4221 **TRITICUM AESTIVUM SSP VULGARE (BREAD WHEAT) CV AMERY** (1995) *Australian Journal of Experimental Agriculture. 35(3):409.* English.

4222 **TRITICUM AESTIVUM SSP VULGARE (BREAD WHEAT) CV DARTER** (1995) *Australian Journal of Experimental Agriculture. 35(3):413.* English.

4223 **TRITICUM AESTIVUM SSP VULGARE (BREAD WHEAT) CV DATATINE** (1995) *Australian Journal of Experimental Agriculture. 35(3):423-424.* English.

4224 **TRITICUM AESTIVUM SSP VULGARE (BREAD WHEAT) CV STRETTON** (1995) *Australian Journal of Experimental Agriculture. 35(3):414.* English.

4225 **TRITICUM AESTIVUM SSP VULGARE (BREAD WHEAT) CV SUNLAND** (1995) *Australian Journal of Experimental Agriculture. 35(3):415.* English.

4226 **TRITICUM AESTIVUM SSP VULGARE (BREAD WHEAT) CV SUNVALE** (1995) *Australian Journal of Experimental Agriculture. 35(3):416.* English.

4227 **TRITICUM AESTIVUM SSP VULGARE (BREAD WHEAT) CV TAMMIN** (1995) *Australian Journal of Experimental Agriculture. 35(3):417-418.* English.

4228 **TRITICUM AESTIVUM SSP VULGARE (BREAD WHEAT) CV TERN** (1995) *Australian Journal of Experimental Agriculture. 35(3):419.* English.

4229 **TRITICUM AESTIVUM SSP VULGARE (BREAD WHEAT) CV TRILLER** (1995) *Australian Journal of Experimental Agriculture. 35(3):420-421.* English.

4230 **TRITICUM AESTIVUM SSP VULGARE (BREAD WHEAT) CV WARBLER** (1995) *Australian Journal of Experimental Agriculture. 35(3):422.* English.

4231 **[Barley quality: 1994 harvest in France]. Qualite des orges. Recolte de France 1994** (1994) Institut Technique des Cereales et des Fourrages, Paris (France); Office National Interprofessionnel des Cereales, Paris (France); Malteurs de France, Paris (France). ITCF. 6 p. French. (AGRIS 95-097521).

4232 **[Quality of barley, 1993 harvest in France]. Qualite des orges. Recolte de France 1993** (1993) Institut Technique des Cereales et des Fourrages, Paris (France); Office National Interprofessionnel des Cereales, Paris (France); Chambre Syndicale de la Malterie Francaise, Paris (France). ITCF. 6 p. French. (AGRIS 95-097522).

4233 Amador, J.; Cabrera, S. (1995) **[Yecora and Cajeme, two wheat cultivars with past and future]. Yecora y Cajeme, dos variedades de trigo con pasado y futuro.** *Alimentacion. Equipos y Tecnologia (Espana) (no.1) p. 91-97.* 3 tab., 13 fig.; 8 ref. Spanish. (AGRIS 95-097338).

4234 Anon. (1994) **[Contrary developments of the world grain market]. Kontraere Entwicklungen am Welt-Getreidemarkt.** *Agra-Europe (Germany); Markt und Meinung v. 35(43) p. 1-3.* 2 tables. German. (AGRIS 95-097554).

4235 Bashford, L.L. (University of Nebraska Lincoln, Lincoln, NE) (1993) **External flute seed metering evaluation related to site specific farming.** *American Society of Agricultural Engineers. Meeting (USA); no. 93-8517 15 p.* ref. Paper presented at the "1993 International Winter Meeting sponsored by the American Society of Agricultural Engineers, " December 14-17, 1993, Chicago, Illinois. English. (AGRIS 95-108956).

4236 Beese, G. (Saechsische Landesanstalt fuer Landwirtschaft, Nossen (Germany)); Hartmann, G. (1994) **[Variety tests of winter wheat: good yields despite extreme heat]. Landessortenversuche Winterweizen: Gute Ertraege trotz grosser Hitze.** *Top agrar / Spezial fuer Mecklenburg-Vorpommern, Brandenburg, Sachsen-Anhalt, Sachsen, Thueringen (Germany) (no.9) p. 16-19.* 1 ill., 1 table. German. (AGRIS 95-097486).

4237 Beese, G. (Saechsische Landesanstalt fuer Landwirtschaft, Nossen (Germany)); Luehe, W. (1994) **[Variety tests of malting barley: Not each high yielding variety is suitable for cropping]. Landessortenversuch Braugerste: Nicht jede ertragsstarke Sorte eignet sich zum Anbau.** *Top agrar / Spezial fuer Mecklenburg-Vorpommern, Brandenburg, Sachsen-Anhalt, Sachsen, Thueringen (Germany) (no.12) p. 19-21.* 1 ill., 3 tables. German. (AGRIS 95-097525).

4238 Bell, M.A. (Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). Wheat Program) (1994) **Four years of on-farm research results at Chalco, Mexico.** *CIMMYT Wheat Special Report (CIMMYT); no. 34 35 p.* CIMMYT. 31 tables; 11 graphs. English. (AGRIS 95-097488).

The purpose of this special report is to record the on-farm research activities conducted around the area of Chalco, in the High Valley of *Mexico*, from 1986-1990. The research was conducted as part of the CIMMYT Wheat Crop Management Research Training Program. The results are presented as tables for each trial type, plus a small discussion for each year summarizing results and reasons for some of the research strategy and treatments used. Recommendations for farmers have already been generated by the Mexican National program (INIFAP) from the data. It is hoped that the work can be used as a case study to analyze and critique an on-farm research program.

4239 Bennett, K.E. (University of Arkansas, Fayetteville, AR.); Siebenmorgen, T.J.; Mauromoustakos, A.; Vories, E.D. (1993) **Combine fuel consumption for harvesting wheat, rice, and soybean.** *American Society of Agricultural Engineers. Meeting (USA); no. 931501 9 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 95-108808).

4240 Bonjean, A. (1995) **BARLEY REVISITED.** *Biofutur. (147):28-32.* French. [AGROGENE SA 620 AV BLAISE PASCAL ZI F-77550 MOISSY CRAMAYEL FRANCE].

4241 Borghi, B.; 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).** *European Journal of Agronomy. 4(1):37-45.* English. [IST SPERIMENTALE CEREALICOLTURA VIA MULINO 3 I-20079 SAN ANGELO LODIGIANO ITALY].

The effects on bread-making quality of crop rotation, fertilizers and manure treatments were evaluated in a long term experiment in which the combinations of organic manure, mineral nitrogen, phosphorus and potassium fertilizers were applied to three crop rotations for a total of 33 different treatments. Protein concentration evaluated for 12 years varied from 10.0 per cent to 12.8 per cent with years and from 10.70 per cent to 13.21 per cent among treatments. The highest grain yields were obtained in the two-year (wheat-maize) or nine-year (wheat-maize-lucerne) rotations, coupled with a great variability for quality, as evaluated with the Chopin alveo-graph. Potassium fertilizer did not affect yield or quality, while positive effects of phosphorus were evident only after continuous cropping with wheat. When wheat was grown continuously, the application of nitrogen fertilizer gave grain of optimum quality but, even in combination with the highest rate of manure, did not raise the yield to the levels achieved by the 2 or 9 year rotations. In the wheat-maize rotation, maximum yield and quality was achieved with the highest rate of fertilizers even in the absence of manure. In the rotation that included lucerne, maximum yield was obtained with the lowest rate of fertilizers but, to optimize the quality, it appeared necessary to apply the highest rate of nitrogen (200 kg N ha(-1)). [References: 45].

4242 Dwyer, S.V.; Clark, S.J. (1992) **Wheat threshing from compaction.** *American Society of Agricultural Engineers. Meeting (USA); no. 921010 44 p.* references. Paper presented at the "1992 International Summer Meeting sponsored by The American Society of Agricultural Engineers, " June 21-24, 1992, Charlotte, North Carolina. English. (AGRIS 95-108723).

4243 Eid, H.M.; Anton, N.A.; Tarrad, A.M. (Ministry of Agriculture, Cairo (Egypt). Soils and Water Research Inst.) (1994) **Comparative study on Egyptian wheat cultivars and their response to high temperatures.** *Annals of Agricultural Science, Moshtohor (Egypt) v. 32(1) p. 143-154.* 2 ill. 8 tables; 14 ref. English. (AGRIS 95-108861).

4244 El Tabbakh, S.S. (Alexandria Univ. (Egypt). Faculty of Agriculture); Atteia, M.F. (1994) **Performance of some Egyptian wheat varieties for yield, yield components and resistance to leaf and stem rust diseases.** *Menofiya Journal of Agricultural Research (Egypt) v. 19(4) p. 1747-1756.* 5 tables; 13 ref. English. (AGRIS 95-108860).

4245 Eltilib, AMA.; Elmahi, YE.; Magid, HMA.; Ahmed, BAM. (1995) **RESPONSE OF WHEAT TO IRRIGATION FREQUENCY AND MANURING IN A SALT-AFFECTED SEMI-ARID ENVIRONMENT.** *Journal of Arid Environments. 31(1):115-125.* English. [KING SAUD UNIV BRANCH COLL AGR & VET MED DEPT SOIL & WATER POB 1482 BURAYDAH SAUDI ARABIA].

Two field experiments were carried our in the irrigated salt-affected (saline-sodic) semi-arid environment of northern Sudan (Khartoum district). The objective was to examine the response of wheat to irrigation frequency and cattle, chicken manure and urea applications. The results obtained indicated that the grain yield of wheat was increased significantly (p less than or equal to 0.01) by decreasing the irrigation interval from 15 to 5 days. The manures applied were found to be more effective in increasing the grain yield than was urea fertilizer. In addition, levels of leaf N, P and K were increased significantly (p less than or equal to 0.01) with fertilizer application. There were no significant effects on leaf levels of Ca and Mg. Increase in irrigation frequency gave a significant increase (p less than or

equal to 0.01) in the leaf N but not the P, K, Ca and Mg contents. (C) 1995 Academic Press Limited. [References: 22].

4246 Flink, M.; Pettersson, R.; Andren, O. (1995) **GROWTH DYNAMICS OF WINTER WHEAT IN THE FIELD WITH DAILY FERTILIZATION AND IRRIGATION.** *Journal of Agronomy & Crop Science-Zeitschrift fur Acker und Pflanzenbau. 174(4):239-252.* English. [SWEDISH UNIV AGR SCI DEPT ECOL & ENVIRONM RES POB 7072 S-75007 UPPSALA SWEDEN].

In a field experiment with fertilized and irrigated winter wheat the above-ground crop was sampled once a week. Phenological development, plant density and canopy height were recorded and the green surface areas of leaves, stems and ears were measured. Soil mineral nitrogen was sampled and the field climate monitored. There were four treatments. The daily irrigated/fertilized (IF) and daily irrigated (I) treatments were both irrigated by a drip-tube system. Liquid fertilizer was applied to IF following a logistic function according to calculated plant uptake. A total of 200 kg N ha(-1) was applied. Treatment I, control (C) and drought (D) were all fertilized once in spring with 200 kg N ha(-1). In treatment D transparent screens were used to divert rainwater. Dry matter production ranged between 1400 in D and 2352 g m(-2) in IF. The corresponding amount of nitrogen uptake ranged between 15.8 and 24.6 g m(-2). After harvest, soil mineral nitrogen was lowest in IF. An increase in the availability of nitrogen and water enhanced total biomass production as well as grain yield and leaf area. The daily supply of nitrogen according to crop demand delayed nitrogen uptake and increased total uptake. The results suggest that when the nitrogen is supplied in accordance with crop demand, the efficiency with which the applied fertilizer is utilized increases and the risk for nitrogen leaching decreases. [References: 33].

4247 Francis, C.A. (University of Nebraska, Lincoln (USA)) (1993) **Developing resource efficient wheat production systems for the future.** 8. Regional wheat workshop for eastern, central and southern Africa; Kampala (Uganda); 7-10 Jun 1993. *Developing sustainable wheat production systems: Regional wheat workshop for eastern, central and southern Africa. Tanner, Douglas G. (CIMMYT, Nirobi (Kenya)) p. 192-200.* CIMMYT. 1 fig.; 16 ref.; Summary (En). English. (AGRIS 95-097487).

Future importance of wheat production in Eastern and Southern Africa depends on a range of biological, economic and social factors. Because there is wide variation among the many growing zones, there is a critical need for site specific technologies and management, and explicit choice of reserch objectives for each region. Periodic drought continues to constrain production and complicate decisions on choice of wheat verses alternative crop species. Specific crop sequences must be determined where wheat is one crop in an annual system, and the potentials for alternative tillage options and use of cover crops needs to be explored. Improvments in productivity are crucial, since most countries are not close to self-sufficiency in wheat, and there is little additional land available for expansion of production zones. Success is measured in productivty per hectar, which assumes that land is always the most limiting factor. Where this is not the case, it may be more rational to measure system success in terms of productivity per unit scarce fertilizer, per unit of irrigation water, per unit of labor, or other measure of scarce resource. Future system design will includ fine tuning site-specific choice of wheat variety, fertilizer rate and type, method of weed management, and timing of irigation where available. Practices may be specific to individual farms, depending of resource level and acceptable risk. This underlines the importance of on-farm rsearch as an approach to adding locations and getting farmers involved as full members of the research and demonstration team. Government policies and available infrastructure can seriously impair or substantially help farmers in wheat production, in terms of price supports, availablity of credit and inputs, funding for research, land tenure policy, and emphasis on a large or small farm sector. These considerations are all important for researchers and farmers who design future resource-efficient production systems in the region.

4248 Franzluebbers, AJ.; Hons, FM.; Saladino, VA. (1995) **SORGHUM, WHEAT AND SOYBEAN PRODUCTION AS AFFECTED BY LONG-TERM TILLAGE, CROP SEQUENCE AND N FERTILIZATION.** *Plant & Soil. 173(1):55-65.* English. [TEXAS A&M UNIV DEPT SOIL & CROP SCI TEXAS AGR EXPT STN COLLEGE STN, TX 77843 USA].

Yield decline of cereals grown in monoculture may be alleviated with alternative crop management strategies. Crop rotation and optimized tillage and fertilizer management can contribute to more sustainable food and fiber production in the long-term by increasing diversity, maintaining soil organic matter (SOM), and reducing adverse effects of excessive N application on water quality. We investigated the effects of crop sequence, tillage, and N fertilization on long-term grain production on an alluvial, silty clay loam soil in southcentral Texas. Crop sequences consisted of monoculture sorghum (Sorghum bicolor (L.) Moench,) wheat (Triticum aestivum L.), and soybean (Glycine max (L.) Merr), wheat/soybean double-crop, and rotation of sorghum with wheat/soybean. Grain yields tended to be lower with no tillage (NT) than with conventional tillage (CT) early in the study and became more similar after 11 years. Nitrogen fertilizer required to produce 95% of maximum sorghum yield was similar for monoculture and rotation upon initiation of the experiment and averaged 16 and 11 mg N g(-1) grain with NT and CT, respectively. After 11 years, however, the N fertilizer requirement became similar for both tillage regimes, but was greater in monoculture (17 mg N g(-1) grain) than in rotation (12 mg N g(-1) grain). Crop sequences with double-cropping resulted in greater land use efficiency because similar or lower amounts of N fertilizer were required to produce equivalent grain than with less intensive monoculture systems. These more intensive crop sequences produced more stover with higher N quality primarily due to the inclusion of soybean in the rotation. Large quantities of stover that remained on the soil surface with NT led to greater SOM content, which increased the internal cycling of nutrients in this soil. In southcentral Texas, where rainfall averages nearly 1000 mm yr(-1), more intensive cropping of sorghum, wheat, and soybean with moderate N fertilization using reduced tillage can increase grain production and potentially decrease N losses to the environment by cycling more N into the crop-SOM system. [References: 27].

4249 Gan, Y.; Stobbe, EH. (1995) **EFFECT OF VARIATIONS IN SEED SIZE AND PLANTING DEPTH ON EMERGENCE, INFERTILE PLANTS, AND GRAIN YIELD OF SPRING WHEAT.** *Canadian Journal of Plant Science. 75(3):565-570.* English. [AGR & AGRIFOOD CANADA RES CTR RES BRANCH POB 1030 SWIFT CURRENT SK S9H 3X2 CANADA].

Crop yield can be improved by minimizing plant-to-plant variability in seedling emergence. A study was conducted to determine the effect of variations in seed size and planting depth within a plot on emergence, proportion of infertile plants and grain yield in hard red spring wheat (Triticum aestivum L.). Large seed (40.8 mg kernel(-1)) was hand planted at 25-, 50- and 75-mm depths, creating three uniform seed size - planting depth treatments. Three other treatments consisted of repeating patterns within the same row: three large seeds and one small seed (23.4 mg kernel(-1)) at each of 25-, 50- and 75-mm depths. Two additional treatments consisted of 1) three seeds planted 25 mm deep and one seed planted 50 mm deep and 2) three seeds planted 25 mm deep and one seed planted 75 mm deep within the same row. Variation in seed size or planting depth within a row had no impact on percentage emergence, but nonuniform planting depth increased the proportion of infertile plants, mainly as a result of late-emerging plants. On a single-plant basis, mainstem grain yields were relatively uniform, but tiller grain yields were highly variable. When small and large seeds were planted 75 mm deep within a plot, the small-seeded plants produced 34% lower tiller grain yield than neighbouring large-seeded plants, while the large-seeded plants produced 10% higher tiller grain yield than plants from a treatment in which only large seeds were planted. Thus, the variation in seed size within a plot had no impact on total grain yield per plot. When seed was planted at variable depths within a plot, grain yield per plant produced by deep-seeded (75 mm) plants was only 20% of that produced by neighbouring shallow-seeded (25 mm) plants and was only 26% of that produced by plants where all seeds were planted deep (75 mm). Within-plot variation in planting depth increased the proportion of infertile plants (up to 158%) and decreased the grain yield. To maximize grain yield in hard red spring wheat, seed should be planted at uniform, shallow planting depth. [References: 17].

4250 Garcia del Moral, L.F.; Boujenna, A.; Yanez, J.A.; Ramos, M.J. (Granada Univ. (Espana). Facultad de Ciencias); Marinetto, J. (1994) **[Dual use of triticale for forage and grain in Granada Province [Spain], 2: Yield components]. Aprovechamiento mixto de forraje y grano del triticale en**

la provincia de Granada [Espana], 2: Componentes de la cosecha. *Investigacion Agraria. Produccion y Proteccion Vegetales (Espana) v. 9(1) p. 401-410.* 4 tab.; 23 ref. Spanish. (AGRIS 95-097337).

4251 Gate, P. (Institut Technique des Cereales et des Fourrages, Paris (France)) (1995) **[The one and two nodes development stages in wheat]. Comment determiner les stades 1 noeud et 2 noeuds?** *Perspectives Agricoles (France) (no 201) p. 34-35.* French. (AGRIS 95-097514).

4252 Gerber, R. (1994) **[Growth regulations in grain crops]. Wachstumsregler im Getreide: Wie ich die richtige Aufwandmenge finde.** *Neue Landwirtschaft (Germany) (no.4) p. 32-33.* 2 tables. German. (AGRIS 95-108717).

4253 Groeblinghoff, F. F. (Universitaet GH Paderborn, Soest (Germany). Fachbereich Landbau); Luetke Entrup, N. (1994) **[Plant protection with catch crops]. Schutz durch Zwischenfruechte.** *Agrar-Uebersicht (Germany) v. 45(6) p. 62-64.* 1 ill., 4 tables. German. (AGRIS 95-109204).

4254 Heenan, D.P. (New South Wales Agriculture, Wagga Wagga (Australia)) (1994) **Long term management of wheat rotations to maintain production and soil fertility.** New South Wales Agriculture. 2 fig. 16 p. English. (AGRIS 95-097697).

Gives an overview of results obtained from long term projects which involved using various grain, legume and pasture crops in rotations with wheat. Also being considered were different tillage practices and the effects of different levels of lime application. Improvements in soil structure, soil fertility, wheat yields and wheat protein quality were obtained in most cases, but improvements were variable depending upon seasonal conditions, wheat varieties and the rotational crop used the previous season.

4255 Ho, KM.; Seaman, WL.; Choo, TM.; Martin, RA. (1995) **AC HAMILTON BARLEY.** *Canadian Journal of Plant Science. 75(3):697-698.* English. [AGR & AGRIFOOD CANADA RES BRANCH PLANT RES CTR OTTAWA ON K1A 0C6 CANADA].

AC Hamilton is a six-rowed spring feed barley (Hordeum vulgare L.) cultivar bred at the Plant Research Centre, Agriculture and Agri-Food Canada, and evaluated by the Eastern Canada Barley Breeding Group. It was selected from a Leger/OAC Kippen cross and is suitable for growing in Ontario, where it outyielded the check cultivars AC Stephen and Chapais. AC Hamilton is moderately resistant to powdery mildew (Erysiphe graminis f. sp. hordei) and is resistant to septoria leaf blotch (Septoria passerinii).

4256 Ionescu, F.; Nicolescu, M.; Paunescu, G.; Similaru, E.; Duicu, I.; Dinca, I.; Mititelu, C.; Nicola, I. (Institutul de Cercetari pentru Cereale si Plante Tehnice Fundulea, Simnic (Romania). Statiunea de Cercetari Agricole Simnic Craiova) (1994) **[The influence of some tillage systems after late forecrops upon wheat yields and some agroproductive properties of brown-reddish faintly luvic soil in long-term trials]. Influenta diferitelor sisteme de lucrare a terenului dupa premergatoarele tarzii, asupra productiei de grau si a unor insusiri agroproductive ale solului brun-roscat slab luvic, in experiente de lunga durata.** *Lucrari stiintifice (Romania) v. 9 p. 141-151.* 4 tables; 2 graphs; 12 ref. Romanian. (AGRIS 95-108766).

During 1970-1991 various tillage systems of sowing wheat after maize were investigated on brown-reddish luvic soil at the Station for Agricultural Research Simnic-Craiova. The area was prepared by disk-harrowing in alternation with tillage at 18 cm 1-3 years, taking into account the conditions of the year e.g., the soil moisture, to provide high work quality; this system proved to be the most efficient. In the variants with these systems of soil tillage the yields showed a tendency of increasing by 0, 4-2 q/ha. The energy of a hectare increased too, whereas the fuel expenditure decreased by 22-48 percent. The alternation of the superficial tillage (disk-harrowing) and the ploughing at 18-28 cm which took place depending on the climate conditions of the year, led also to a good evolution in soil fertility properties as compared with the tillage at the same depth every year.

4257 Khokhlova, L.P.; Khamidullina, N.G.; Belogub, O.V.; Garaeva, R.G.; Fazliakhmetova, G.I. (1994) **[Field tests of cartolene-2 and oxicarbam on small grains, groat crops and fodder grasses in Tatarstan [Russian Federation] [Antistress plant growth regulators]]. Polevye ispytaniya kartolina-2 i oksikarbama na zernovykh, krupyanykh kul'turakh i kormovykh travakh v Tatarstane.** *Agrokhimiya (Russian Federation) (no.5) p. 90-98.* 16 ref. Russian. (AGRIS 95-097552).

4258 Kim, H.B. (Dongguk University, Seoul (Korea Republic). Department of Agronomy) (1995) **Varietal difference of immature spike number and its relationship with other characters in barley and wheat.** *Korean Journal of Crop Science (Korea Republic) v. 40(2) p. 245-249.* 5 tables; 10 ref. Korean. (AGRIS 95-108757).

4259 Krezel, R.; Parylak, D.; Szumilak, G. (Akademia Rolnicza, Wroclaw (Poland). Katedra Ogolnej Uprawy Roli i Roslin) (1994) **[Plant yielding in 2-, 3- and 4-field crop succession on the medium soil]. Plonowanie roslin w zmianowaniach 2-, 3- i 4-polowych na glebie sredniej.** *Zeszyty Naukowe Akademii Rolniczej we Wroclawiu. Rolnictwo (Poland) (no.238) p. 67-72.* 5 tables; 7 ref. Polish. (AGRIS 95-097709).

In the years 1986-89 the yielding of plants on the medium soil in 2-, 3- and 4-field crop successions with the fraction of cereal plants was 50, 66 and 100 percent. The highest yields of winter wheat grain were obtained after pea in 4-field rotations with 50 percent fraction of cereal plants (average yield 5.6 t/ha). The yield of spring barley was the best in 2-field rotations after sugar beet (on average 3.78 t/ha). In 2-field rotations with 100 percent fraction of cereal plants the yields of winter wheat and spring barley were respectively lower for 13 percent and 15 percent from the yields with 50 percent fraction of cereals.

4260 Kuchar, L. (Akademia Rolnicza, Wroclaw (Poland). Wydzial Inzynierii Srodowiska); Skjelvag, A.O. (Norway Agricultural University, (Norway). Dept. of Crop Science) (1994) **[Time trend in crop production based on cereals yield]. Trendy produkcji roslinnej w Norwegii na przykladzie produkcji zboz.** *Fragmenta Agronomica (Poland) v. 11(1) p. 61-71.* 4 fig., 3 tables; 10 ref. Polish. (AGRIS 95-097526).

Average grain yields per hectare of barley, oats and wheat from 1945 to 1990 were examined for time trends. A sigmoidal time trend, indicated a slight increase during the first 15 years, a steeper increase during following 25 to 30 years and thereafter a tendency to leveling off. Variation in yield during the period 1945-90 was analysed by creating 32 moving series of 14 years, according to the autocorrelation analysis. The variation in yield of all three species during these overlapping periods has increased with time until the periods starting in the first half of the sixties.

4261 Kulhare, PS.; Kauraw, DL.; Khan, RA. (1995) **RESPONSE OF LATE-SOWN WHEAT (TRITICUM AESTIVUM) AND SOYBEAN (GLYCINE MAX) TO FRESH, RESIDUAL AND CUMULATIVE SULPHUR LEVELS ON DEEP VERTISOL.** *Indian Journal of Agricultural Sciences. 65(8):594-596.* English. [JAWAHARLAL NEHRU UNIV ZONAL AGR RES STN POWARKHEDA 461110 MADHYA PRADESH INDIA].

4262 Lee, H.S.; Ku, J.H. (Seoul National University, Suwon (Korea Republic). College of Agriculture and Life Science); Park, E.H. (Yeungnam University, Kyeongsan (Korea Republic). College of Agriculture and Animal Science); Song, H.S. (Rural Development Administration, Suwon (Korea Republic). Crop Experiment Station) (1995) **Effects of water table depth in different soil texture on growth and yield of barley and wheat.** *Korean Journal of Crop Science (Korea Republic) v. 40(2) p. 195-202.* 4 illus.; 4 tables; 9 ref. Korean. (AGRIS 95-108756).

4263 Liska, E. (Vysoka Skola Polnohospodarska, Nitra (Slovak Republic). Katedra Polnohospodarskych Sustav); Francakova, H.; Kulik, D. (1994) **[The effect of climatic factors on qualitative parameters of spring barley grain]. Vplyv poveternostnych podmienok na kvalitu zrna jarneho jacmena.** *Polnohospodarstvo (Slovak Republic) v. 40(9) p. 642-650.* 4 tables; 7 ref. Slovak. (AGRIS 95-097527).

The effect of climatic factors on qualitative parameters of spring (malting) barley grain is discussed. The positive influence of precipitation (60-80 mm) in pre-vegetation period (February-March) which decreased crude protein (-1.34 %), was found. Also a decrease of the total protein

content in grain caused by a lower amount of precipitation was observed. The higher temperature in the period of tillering and shooting significantly influenced the portion on first-class grain and extract. The highest parameters of grain quality were met by the variety Jubilant. This variety was included in the list of EBC varieties (European Brewery Convention). Based on the results, there were significant differences among tested varieties and the dependence of the quality of grain and climatic conditions was confirmed.

4264 Littorin Johansson, Aa. (1994) **[Durum wheat - possibilities for cultivation in Sweden]. Durumvete - moejligheter foer odling i Sverige.** *Seminarier och Examensarbeten - Institutionen foer Vaextodlingslaera, Sveriges Lantbruksuniversitet (Sweden); no. 907 12 p.* 11 ref. Swedish. (AGRIS 95-108869).

4265 Makke, A. (Estonian Agricultural Univ., Tartu (Estonia).Inst.of Soil Management); Roostalu, H. (Inst. of Soil Science and Agrochemistry) (1994) **[Factors influencing the barley yield and its quality]. Odra saaki ja selle kvaliteeti mojutavad tegurid.** *Transactions of Estonian Agricultural University (Estonia); Agronomy (no.178) p. 53-57.* 2 fig., 1 ref., 1 table. Estonian. (AGRIS 95-108749).

The investigations were carried out on brown lessive sandy loam soil during the period of 1969.1990. Within the limits of field experiments productivity and yield quality of barley depending on the soil-climatic resources, on the fertilization, sowing time and cultivars were studied. On the basis of the results of field experiments it was established that the most important factors limiting the barley yield are weather conditions. The relative influence of weather on barley productivity is twice as strong as the effect of fertilization and three times stronger than the impact of the sowing time. It is connected with the facts, that the total precipitation during the vegetative period annually varies more than 4.5 times and the sum of active temperature accordingly 1.5-2 times.

4266 Martin, D.J.; Stewart, B.G. (Queensland Wheat Research Institute, Toowoomba, Queensland (Australia). Wheat Quality Laboratory) (1994) **Australian wheats for Asian wheat based products.** *Asean Food Journal (Malaysia) v. 9(3) p.87-92.* ill.; 4 tables; 18 ref. English. (AGRIS 95-108857).

4267 Martin, G. (Institut Technique des Cereales et des Fourrages, Paris (France). Labo Qualite des Bles) (1994) **[1994 yield: few proteins but good quality]. Recolte 1994: peu de proteines, mais de bonne qualite.** 45. Journees de l'ENSMIC; Paris (France); 24-25 Nov 1994. *Industries des Cereales (France) (no 90) p. 7-11.* French. (AGRIS 95-097547).

4268 Megahed, M.M. (Agricultural Engineering, Research Institute, Dokki (Egypt)); El Behery, A.; Krutz, G.W.; Doster, D.H. (1993) **Economic evaluation of wheat and rice harvesting under Egyptian conditions.** *American Society of Agricultural Engineers. Meeting (USA); no. 93-8519 6 p.* ref. Paper presented at the "1993 International Winter Meeting sponsored by the American Society of Agricultural Engineers, " December 14-17, 1993, Chicago, Illinois. English. (AGRIS 95-108624).

4269 Mellado Z, Mario (Instituto de Investigaciones Agropecuarias, Chillan (Chile). Estacion Experimental Quilamapu) (1994) **[Effect of sowing time and type of variety [Candela-INIA, Lancero-INIA, Saeta-INIA] on wheat quality (Triticum aestivum L.)]. Efecto de la fecha de siembra y del tipo de variedad [Candela-INIA, Lancero-INIA, Saeta-INIA] sobre la calidad del trigo (Triticum aestivum L.).** *Agricultura Tecnica (Chile) v. 54(2) p. 102-105.* 9 ref. Spanish. (AGRIS 95-097546).

In order to evaluate some wheat bread quality indexes (hectoliter weight, grain protein, sedimentation value, mixogram, water absorption, development time and bread volume), three wheat varieties Candela-INIA, Lancero-INIA and Saeta-INIA were sown at Quilamapu Research Station every 30 days, from May to October, under irrigated conditions. Experimental results showed a strong genetic (variety) and environmental (date of sowing) effect on wheat quality. The best quality index corresponded to spring wheat variety and late sowing date. Only hectoliter weight reached the least values in late sowing time.

4270 Milovanovic, M. (Centar za strna zita, Kragujevac (Yugoslavia)); Pavlovic, M.; Kuburovic, M.; Jestrovic, Z. (1993) **[Effect of years and locations on grain yield and quality in winter Triticale (X Triticosecale Wittmack)]. Uticaj godine i lokaliteta na prinos i fizicki kvalitet zma ozimog tritikalea (X Triticosecale Wittmack).** *Zito hleb (Yugoslavia) v. 20(1-2) p. 21-24.* 2 tables; 18 ref. Serbian. (AGRIS 95-108735).

Influences of year and location on grain yield stability of some Kragujevac (Yugoslav) winter (facultative) triticale varieties and lines were shown in this paper. Two winter wheat varieties were used as standard. Grain yield of examined triticale was significantly influenced by year and location. Triticales had on average less yield than better yielding wheat. In comparison with worse yielding wheat standard, 4 examined triticales had higher yield, but not significantly. Triticale varieties and lines with highest yield didn't express satisfactory stability of grain yield.

4271 Nour El Din, N.A. (Ain Shams Univ., Cairo (Egypt). Faculty of Agriculture); Abd El Halim, A.A.; Hassan, R.K.; Atia, S.G. (1994) **Response of two triticale varieties to sowing dates and nitrogen fertilization.** *Annals of Agricultural Science, Moshtohor (Egypt) v. 32(1) p. 83-94.* 4 tables; 17 ref. English. (AGRIS 95-108710).

4272 Onderka, M.; Misa, P. (Zemedelsky Vyzkumny Ustav, Kromeriz (Czech Republic)) (1995) **[The establishment of spring barley stands]. Zakladani porostu jarnich jecmenu.** *Obilnarske Listy (Czech Republic) v. 3(2) p. 19-20.* 2 tables. Czech. (AGRIS 95-108753).

4273 Philipp, H. J. (Institut fuer Soziooekonomie im ZALF e.V., Muencheberg (Germany)) (1994) **[Success in desert production of wheat in Saudi-Arabia]. Januskoepfiger Agrarboom in Saudi-Arabien: Die Wuesten produzieren, und wie.** *Neue Landwirtschaft (Germany) (no.5) p. 93-95.* 3 ill., 1 table. German. (AGRIS 95-108718).

4274 Pottie, D. (New South Wales Agriculture, Condobolin (Australia)) (1995) **Regional crop improvement trials central west NSW: annual report 1994 [New South Wales].** *Regional Crop Improvement trials Central West New South Wales - Annual Report (Australia) 36 p.* New South Wales Agriculture. Tables. English. (AGRIS 95-108738).

Gives the results of core variety trials conducted during 1994. Grain quality data is included for wheat trials. Trials for wheat, barley, oats, field peas, chickpeas and canola were conducted.

4275 Ramos, M.J.; Yanez, J.A.; Garcia del Moral, L.F. (Granada Univ. (Espana). Facultad de Ciencias); Marinetto, J. (1994) **[Dual use of triticale for forage and grain in Granada Province [Spain], 1: Economic profitability]. Aprovechamiento mixto de forraje y grano del triticale en la provincia de Granada [Espana], 1: Rentabilidad economica.** *Investigacion Agraria. Produccion y Proteccion Vegetales (Espana) v. 9(3) p. 391-399.* 2 tab.; 29 ref. Spanish. (AGRIS 95-097336).

4276 Roy, S.K.; Hossain, M.A.; Biswas, P.K.; Sahid, M.A. (1992) **Effect of cultivar and planting method on tillering, yield components and yield of wheat in three different locations [in Bangladesh].** *Bangladesh Journal of Agricultural Research (Bangladesh) v. 17(2) p. 142-146.* 4 tables, 14 ref. English. (AGRIS 95-108858).

Wheat cultivars Kanchan and Sonalika were grown under five methods of planting viz., broadcast, 10, 20, 30 cm rows and 20 cm cross rows under same seed rate of 120 kg/ha at Joydebpur, Dinajpur and Hathazari in 1989-90 and 1990-91. Kanchan produced significantly higher yield than Sonalika mainly due to higher number of ears/M2 in all the locations. Plants in 10 cm rows produced significantly higher number of tillers and ears/m2 followed by 20 cm cross rows. Most of the plants produced first leaf and second leaf tillers in all the locations but the third leaf and other tillers were significantly more in 10 cm rows and 20 cm cross rows although the survival percentages of third leaf and other tillers were less except that at Dinajpur. Higher grain yields ranging from 3.55 - 4.32 t/ha were obtained from 10 cm rows followed by 20 cm cross rows in all the locations. The apparent translocation of pre-anthesis stem reserves was higher with Sonalika and plants in 30 cm rows for both the years although there were year-to-year variations.

4277 Ruland, W. (Landwirtschaftskammer Muenster (Germany)); Dietsch, H. (1994) **[Changing yields at spring barley]. Wechselnde Ertraege bei**

Sommergerste. *Landwirtschaftliches Wochenblatt Westfalen-Lippe, Ausgabe A (Germany) v. 151(51) p. 38-39.* 1 ill., 5 tables. German. (AGRIS 95-108754).

4278 Ruland, W. (Landwirtschaftskammer Muenster (Germany)); Dietzsch, H. (1994) **[Less time for spring wheat]. Knappe Zeit fuer Sommerweizen.** *Landwirtschaftliches Wochenblatt Westfalen-Lippe, Ausgabe A (Germany) v. 151(48) p. 30-32.* 1 ill., 5 tables. German. (AGRIS 95-108719).

4279 Shafiq, M.; Hassan, A.; Ahmad, S. (1995) **EFFECT OF CROP ROTATION, TILLAGE TECHNIQUE, FERTILIZATION AND WEED CONTROL ON YIELD OF WHEAT (TRITICUM AESTIVUM) AND GREENGRAM (PHASEOLUS RADIATUS) UNDER RAINFED CONDITION.** *Indian Journal of Agricultural Sciences. 65(8):591-593.* English. [NATL AGR RES CTR WATER RESOURCES RES INST ISLAMABAD 54400 PAKISTAN].

4280 Solie, J.B.; Krenzer, E.G.; Venter, J.D. (1993) **Influence of soil compaction by grazing on wheat yields.** *American Society of Agricultural Engineers. Meeting (USA); no. 931565 21 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 95-108722).

4281 Sutch, B.A. (1992) **Weed suppression in no-till broccoli using crimson clover, barley and pea cover crops.** Maine Univ. (USA). ill. Bibliography: leaves 73-80. vita. 81 leaves. English. (AGRIS 95-097507).

4282 Thakur, C.L.; Khandelwal, N.K.; Mittal, J.P. (Mahatma Gandhi Institute of Integrated Rural Energy Planning and Development, Bakoli, Alipur, Delhi 110 036 (India)) (1994) **Energetics and economics of wheat production in two selected villages of Madhya Pradesh, India.** *Energy Conversion and Management (United Kingdom) v. 35(11) p. 933-941.* 7 ref. English. (AGRIS 95-097550).

4283 Webb, J.; Sylvesterbradley, R.; Wafford, JD. (1995) **INFLUENCE OF SOWING DATE ON THE UPTAKE OF AND RESPONSES TO SOIL AND FERTILIZER NITROGEN BY THE SPRING WHEAT CULTIVAR TONIC.** *Journal of Agricultural Science. 125(Part 1):25-37.* English. [AGR DEV & ADVISORY SERV ROSEMAUND WOLVERHAMPTON WV6 8TQ ENGLAND].

At 14 sites in the UK, spring wheat (Triticum aestivum) cv. Tonic, was sown on three or four dates at each site between October and March in the 1988/89, 1989/90 and 1990/91 seasons. Responses to spring-applied fertilizer N over the range 0-320 kg/ha were determined. Earlier sowing did not increase uptake of soil N by the crop. Fertilizer N increased grain N offtake by between 25 and 140 kg/ha and yield by between 0.3 and 5.5 t/ha, although grain yield was less responsive to fertilizer N at later sowing dates. Apparent recovery of fertilizer N (AFR) also decreased as sowing was delayed but there was no effect of delayed sowing on the amount of grain produced from each kg of fertilizer N recovered. Because fertilizer N recovery decreased with later sowing, the amount of fertilizer N needed to produce the optimum economic grain yield was not reduced. Neither AFR nor optimum fertilizer (N-opt) was related to optimum yield. Regression of N-opt on the difference between optimum yield and yield without fertilizer N (Delta(Y)) explained 77 % of the variance in N-opt. There was an inverse relationship between Delta(Y) and soil mineral N (SMN) in spring; regression of Delta, on SMN in spring accounted for 29 % of the variance in Delta(Y). Current advisory systems which adjust economic fertilizer N recommendations according to anticipated yield are not justified by these results. Moreover the adjustments made, based on yield expectation, appear about three times as large as those needed to minimize residues of fertilizer N left unrecovered by the crop and to reduce the risk of nitrate leaching in the following winter. [References: 33].

4284 Zauralov, O.A.; Chernavina, M.V. (1994) **[Effect of 2, 4-D and mineral mixture on wheat development and crop yield in forest steppe zone of Russia]. Vliyanie 2, 4-D i mineral'noj smesi na razvitie i urozhajnost' pshenitsy v lesostepnoj zone Rossii.** *Agrokhimiya (Russian Federation) (no.10) p. 61-66.* 14 ref. Russian. (AGRIS 95-108862).

F02 PLANT PROPAGATION

4285 Bablak, P.; Draper, J.; Davey, MR.; Lynch, PT. (1995) **PLANT REGENERATION AND MICROPROPAGATION OF BRACHYPODIUM DISTACHYON.** *Plant Cell Tissue & Organ Culture. 42(1):97-107.* English. [UNIV LEICESTER DEPT BOT UNIV RD LEICESTER LE1 7RH LEICS ENGLAND].

Brachypodium distachyon (L.) P Beauv, has several features of its genome and growth habit reminiscent of Arabidopsis thaliana (L.) Heyn, that may allow it to be developed as a model molecular genetic system representative of the temperate grasses. In order for B, distachyon to be exploited in this way, it will be necessary to develop tissue culture procedures. This report details initial studies of the characteristics of mature seed-derived callus and the production of fertile plants from callus of three ecotypes of B. distachyon. Optimum development of embryogenic callus occurred on LS (Linsmaier & Skoog 1965) and N6 (Chu et al. 1975) media containing 3.0% w/v sucrose and 11.25 mu M (2.5 mg 1(-1)) 2, 4-dichlorophenoxyacetic acid. Plants were recovered at a high frequency from embryogenic callus of ecotype B200 maintained on growth regulator-free N6 medium and were easy to establish in compost. A method was also developed for the in vitro clonal propagation of shoots using MS (Murashige & Skoog 1962) medium supplemented with 4 to 13 mu M (1.0 to 3.0 mg 1(-1)) benzyladenine. It was concluded that B. distachyon performed well in tissue culture and was suitable for further studies aimed at genetic transformation and its continued development as a model molecular genetic system. [References: 32].

4286 Espelund, M.; Debedout, JA.; Outlaw, WH.; Jakobsen, KS. (1995) **ENVIRONMENTAL AND HORMONAL REGULATION OF BARLEY LATE-EMBRYOGENESIS-ABUNDANT (LEA) MRNAS IS VIA DIFFERENT SIGNAL TRANSDUCTION PATHWAYS.** *Plant Cell & Environment. 18(8):943-949.* English. [UNIV OSLO DIV GEN GENET POB 1031 N-0315 OSLO NORWAY].

Late-embryogenesis-abundant (Lea) genes are induced in immature embryos by ABA and osmotic stress, Using the ABA-biosynthesis inhibitor norflurazon in combination with ionic and non-ionic stress, the expression of three distinct groups of Lea transcripts in immature barley embryos was investigated, these groups being embryo- and aleurone-specific B15C mRNAs, embryo-specific B19 mRNAs, and rab/dehydrin mRNAs, which encode stress-related proteins that are also expressed in vegetative tissues, The expression of B15C and rab/dehydrins in response to mannitol was not affected by the addition of norflurazon, which decreased the endogenous ABA levels by 89%; this observation is consistent with an ABA-independent pathway, The expression of B19 was only slightly dependent on ABA, In contrast, induction of the Lea genes by salt (NaCl) required at least 25 mu mol m(-3) endogenous ABA. Together, these results are evidence for different signal transduction pathways linking ionic and non-ionic osmotic stress to Lea mRNA accumulation in barley embryos. [References: 43].

4287 Fretz, A.; Lorz, H. (1995) **CRYOPRESERVATION OF IN VITRO CULTURES OF BARLEY (HORDEUM VULGARE L AND H-MURINUM L) AND TRANSGENIC CELLS OF WHEAT (TRITICUM AESTIVUM L).** *Journal of Plant Physiology. 146(4):489-496.* English. [INST GEN BOT AMP II OHNHORSTSTR 18 D-22609 HAMBURG GERMANY].

Different barley cultivars of embryogenic suspensions (Hordeum vulgare L.) and calli (Hordeum murinum L., H. vulgare) were successfully cryopreserved. Best survival was obtained when cells were precultured with 0.5 mg/kg (+) abscisic acid (ABA). Cells were treated with various cryoprotectants, slowly cooled at a constant rate (1 K/min) to -40 degrees C and stored up to 4 weeks in liquid nitrogen. After rapid thawing cell growth resumed within 2 weeks and fertile plants were regenerated. Calli subjected to ABA produced about twice as many somatic embryos than non-treated cells. However, the number of shoots did not differ from control cultures. Application of 10 g/kg ascorbic acid (vitamin C) decreased lipid peroxidation measured as malondialdehyde level and, thus, increased survival. Furthermore, storage in liquid nitrogen did not alter post-thawing NPT-activity in transgenic calli of wheat (Triticum aestivum L.), corroberating cryopreservation as the optimal means to guarantee genetic stability of valuable cell lines. [References: 40].

4288 Grilli, I.; Bacci, E.; Lombardi, T.; Spano, C.; Floris, C. (1995) **NATURAL AGEING - POLY(A) POLYMERASE IN GERMINATING EMBRYOS OF TRITICUM DURUM WHEAT.** *Annals of Botany. 76(1):15-21.* English. [UNIV PISA DEPT BOT SCI VIA LUCA GHINI 5 I-56123 PISA ITALY].

The viability of seeds is associated with ageing and storage conditions. A loss of viability is accompanied by slow germination, reduced growth, and a decline in protein and poly(A)(+)RNA synthesis. This paper reports on the activity of poly(A) polymerase in dry and germinating embryos of Triticum durum Desf. cv. Cappelli caryopses of different ages and viability. The enzyme was present as a single form during ageing and germination. The poly(A) polymerase was active at decreasing levels in all aged dry embryos, in parallel with loss of viability. Its activity strongly increased during the germination only in viable embryos. The observed increase was due to de novo synthesis of the enzyme. Poly(A) polymerase synthesis was low during germination of less viable embryos and absent in older ones. Reduced poly(A) polymerase activity in dry or germinated wheat embryos may cause a shortening of poly(A) chains in vitro and a decline in poly(A)(+)RNA synthesis. (C) 1995 Annals of Botany Company [References: 31].

4289 Kopertekh, LG.; Butenko, RG. (1995) **NATURALLY OCCURRING PHYTOHORMONES IN WHEAT EXPLANTS AS RELATED TO WHEAT MORPHOGENESIS IN VITRO.** *Russian Journal of Plant Physiology. 42(4):488-491.* English. [RUSSIAN ACAD SCI KA TIMIRYAZEV PLANT PHYSIOL INST BOT SKAYA 35 MOSCOW 127276 RUSSIA].

The levels of endogenous phytohormones in the explants (immature embryos) and derived morphogenic callus tissues of wheat (Triticum aestivum L.), cv. Taezhnaya and line Fotos, were assayed. The explants from line Fotos contained more cytokinins but less IAA and ABA, as compared with those from cv. Taezhnaya. When these explants were cultured on the same nutrient medium under similar growth conditions, they behaved differently: line Fotos produced callus tissues more rapidly than cv. Taezhnaya. The two genotypes also differed in the frequency of morphogenic tissue formation and regeneration capacity. After two subcultures, initial differences in the phytohormone levels between the two genotypes diminished, and the morphogenic callus of both genotypes was essentially similar in the relative contents of different phytohormones. Endogenous phytohormone status is supposed to be one of the factors affecting the induction of callus formation and morphogenesis. Exogenous 2, 4-D exerts noticeable effects on the endogenous phytohormone contents during long-term tissue culturing. [References: 17].

4290 Krautwig, B.; Lorz, H. (1995) **SINGLE ANDROGENETIC STRUCTURES OF MAIZE (ZEA MAYS L) FOR THE INITIATION OF HOMOGENEOUS CELL SUSPENSION AND PROTOPLAST CULTURES.** *Plant Cell Reports. 14(8):477-481.* English. [INST ALLGEMEINE BOT AMP 2 OHNHORSTSTR 18 D-22609 HAMBURG GERMANY].

Induction of androgenesis in maize leads to heterogeneous callus types in terms of chromosome number and regeneration ability. In order to obtain homogeneous cell suspensions from androgenetic material we initiated maize cultures from single microspore-derived structures. Cultures were established either by transfer of previously selected type-II callus or by transfer of single aggregates directly into suspension medium. During establishment no selection was performed. Independent suspension lines were analysed with respect to their chromosome number, their embryogenic capacity, and their regeneration ability. Cytological analysis revealed that most of the cultures tested showed a constant chromosome number over a period of 18 months, indicating a homogeneous constitution Within regenerable lines no difference in embryogenic capacity could be observed when smaller (1mm) and larger (4mm) aggregates were compared. Furthermore, their homogeneous character was confirmed by the regeneration of only green or albino plants from the individual lines. Chromosome analysis of regenerants by root tip cytology showed that their numbers corresponded to that of the suspension they were regenerated from. Similar results showing the homogeneous nature of the lines were obtained in protoplast culture and regeneration experiments. [References: 18].

4291 Ling, DX.; Luckett, DJ.; Darvey, NL. (1995) **A COST-BASED INDEX OF ANTHER CULTURE RESPONSE IN DIVERSE WHEAT-BREEDING GERMPLASM.** *Australian Journal of Experimental Agriculture. 35(3):395-401.* English. [NSW AGR AGR RES INST WAGGA WAGGA NSW 2650 AUSTRALIA].

Anther culture response in a diverse range of Australian wheat-breeding genotypes was tested and expressed as a 'culturability index' based on the actual costs of the various laboratory procedures. When the delay from harvest to plating was up to 12 h, the use of low dose gamma irradiation did not increase the anther culture response in this array of genotypes. This is in contrast to previous findings for which spike harvesting, irradiation, and plating was completed within 3 h and the irradiation treatment increased the anther culture response. Internal contamination of immature spike explants with Fusarium poae caused significant loss of cultures and may be a persistent problem for cereal anther culture. For the genotypes producing green regenerants, costs ranged from $A1.40 to $85/green regenerant. [References: 20].

4292 Maheshwari, N.; Rajyalakshmi, K.; Baweja, K.; Dhir, SK.; Chowdhry, CN.; Maheshwari, SC. (1995) **IN VITRO CULTURE OF WHEAT AND GENETIC TRANSFORMATION - RETROSPECT AND PROSPECT (VOL 14, PG 149, 1995).** *Critical Reviews in Plant Sciences. 14(3):281-282.* English.

4293 Marcinska, I.; Dubert, F.; Biesagakoscielniak, J. (1995) **TRANSFER OF THE ABILITY TO FLOWER IN WINTER WHEAT VIA CALLUS TISSUE REGENERATED FROM IMMATURE INFLORESCENCES.** *Plant Cell Tissue & Organ Culture. 41(3):285-288.* English. [POLISH ACAD SCI DEPT PLANT PHYSIOL PODLUZNA 3 PL-30239 KRAKOW POLAND].

Using two wheat varieties (Triticum aestivum L., winter 'Grana' and spring 'Jara') the ability of callus from immature inflorescences to differentiate into new plants was studied. In the case of the winter wheat the requirement for vernalization of the newly developed plants to attain the ability for heading was investigated. Callus was developed from 1-2 mm fragments of immature inflorescences, 5-10 mm in length, on Murashige and Skoog medium containing 1 mg l(-1) 2, 4-D, 3% sucrose and 0.6% agar, at 25 degrees C and in continuous light of about 6.4 W m(-2) PAR energy. After 6 weeks of culture green centres of differentiation were observed. During the following 4 weeks culture on MS medium free of 2, 4-D, leaf-like structures as well as a small number of roots were obtained. The regenerants were rooted on a half-strength MS medium, then transferred to pots of soil and placed in a glasshouse with 16 h photoperiod at a temperature day/night 23/17 degrees C. After about 6 weeks of culture in the glasshouse, almost all regenerants (98%) headed and were fertile, producing normal seeds, including the winter variety. The heading of winter plants under conditions excluding vernalization indicates that the callus tissue derived from a generative organ transmits the state of generative induction onto the developing new plants. [References: 21].

4294 Rakoczytrojanowska, M.; Malepszy, S. (1995) **GENETIC FACTORS INFLUENCING THE REGENERATION ABILITY OF RYE (SECALE CEREALE L) .2. IMMATURE EMBRYOS.** *Euphytica. 83(3):233-239.* English. [AGR UNIV WARSAW INST HORT PLANT GENET & BREEDING NOWOURSYNOWSKA 166 PL-02766 WARSAW POLAND].

Immature embryos of seven rye inbred lines were cultured on modified MS medium containing 3 mg/dm(-3) 2, 4-D. According to the in vitro response lines were divided into four groups: (1) those producing non-embryogenic callus (NEC) from above 30% of the embryos and having a high rate of non-responding (NR) embryos, (2) those producing non-embryogenic callus (NEC) from the majority of embryos, (3) those producing NEC by the majority of embryos with a high percentage of calli regenerating roots, (4) those producing embryogenic callus (EC) and regenerating plants by above 50% of the embryos. The inheritance of these response types was analysed in F-1, F-2, and F-3 generations of crosses of some lines. The results obtained indicate that EC production and both plant and root regeneration are determined by recessive genes whereas the reduced ability for NEC production most probably by dominant genes. The lack of response is controlled by at least two interacting genes. [References: 28].

4295 Symillides, Y.; Henry, Y.; Debuyser, J. (1995) **ANALYSIS OF CHINESE SPRING REGENERANTS OBTAINED FROM SHORT- AND LONG-TERM WHEAT SOMATIC EMBRYOGENESIS.** *Euphytica. 82(3):263-268.* English. [AGR UNIV ATHENS IERA ODOS 75 GR-11855 ATHENS GREECE].

Somatic embryogenesis was initiated from 'immature embryos' on Murashige-Skoog (MS) medium plus 2 mg.l(-1) 2, 4-dichlorophenoxyacetic acid, 2% sucrose and 0.6% agarose. Somatic embryos were isolated and regenerated into whole green plants on MS medium devoid of 2, 4-D. These regenerants were previously demonstrated to differ in their mitochondrial DNA organization. In order to estimate their characteristics three progenies of short-term culture regenerants and three progenies of long-term culture regenerants were analyzed and compared to the parental line. These somaclones obtained from the wheat variety Chinese Spring were evaluated for variation of 13 agronomic and morphological quantitative characters in comparison to the parental line. Significant variation was observed for plant height, spike length, main tiller diameter, between the somaclones regenerated from long-term culture and their parent. Differences were observed to increase with the duration of culture, leading to a significant modification of the structure of the plants. Several changes occurred during the somatic tissue cultures, but to a lesser extent than has previously been described in the literature. [References: 45].

4296 Szakacs, E.; Barnabas, B. (1995) **THE EFFECT OF COLCHICINE TREATMENT ON MICROSPORE DIVISION AND MICROSPORE-DERIVED EMBRYO DIFFERENTIATION IN WHEAT (TRITICUM AESTIVUM L) ANTHER CULTURE.** *Euphytica. 83(3):209-213.* English. [HUNGARIAN ACAD SCI AGR RES INST H-2462 MARTONVASAR HUNGARY].

The relationship between division symmetry and in vitro microspore embryo genesis was studied using two winter wheat varieties of high embryogenic capacity. Anther cultures were treated with colchicine added to the induction media at concentrations of 0.01%, 0.02% and 0.04%. As a result of the colchicine treatment, the rate of symmetrical divisions increased significantly which was followed by a significant increase in the microspore-derived embryo frequency. The effect of colchicine was not dependent on the concentrations used. On the basis of this it can be supposed that there is a clear relationship between symmetric divisions and microspore-derived embryo differentiation. [References: 24].

4297 Winfield, MO.; Karp, A.; Lazzeri, PA.; Davey, MR. (1995) **CHROMOSOME 5D INSTABILITY IN CELL LINES OF TRITICUM TAUSCHII AND MORPHOLOGICAL VARIATION IN REGENERATED PLANTS.** *Genome. 38(4):737-742.* English. [UNIV BRISTOL DEPT AGR SCI LONG ASHTON RES STN INST ARABLE CROPS RES BRISTOL BS18 9AF AVON ENGLAND].

Immature embryos of Triticum tauschii cultured on L2 medium with 30 g . L(-1) maltose gave rise to compact and highly structured callus that readily regenerated shoots when transferred to MS medium supplemented with zeatin and indole-3-acetic acid. Two cell suspensions were initiated from the callus induced on L2 medium. An analysis of chromosome number in these cell suspensions after 3 months of culture showed that 95 and 75% of the cells had a normal complement. After 5 months, in both lines the majority of cells had chromosome complements of 2n = 13 and many of these aneuploid cells possessed a dicentric chromosome. C-banding indicated that the dicentric was often formed from chromosomes 2D and 5D. Fifty-six plants regenerated from callus were grown to maturity. Variation was observed in tiller number, flowering time, and seed-set; in two cases, the variation in early flowering was shown to be heritable. All the regenerants analysed had normal chromosome counts (2n = 2x = 14) and meiotic analyses of 35 plants revealed no obvious structural rearrangements. [References: 19].

4298 Zorinyants, SE.; Nosov, AV.; Badaeva, ED.; Smolenskaya, IN.; Badaev, NS. (1995) **CYTOGENETIC ANALYSIS OF A LONG-TERM TRITICUM TIMOPHEEVII (ZHUK) ZHUK CELL SUSPENSION CULTURE.** *Plant Breeding-Zeitschrift fur Pflanzenzuchtung. 114(3):219-225.* English. [RUSSIAN ACAD SCI KA TIMIRYAZEV INST PLANT PHYSIOL BOT SKAYA STR 35 MOSCOW 127276 RUSSIA].

In vitro culturing of plant cells can cause changes in karyotype. Chromosome variations following long-term propagation in suspension culture of Triticum timopheevii (Zhuk.) Zhuk. were studied by routine staining and C-banding. The culture was highly heterogeneous with respect to the number and structure of chromosomes. The modal class cells had a lower chromosome number than T. timopheevii (2n = 28). This data was confirmed by cytophotometric analysis of nuclear-DNA content. Frequencies of chromosome loss varied for different homoe- ologous groups. A(t) genome chromosomes tended to be preferentially eliminated in cells of different ploidy levels. Deletions, insertions, translocations, telocentric chromosomes, isochromosomes and dicentrics and their derivatives were observed in cultured cells. Chromosomes of various homoeologous groups differed in the frequencies and spectra of re-arrangements, but most aberrations occurred in the G-genome chromosomes. In vitro chromosome modifications did not correspond to in vivo variation. Presumably, this difference was caused by differences in the mechanisms of adaptation to the environment at the levels of the cell and the whole organism. G-genome chromosomes were more frequently involved in this process, both in vivo acid in vitro. [References: 34].

F03 SEED PRODUCTION

4299 Basu, R.N. (1994) **An appraisal of research on wet and dry physiological seed treatments and their applicability, with special reference to tropical and sub-tropical countries.** Calcutta Univ., Calcutta (India). University College of Agriculture. *Seed Science and Technology (Switzerland); Proceedings of the International Seed Testing Association v. 22(1) p. 107-126.* numerous references. English. (AGRIS 95-109669).

4300 Castro, C. (EMBRAPA/CENARGEN, Brasilia (Brasil)); Schaad, N.W.; Bonde, M.R. (US Department of Agriculture, Frederick (USA). Agricultural Research Service) (1994) **A technique for extracting Tilletia indica teliospores from contaminated wheat seeds.** *Seed Science and Technology (Switzerland); Proceedings of the International Seed Testing Association v. 22(1) p. 91-98.* 1 table, 1 photograph, numerous ref. English. (AGRIS 95-109655).

4301 Kashyap, R.K.; Chaudhary, O P.; Sheoran, I.S. (CCS Haryana Agricultural Univ., Hisar (India). Seed Technology Centre) (1994) **Effects on insecticide seed treatments on seed viability and vigour in wheat cultivars.** *Seed Science and Technology (Switzerland); Proceedings of the International Seed Testing Association v. 22(3) p. 503-517.* 8 tables, 7 graphs, numerous ref. English. (AGRIS 95-109658).

4302 Kashyap, R.K.; Duhan, J.C. (Haryana Agricultural Univ., Hisar (India). Seed Technology Centre) (1994) **Health status of farmers' saved wheat seed in Haryan, India.** *Seed Science and Technology (Switzerland); Proceedings of the International Seed Testing Association v. 22(3) p. 619-628.* 8 tables, 14 ref. English. (AGRIS 95-109693).

4303 Kim, S.H.; Kang, J.H. (Gyeongsang National Univ., Chinju (Korea Republic)); Copeland, L.O.; Elias, S. (Michigan State Univ., East Lansing (USA). Department of Crop and Soil Sciences) (1994) **Multiple seed vigour indices to predict field emergence and performance of barley.** *Seed Science and Technology (Switzerland); Proceedings of the International Seed Testing Association v. 22(1) p. 59-68.* 7 tables, numerous ref. English. (AGRIS 95-109668).

4304 Maykuss, F. (Landwirtschaftskammer Hannover, Bezirksstelle Uelzen (Germany)) (1994) **[Is seed dressing still necessary?]. Noch beizen?** *Agrar-Uebersicht (Germany) v. 45(6) p. 32-33.* 1 ill., 1 table. German. (AGRIS 95-109660).

4305 Moreno Martinez, E.; Vazquez Badillo, M.E.; Navarrette, R.; Ramirez Gonzalez, J. (Quimica Hoechst Mexico, Mexico D.F. (Mexico)) (1994) **Effect of fungi and chemical treatment on viability of maize and barley seeds with different storage characteristics.** *Seed Science and Technology (Switzerland); Proceedings of the International Seed Testing Association v. 22(3) p. 541-549.* 4 tables, numerous ref. English. (AGRIS 95-109677).

4306 Murariu, D.; Cristea, M.; Fartais, L.; Drochioiu, G.; Raibuh, A. (Banca de Gene, Suceava (Romania)); Murariu, M. (Statiunea de Cercetari Agricole, Suceava (Romania)) (1994) **[Influence of temperature and**

moisture on the viability of seeds of some plant species in custody of the gene bank in Suceava]. Influenta temperaturii si umiditatii asupra viabilitatii semintelor unor specii de plante pastrate in banca de gene de la Suceava. *Analele Institutului de Cercetari pentru Cereale si Plante Tehnice Fundulea (Romania) v. 61 p. 57-64.* 5 tables; 4 graphs; 8 ref. Romanian. (AGRIS 95-109681).

Keeping of the viability of the seeds on high level for a long time, represent one of the main objective of preservation of genetic vegetable resources in gene banks. The studies were carried out at the Bank of Genes in Suceava regarding simultaneous influence of temperature and moisture of seeds on the viability of seeds, catalase activity and dynamics of cells division. Researches were performed regarding viability of seeds and catalase activity and pointed out the similitude and differences between the analysed species (barley, maize, horse-bean, linen). Moisture and temperature have strongly influenced the viability of seeds in limes and the catalase activity in maize. Cytological observations regarding mitotic division showed that dynamics of cells division depends on two factors under study.

4307 Panajotov, I.; Todorov, I.; Dobreva, S. (Institut po Pshenitsta i Sl"nchogleda "Dobrudzha", General Toshevo (Bulgaria)) (1994) **[Survey on the progress of wheat seed production at the Institute of wheat and sunflower "Dobrudzha" during the 1969 - 1991 period and germinative characteristics of the wheat varieties]. Semeproizvodstvo na pshenitsata v Instituta po pshenitsata i sl"nchogleda "Dobrudzha" prez perioda 1969-1991 g. i osobenosti na sortovete pri ponikvane.** Selskostopanska Akademiya, Sofia (Bulgaria). Ministerstvo na Zemedelieto. *Selskostopanska Nauka i Proizvodstvo (Bulgaria); Agricultural Science and Production v. 1(1-2) p. 8-13.* 3 ill., 3 tables; 12 ref. Bulgarian. (AGRIS 95-109691).

Seed production is carried out according to a modified scheme for one-year testing of the progenies. Substantial difference exists between varieties and such indices as uniformity of plants and seeds, seed amounts and quality of fractions. At the present stage the extent of each variety spreading and the amount of the superelite and elite seed material depends first of all on its plasticity, its economic efficiency and grain quality. Wheat breeding carried out at the Institute of Wheat and Sunflower aims at attaining these indices. Highest capacity for germination from varying depth of sowing display Vratsa and Slavyanka 196 varieties. The sowing depths in the remaining varieties should not exceed 5 cm.

4308 Samsonaw, U.P.; Paznyak, S.S. (Belarus Research Institute of Arable Farming and Fodders, Zhodino (Belarus)) (1994) **[Incrustation of seeds of spring barley]. Inkrustatsyya nasennya yaravoga yachmenyu.** *Vestsi Akadehmii Agrarnykh Navuk Belarusi (Belarus) (no.3) p. 7-10.* 1 table, 3 ref. Byelo Russian. (AGRIS 95-109667).

Barley seed incrustation using M-3 polymer, flavobacterin, cartolin and oxyhumate is an effective technique which increases seed field germination, grain yield and makes it possible to exclude in some cases the use of toxic chemicals.

4309 Schilder, A.M.C.; Bergstrom, G.C. (Cornell Univ., Ithaca (USA). Department of Plant Pathology) (1994) **Pyrenophora tritici-repentis as a component of the fungal flora of winter wheat seed in New York.** *Seed Science and Technology (Switzerland); Proceedings of the International Seed Testing Association v. 22(2) p. 285-297.* 1 table, 3 graphs, 15 photographs, numerous ref. English. (AGRIS 95-109656).

4310 Stoyanova, S.D. (1994) **Expression of gliadin in a dominant mutation of wheat seeds.** Institute of Introduction and Plant Genetic Resources, Sadovo (Bulgaria). *Seed Science and Technology (Switzerland); Proceedings of the InternationalSeed Testing Association v. 22(3) p. 477-484.* 3 tables, 2 graphs, numerous ref. English. (AGRIS 95-109657).

4311 Winter, W.; Baenziger, I.; Ruegger, A. (Eidg. Forschungsanstalt fuer landwirtschaftlichen Pflanzenbau, Reckenholz (Switzerland)) (1995) **[New ways for the treatment of wheat seeds]. Neue Wege in der Weizen-Saatgutbeizung.** *Agrar Forschung (Switzerland) v. 2(4) p. 137-140.* 2 tables, 2 graphs, 5 photographs, 10 ref. German. (AGRIS 95-109659).

Routine health tests (1977-1993) showed that Septoria nodorum and Fusarium nivale were dominant pathogens on certified seed. This article explains the various evolution of pathogens.

F04 FERTILIZING

4312 **The long-term influence of phosphorous application on soil phosphorous content, growth and yield of wheat under rainfed conditions** (1995) Fertilizer Society of South Africa, Pretoria (South Africa). *Plantfood (South Africa) v. 6(1-2) p. 5.* English. (AGRIS 95-109950).

4313 Alvarez, J.B.; Martin, L.M. (Universidad Nacional de Cordoba (Spain). Dept. de Genetica); Ballesteros, J. (Consejo Superior de Investigaciones Cientificas, Cordoba (Spain). Inst. de Agricultura Sostenible) (1994) **[Influence of nitrogen fertilization on breadmaking quality of hexaploid tritordeum]. Influenza della concimazione azotata sulla qualita' di tritordeum esaploide da panificazione.** *Journal of Genetics and Breeding (Italy) v. 48(4) p. 323-328.* 5 tables; 1 graph; 25 ref. English. (AGRIS 95-098078).

The influence of nitrogen fertilization on breadmaking quality of tritordeum was studied in comparison with durum wheat and hexaploid triticale. The tritordeum genotypes showed high SDS-sedimentation volumes, seed hardness and yellow pigment content compared with triticale. Moreover, tritordeum and triticale possessed lower test weights and kernel weights, as well as higher hardness indexes than durum wheat. Nitrogen fertilization (0, 150 and 300 kg/ha) was found to increase protein content and decrease test weight and kernel weight.

4314 Ayoub, M.; Guertin, S.; Smith, DL. (1995) **NITROGEN FERTILIZER RATE AND TIMING EFFECT ON BREAD WHEAT PROTEIN IN EASTERN CANADA.** *Journal of Agronomy & Crop Science-Zeitschrift fur Acker und Pflanzenbau. 174(5):337-349.* English. [MCGILL UNIV DEPT PLANT SCI MACDONALD CAMPUS 21111 LAKESHORE RD ST ANNE DE BELLEVUE PQ H9X 3V9 CANADA].

Nitrogen management for production of bread quality wheat (Triticum aestivum L.) in eastern Canada has received little research attention. An experiment was conducted for 2 years at each of two sites in Quebec to study the effect of level and timing of nitrogen (N) fertilizer application on grain protein concentration, protein content per seed, non-protein seed dry matter, grain protein yield and nitrogen harvest index (portion of plant N in the grain) of four hard red spring wheat cultivars known to have potential as bread wheats in eastern Canada. The soil types were Bearbroock clay (fine, mixed, non-acid, frigid, Humaquept) and Ste-Rosalie clay (typic, non-acid, frigid, Humaquept). The experiment was a 4 x 4 x 2 factorial. Four cultivars were used: Columbus, Katepwa, Max and Hege 155-85. In both years 0, 60, 120 and 180 kg N ha(-1) were applied either all at seeding or 60% at seeding and 40% at heading. Grain protein concentration and grain protein yield increased consistently with increasing N fertilizer and with split N application. Nitrogen harvest index was not increased by increasing applications of N fertilizer. Protein content per seed was more critical in determining grain protein concentration than non-protein seed dry matter content. The western Canadian cultivars Columbus and Katepwa generally had greater grain protein concentration than the European cultivars Max and Hege 155-85. With reasonable N fertility the grain protein concentration of spring wheats grown in eastern Canada are sufficient for bread production. [References: 34].

4315 Barreto, HJ.; Bell, MA. (1995) **ASSESSING RISK ASSOCIATED WITH N FERTILIZER RECOMMENDATIONS IN THE ABSENCE OF SOIL TESTS.** *Fertilizer Research. 40(3):175-183.* English. [CIMMYT LISBOA 27 APARTADO POSTAL 6-641 MEXICO CITY 06600 DF MEXICO].

In many developing countries, fertilizer recommendations must be made in the absence of plant and soil analyses. When the region is variable in terms of soils, weather, and magnitude of response to fertilizer, a recommendation is likely to involve a high degree of risk for the farmer. Quantification of such risk is key to developing appropriate recommendations for the farmer. However, most methodologies generally used in analyzing fertilizer trials do not allow adequate quantification, especially as a continuous function, of the risk associated with a given recommendation. Three years of on-farm trials conducted in the High Valley of Mexico were used to evaluate different methodologies for generating N fertilization recommendations and their associated risk for wheat (Triticum aestivum) production in the absence of soil tests. When the traditional approach, using average yield responses or separate trial

results, was used, an economic optimum was identified, but it was not possible to quantify the associated risk. In contrast, however, by using a combination of response surface methodology and simple probability analysis, the risk associated with any given recommendation was developed, even under the highly variable conditions of the study zone. The approach uses a treatment difference matrix (developed using average yield differences between a treatment and the zero N (ON) check) and its associated standard deviation over locations. From the matrix, an equation (being a function of N rate and relative grain:N price ratios) was developed that shows the probability of outperforming the ON check for the economic optimum rate.

4316 Berzin, A.M.; Chuprova, V.V.; Voloshin, E.I. (1994) **[Effect of green manure on fertility of leached chernozem and grain crop yield under conditions of Krasnoyarsk forest steppe [Russian Federation]]. Vliyanie sideratov na plodorodie chernozema vyshchelochennogo i urozhajnost' zernovykh kul'tur v usloviyakh Krasnoyarskoj lesostepi.** *Agrokhimiya (Russian Federation) (no.11) p. 16-24.* 5 ref. Russian. (AGRIS 95-110071).

4317 Boman, RK.; Westerman, RL.; Raun, WR.; Jojola, ME. (1995) **TIME OF NITROGEN APPLICATION - EFFECTS ON WINTER WHEAT AND RESIDUAL SOIL NITRATE.** *Soil Science Society of America Journal. 59(5):1364-1369.* English. [OKLAHOMA STATE UNIV DEPT AGRON STILLWATER, OK 74078 USA].

Rate and time of N fertilizer application can affect winter wheat (Triticum aestivum L.) forage and grain yield and quality, and may influence residual NO3-N concentration and distribution in the soil profile. Objectives of this experiment were to determine the effects of N fertilizer rate and time of application on forage and grain yield, N uptake, and distribution of residual soil NO3-N. Field experiments were conducted for four consecutive years on a Teller sandy loam (fine-loamy, mixed, thermic Udic Argiustoll) cropped to winter wheat under conventional tillage, Urea-ammonium nitrate (UAN) was broadcast and incorporated before planting (PPI or topdressed in December (Feekes 3), January Gate Feekes 3), February (Feekes 4), or March (Feekes 5-6) at rates of 34, 67, 101, and 134 kg N ha(-1), Soil samples were taken from each plot after each grain harvest to 1.2 m and analyzed for NH4-N and NO3-N, Forage yield response (measured in late March to mid-April) to January and December N application was comparable to PPI when adequate precipitation was received after N was applied. Applying N in February and March resulted in plant tissue damage and lower forage yields due to less early-season growth than with other applications. Apparent fertilizer N recovery in forage was highest when N was applied at or before mid-January, Date of N application had minimal influence on grain yields, Quadratic response surface models suggest the optimum time of N application for maximum forage and grain yields to be mid-November and early January, respectively. Timing of N application had no effect on residual NH4-N and little influence on residual NO3-N concentration and distribution in the soil profile at the end of each cropping cycle. [References: 24].

4318 Byazlyudny, M.M.; Newmyarzhytski, M.U.; Shypko, P.I. (Belarus Research Institute of Arable Farming and Fodders, Zhodzina (Belarus)) (1994) **[Productivity of different barley varieties at different levels of use of chemical means]. Uradzhajnasts' roznykh sartow yachmenyu pry roznykh uzrownyakh vykarystannya srodkaw khimizatsyi.** *Vestsi Akadehmii Agrarnykh Navuk Belarusi (Belarus) (no.3) p. 29-32.* 2 tables. Byelo Russian. (AGRIS 95-109970).

4319 Conyers, M.K.; Poile, G.J.; Scott, B.J.; James, K.N. (New South Wales Agriculture, Wagga Wagga (Australia)); Mullen, C.L. (New South Wales Agriculture, Dubbo (Australia)) (1994) **Long term benefits of lime applications to crop yield on acidic soils.** New South Wales Agriculture. 5 fig., 4 ref. 17 p. English. (AGRIS 95-098044).

Reports o a project undertaken to: a. establish the residual long term benefits of limestone applications to grain yield, and b. establish the residual value of lime on surface (0-10cm) soil pH and the extent of long term lime movement into acidic subsurface soils. Results have shown a positive residual benefit of lime on grain yield. Reacidification rates following application is systematic and proportional to the maximum pH attained after liming. It is possible to ameliorate subsurface soil acidity with heavy applications of lime, which will move into the subsoil. However the cost is high, and the use of more acid tolerant wheat cultivars may be a more viable long term option.

4320 Davies, DB.; Sylvesterbradley, R. (1995) **THE CONTRIBUTION OF FERTILISER NITROGEN TO LEACHABLE NITROGEN IN THE UK - A REVIEW [Review].** *Journal of the Science of Food & Agriculture. 68(4):399-406.* English. [AGR DEV & ADVISORY SERV SOIL & WATER RES CTR ANSTEY HALL CAMBRIDGE CB2 2LF ENGLAND].

Evidence relating to nitrate leaching was taken from series of extensive field experiments conducted to support guidance on fertiliser use. Over the last 50 years, it is estimated that increased fertiliser N use on intensive wheat in the UK, has resulted in an increase of 36 kg N ha(-1) year(-1) leachable nitrate. Probably more than one-third of this change is due to larger yields resulting in a gradual build up in soil organic matter, the remainder to annual effects of fertiliser application. This justifies the association generally made between fertiliser used and nitrate leached and supports the value of some control of fertiliser use in order to restrict nitrate concentrations in drinking water. [References: 42].

4321 Demin, V.A.; Demin, N.I.; Vasil'ev, A.N. (1994) **[Effect of calculated fertilizer systems on the amount and quality of winter wheat crop yields in eight-field crop rotations on dark grey forest soil of Vladimir Opolie [Russian Federation]]. Vliyanie raschetnykh sistem udobreniya na velichinu i kachestvo urozhaya ozimoj pshenitsy v vos'mipol'nom sevooborote na temno-seroj lesnoj pochve Vladimirskogo opol'ya.** *Agrokhimiya (Russian Federation) (no.9) p. 65-70.* 6 ref. Russian. (AGRIS 95-110072).

4322 Doyle, A.D. (New South Wales Agriculture, Tamworth (Australia)) (1994) **Nitrogen application strategies for wheat in Northern New South Wales.** New South Wales Agriculture. 32 tables, 10 ref. 44 p. English. (AGRIS 95-098043).

Gives results of experiments undertaken to examine: a. the residual effects of nitrogen fertilizer in the second and third year after application, and b. the effect of pre-applying nitrogen up to three months before sowing wheat crops. Results show that when nitrogen is not used by a wheat crop in the year of application, much of it remains for use by subsequent crops and is not wasted, though total recovery does not appear to exceed 50%. Results of experiments with the pre-application of nitrogen indicate there may be an advantage in higher protein levels in wheat when nitrogen is applied before sowing. No disadvantage was suffered by early application.

4323 El Bana, A.Y.A.; Aly, R.M. (Zagazig Univ. (Egypt). Faculty of Agriculture) (1993) **Effect of nitrogen fertilization levels on yield and yield attributes of some wheat cultivars, Triticum aestivum L. in newly cultivated sandy soil.** *Zagazig Journal of Agricultural Research (Egypt) v. 20(6) p. 1739-1749.* 3 tables; 18 ref. English. (AGRIS 95-110064).

4324 El Gazzar, M.M.; Ahmed, M.A.; Zaki, N.M. (National Research Centre, Cairo (Egypt). Field Crops Research Dept.) (1993) **Effect of nitrogen fertilizer rates and cutting on forage grain and straw yields of wheat and barley.** *Annals of Agricultural Science, Moshtohor (Egypt) v. 31(1) p. 13-22.* 2 tables; 17 ref. English. (AGRIS 95-110066).

4325 El Khayat, E.F. (Zagazig Univ., Moshtohor (Egypt). Faculty of Agriculture) (1994) **Effect of nitrogen fertilization on wheat aphids infestation, bioenemies and grain production.** *Annals of Agricultural Science, Moshtohor (Egypt) v. 32(1) p. 557-566.* 4 tables; 15 ref. English. (AGRIS 95-110063).

4326 Fatyga, J.; Chrzanowska Drozdz, B. (Akademia Rolnicza, Wroclaw (Poland). Katedra Szczegolowej Uprawy Roslin) (1994) **[Influence of nitrogen fertilization on the grain yielding of winter triticale]. Wplyw nawozenia azotem na plonowanie pszenzyta ozimego.** *Zeszyty Naukowe Akademii Rolniczej we Wroclawiu. Rolnictwo (Poland) (no.238) p. 249-257.* 5 tables; 6 ref. Polish. (AGRIS 95-098040).

Different doses of nitrogen fertilizing were tested in Grado variety of winter triticale. Triticale was planted after oat which was planted second year after organic fertilization. Without nitrogen fertilization yield was 4.12 t/ha and with dose of nitrogen 120 kg/ha yield as 6.58 t/ha. Dose of nitrogen 150 kg/ha was given lower grain yield and lower TGW (1000

grain weight) than dose 120 kg N/ha. The highest protein yield per ha (9315 kg/ha) was obtained when the dose of nitrogen was 150 kg/ha. Dose of nitrogen 60 kg/ha used during spring vegetation (first stages) gave the best results of plants development and grain yield on this variety.

4327 Garcia, R.J.; Randall, A. (1994) **A cost function analysis to estimate the effects of fertilizer policy on the supply of wheat and corn.** *Review of agricultural economics (USA) v. 16(2) p. 215-230.* references. English. (AGRIS 95-110078).

Cost functions by crop (U.S. and French wheat and corn, and English wheat) are estimated and marginal costs derived. Fertilizer input demand and output supply elasticities, estimated via marginal cost, are computed capturing the effect of fertilizer-reducing policies (a tax and a quota). Supply and fertilizer demand effects are compared within and across countries. The results generally support the hypothesis that fertilizer-reducing policies have a greater effect on crop supplies that use fertilizer more intensively, and that fertilizer policy multilaterally imposed will give U.S. producers a relative competitive advantage vis-a-vis French and English producers.

4328 Genaidy, S.A.M. (Ministry of Agriculture, Cairo (Egypt). Faculty of Agriculture) (1994) **Fertilization of some cereal crops [wheat, faba bean, maize and rice] in Egyptian northern delta soils.** *Journal of Agricultural Sciences. Mansoura Univ. (Egypt) v. 19(4) p. 1599-1605.* 3 tables; 12 ref. English. (AGRIS 95-109964).

4329 Hamid, A.; Ahmad, M. (1995) **INTERACTION OF N-15-LABELLED AMMONIUM NITRATE, UREA AND AMMONIUM SULPHATE WITH SOIL N DURING GROWTH OF WHEAT (TRITICUM AESTIVUM L) UNDER FIELD CONDITIONS.** *Biology & Fertility of Soils. 20(3):185-189.* English. [NUCL INST AGR & BIOL DIV SOIL SCI POB 128 FAISALABAD PAKISTAN].

The effects of N-15-labelled ammonium nitrate, urea and ammonium sulphate on yield and uptake of labelled and unlabelled N by wheat (Triticum aestivum L. cv. Mexi-Pak-65) were studied in a field experiment. The dry matter and N yields were significantly increased with fertilizer N application compared to those from unfertilized soil. The wheat crop used 64.0 - 74.8%, 61.5 - 64.7% and 61.7 - 63.4% of the N from ammonium nitrate, urea and ammonium sulphate, respectively. The fertilizer N uptake showed that ammonium nitrate was a more available source of N for wheat than urea and ammonium sulphate. The effective use of fertilizer N (ratio of fertilizer N in grain to fertilizer N in whole plant) was statistically similar for the three N fertilizers. The application of fertilizer N increased the uptake of unlabelled soil N by wheat, a result attributed to a positive added N interaction, which varied with the method of application of fertilizer N. Ammonium nitrate, urea and ammonium sulphate gave 59.3%, 42.8% and 26.3% more added N interaction, respectively, when applied by the broadcast/worked-in method than with band placement. A highly significant correlation between soil N and grain yield, dry matter and added N interaction showed that soil N was more important than fertilizer N in wheat production. A values were not significantly correlated with added N interaction (r = 0.719). The observed added N interaction may have been the result of pool substitution, whereby added labelled fertilizer N stood proxy for unlabelled soil N. [References: 20].

4330 He, NZ.; Ye, ZQ.; Ouyang, H.; Xiong, JS. (1995) **EFFECT OF LIME NITROGEN ON THE EFFICIENCY OF UREA AND OTHER AMMONIUM NITROGEN FERTILIZERS.** *Fertilizer Research. 41(1):19-26.* English. [ZHEJIANG AGR UNIV DEPT LAND SCI & APPL CHEM HANGZHOU 310029 PEOPLES REPUBLIC OF CHINA].

Five pot experiments were conducted with wheat and rice in a net house to study the effect of lime nitrogen (LN, contains about 55% calcium cyanamide) amendment rates on the efficiency of urea, the recovery urea-N-15, the efficiency of the three nitrogen fertilizers (NF), on the efficiency of urea in the three soils, and on NO3- -N leaching from a flooded soil. A rate of LN-N of 5-8% of applied fertilizer N increased the recovery of labeled urea-N by 9.42%. The effect of LN on the efficiency of NF was urea > ammonium sulfate > ammonium chloride. Under flooded conditions, LN decreased NO, formation and leaching. Responses of several crops to LN amended fertilizers were also studied in field experiments. At equal NPK applications, the efficiency of basal applications to rice, wheat, corn, potatoes, soybean, peanut, grapes, peaches, melon and watermelon were better with LN than without. Efficiency with a basal fertilizer for rice or wheat with LN were the same as with the same fertilizer without LN applied in split applications.

4331 Hegab, M.T. (Ministry of Agriculture, Cairo (Egypt). Desert Research Centre) (1994) **Effect of nitrogen and potassium on wheat yield under Wadi Surd [of Egypt] conditions.** *Annals of Agricultural Science, Moshtohor (Egypt) v. 32(1) p. 21-34.* 9 tables; 22 ref. English. (AGRIS 95-109945).

4332 Ivojlov, A.V.; Bessonova, M.N.; Naumova, G.P. (1994) **[Crop quality and removal of basic nutrition elements with field rotation crops as influenced by fertilizer systems on leached heavy clay chernozems]. Kachestvo urozhaya i vynos osnovnykh ehlementov pitaniya kul'turami polevogo sevooborota v zavisimosti ot sistem udobreniya chernozema vyshchelochennogo tyazhelosuglinistogo.** *Agrokhimiya (Russian Federation) (no.10) p. 20-29.* 7 ref. Russian. (AGRIS 95-109991).

4333 Lonhardbory, E.; Nemeth, I.; Ragasits, I. (1995) **EFFECT OF N AND P FERTILIZATIONS ON THE GENERATIVE DEVELOPMENT OF WHEAT.** *Novenytermeles. 44(2):171-177.* Hungarian. [PANNON UNIV AGR SCI KESZTHELY HUNGARY].

Studies were made in a nutrient experiment on Ramann's brown forest soil at Keszthely on the effect of nitrogen and phosphorus on the development of wheat and its yield (ear length, ear mass, number of grains per ear). Nitrogen treatments: 87, 174 261 kg/ha P2O5 treatments: 60, 120 kg/ha According to the experiments the nutrient supply had a significant influence on the length of the development stages, especially during the initial development it was slower in the N and P deficient treatments. Among the different doses of N and P rates there was already only a small difference in development. These differences in development narrowed towards the end of vegetation period, and at ripening there was a difference of only 1-2 days. The nature of nutrient supply influenced decisively the quantitative indices of the ears. There were large, significant differences in the respect of ear length, ear mass, and number of grains per ear on the effect of fertilazation. The N or P deficient treatments were essentially behind the plots receiving entire nutrient supply. The ear length, ear mass and number of grains per ear did not increase linearly on the effect of nitrogen and phosphorus fertilizations. Between the effect of N-doses of 87 kg/ha and 174 kg/ha there was a smaller difference than in case of N-0 and N-dose of 87 kg/ha. Similarly the difference between the effect of P2O5 of 60 and 120 kg/ha was smaller than between the effect of P-0 and rate of 60 kg/ha. Results show that quantity acid ratio of fertilizers determine already at the beginning of the vegetation period the potentials of the development.

4334 Mimbe, JN.; Lafarge, M. (1995) **NITROGEN AND REDUCED IRRADIANCE EFFECTS ON EAR FERTILITY IN WINTER WHEAT.** *European Journal of Agronomy. 4(1):135-142.* English. [INRA AGRON STN 12 AV BREZET F-63039 CLERMONT FERRAND FRANCE].

Shading or nitrogen shortage were applied either continuously or removed at selected developmental stages, to single-stemmed plants of wheat. The number of competent florets was linked to both the ear growth rate and the plant growth potential before meiosis. Grain setting of these florets was also correlated with the ear growth rate before anthesis, suggesting that the competitiveness of competent florets was affected by conditions experienced during their formation. Therefore the ear fertility integrates previous history of the plant. From meiosis on ward, the growth of starved plants and the recovery of those re-supplied was better after a shading period than after nitrogen shortage. The growth of the ear did not seem to be hampered by the growth of the vegetative parts of the shoot. [References: 24].

4335 Neuberg, J.; Jedlicka, J.; Cervena, H. (Vyzkumny Ustav Rostlinne Vyroby, Prague Ruzyne (Czech Republic)) (1995) **[Plant nutrition and fertilizer application]. Vyziva a hnojeni plodin.** *Metodiky pro Zavadeni Vysledku Vyzkumu do Zemedelske Praxe - UZPI (Czech Republic); no. 8 64 p.* Ustav Zemedelskych a Potravinarskych Informaci. 27 tables; 5 ref. Czech. (AGRIS 95-110092).

4336 Nicola, I.; Duicu, I.; Ionescu, F. (Institutul de Cercetari pentru Cereale si Plante Tehnice Fundulea, Simnic (Romania). Statiunea de Cercetari Agricole Simnic Craiova); Grigoriu, V. (SC Cartrans, Craiova (Romania). Dep. Biotehnologii) (1994) **[The influence of mineral fertilization upon wheat yields and upon soil fertility of eroded slopes]. Influenta fertilizarii minerale asupra productiei de grau si a fertilitatii solului pe terenurile in panta erodate.** *Lucrari stiintifice (Romania) v. 9 p. 251-257.* 3 graphs; 5 ref. Romanian. (AGRIS 95-109948).

Research work carried out in wheat crops on eroded slopes emphasizes the influence of fertilizers upon yields. So, the maximum production gain is obtained using the dose of N160P160 (2000 kg/ha). The application of nitrogen and phosphorous in doses more than 100 kg/ha active stuff contributes to increase the content of these elements.

4337 Nicolescu, M.; Mititelu, C.; Croitoru, C.; Coifan, M. (Institutul de Cercetari pentru Cereale si Plante Tehnice Fundulea, Simnic (Romania). Statiunea de Cercetari Agricole Simnic Craiova) (1994) **[The influence of irrigation and chemical fertilizers upon yields and quality of winter wheat on brown-reddish luvic soil at SCA Simnic]. Influenta irigatiei si a ingrasamintelor chimice asupra productiei si calitatii graului de toamna in conditiile solului brun-roscat luvic de la SCA Simnic.** *Lucrari stiintifice (Romania) v. 9 p. 207-216.* 2 tables; 6 graphs; 4 ref. Romanian. (AGRIS 95-110069).

For the winter wheat cultivation in the northern zone of Oltenia, characterized by deficient precipitation during the cold season in most years, it is necessary to apply watering for shoot development and then to maintain the moisture in soil at minimum level of 50 percent IUA during the whole vegetation period. In this way the best yield (65 q/ha) and a high energetic output (4, 2) were got. Provided with optimum quantity of water fertilizers should be applied in doses of 120 kg/ha N and 80 kg/ha P2O5. These doses led to a yield gain of 32, 5 q/ha as compared with the variant without chemical fertilizers. Along with the increased production, the applying of the irrigation rate, and the doses of fertilizers recommended, the qualitative parameters of the wheat yields have been improved.

4338 Nikitishen, V.I.; Dmitrakova, L.K.; Zaborin, A.V. (1994) **[Effect of nitrogen and phosphorus fertilizers on winter wheat crop yield on grey forest soil]. Vliyanie azotnykh i fosfornykh udobrenij na urozhajnost' ozimoj pshenitsy na seroj lesnoj pochve.** *Agrokhimiya (Russian Federation) (no.10) p. 30-40.* 9 ref. Russian. (AGRIS 95-110070).

4339 Nikitishen, V.I.; Dmitrakova, L.K.; Zaborin, A.V. (1994) **[Specific features of nitrogen and phosphorus nutrition in barley under conditions of long-term fertilizer application on grey forest soil]. Osobennosti azotnogo i fosfornogo pitaniya yachmenya v usloviyakh dlitel'nogo vneseniya udobrenij na seroj lesnoj pochve.** *Agrokhimiya (Russian Federation) (no.11) p. 37-44.* 7 ref. Russian. (AGRIS 95-109973).

4340 Papastylianou, I. (1995) **THE EFFECTS OF SEED RATE AND NITROGEN FERTILIZATION ON YIELD AND YIELD COMPONENTS OF TWO-ROW BARLEY.** *European Journal of Agronomy. 4(2):237-243.* English. [INST AGR RES NICOSIA CYPRUS].

The effects of seed rate (60-150:kg ha(-1)) and nitrogen fertilization (N) (0-150 kg N ha(-1)) on the productivity of two-row barley was investigated in field trials for six growing seasons (1987-93) under rainfed conditions in Cyprus. Over all years and nitrogen rates, the highest seed rate increased barley grain yield by 6 per cent, while over all years and seed rates nitrogen fertilizer increased yield by up to 25 per cent. At the low seed rate it was possible to reach the maximum grain yield obtained under these growing conditions by the addition of N fertilizer. With low N rates, increasing the seed rate did not significantly increase grain yield. High seed rates and rates of N fertilization, suppressed yield, due to the negative effect on number of seeds per spike and on the weight of the individual grains. Low seed rate (140 kernels m(-2)) is recommended in seasons when establishment is assured by early rain, and an intermediate seed rate (240 kernels m(-2)) is recommended in years when establishment may be reduced. These seed rates should be associated with the optimum N fertilization recommended for the site. [References: 22].

4341 Papastylianou, I. (1995) **YIELD COMPONENTS IN RELATION TO GRAIN YIELD LOSSES OF BARLEY FERTILIZED WITH NITROGEN.** *European Journal of Agronomy. 4(1):55-63.* English. [AGR RES INST NICOSIA CYPRUS].

Application of nitrogen (N) fertilizer above the optimum rate suppresses grain yield of cereals in environments in which water supply is limited towards the end of the growing season. The aim of this study was to examine the effect of N fertilizer application on yield components of barley. The two-rowed barley locally named Kantara was grown for eight growing seasons in different long-term rotational experiments at two locations under rainfed conditions (200 to 450 mm) in Cyprus. Four rates of ammonium sulphate (0, 30, 60 and 90 kg N ha(-1)) were applied at sowing. Nitrogen application linearly increased the number of spikes per unit area and linearly decreased the weight per grain. The number of grains per spike and grain yield per unit area showed a quadratic response to nitrogen application, in which an initial increase was followed by a reduction at higher rates of N application. Stepwise regression analysis showed that the importance of variation in each yield component for explaining variation in grain yield varied with season, with the weight per grain being usually the least important, though always being statistically significant. Most of the variation in grain yield was explained by the number of grains per spike and by the number of tillers m(-2). Strategies for managing N fertilizer application for specific environment and rotation systems for avoiding yield loss are suggested. [References: 32].

4342 Park, S.G.; Son, C.K.; Choi, B.S. (Rural Development Administration, Taegu (Korea Republic). Gyungbug Provincial Rural Development Administration) (1995) **Effect of rice straw application by cutting and increased nitrogen topdressing level on growth and yield of drilled barley.** *RDA Journal of Agricultural Science (Korea Republic) v. 37(1) p. 279-282.* 4 tables; 6 ref. Korean. (AGRIS 95-109972).

4343 Pestryakov, A.M.; Gabibov, M.A. (1994) **[Crop yield and quality of grain in barley Zaozerskii-85 as influenced by dosage of nitrogen fertilizers]. Urozhaj i kachestvo zerna yachmenya Zazerskij-85 v zavisimosti ot doz azotnykh udobrenij.** *Agrokhimiya (Russian Federation) (no.9) p. 80-83.* Russian. (AGRIS 95-109974).

4344 Proshkin, V.A.; Smirnov, A.P. (1994) **[Comparative efficiency of mineral fertilizers on various soils]. Sravnitel'naya ehffektivnost' mineral'nykh udobrenij na razlichnykh pochvakh.** *Agrokhimiya (Russian Federation) (no.5) p. 35-39.* 5 ref. Russian. (AGRIS 95-098076).

4345 Ruza, A. (Latvia University of Agriculture, Jelgava (Latvia)); Kreita, Dz. (Latvia) (1993) **[Impact of nitrogen fertiliser on winter wheat yield and wheat quality]. Slapekla meslojums. Ka tas ietekme ziemas kviesu razu.** *Latvijas Lauksaimnieks (Latvia) (no.3) p. 10-12.* 4 tables. Latvian. (AGRIS 95-110059).

Impact of nitrogen fertilizers on winter wheat grown on turf carbonate soil was studied in the period of 1991-1994. Grain yield and quality of two wheat varieties "Kosack" and "Mironovskaya" were analysed. The results of the trials show that yields and particularly the gluten content and quality depend on meteorological conditions during vegetation. It is pointed out that a sufficient amount of fertilizers can compensate the negative effect of weather.

4346 Salem, M.A. (Minia Univ. (Egypt). Faculty of Agriculture) (1993) **Effect of some sandy soil conditioners and seeding rates on yield and yield components of wheat, Triticum aestivum L.** *Minia Journal of Agricultural Research and Development (Egypt) v. 15(3) p. 901-913.* 4 tables; 15 ref. English. (AGRIS 95-110062).

4347 Sohn, S.M.; Han, I.A. (Dankook University, Cheonan (Korea Republic). Department of International Agriculture); Kucke, M. (FAL, Braunschweig (Germany). Institute of Plant Nutrition and Soil Science) (1995) **Dynamics of NO3-N in barley rhizosphere and optimum rate of nitrogen top-dressing based on Nmin soil test.** *Korean Journal of Crop Science (Korea Republic) v. 40(2) p. 185-194.* 5 illus.; 1 table; 29 ref. Korean. (AGRIS 95-109971).

4348 Tilahun Geleto (1994) **The Effects of Nitrogen Fertilizer Sources, Rates and Time of Application on the Nitrogen Uptake, Grain Yield and Yield Components of Wheat.** Alemaya Univ. of Agriculture, Dere Dawa

(Ethiopia). 41 tables; 249 ref.; 1 map; 2 graphs. 179 p. English. (AGRIS 95-098045).

A field experiment was conducted in 1990 and 1991 at Akaki and Arsi Robe. The purpose of the trial was to study the effects of three nitrogen factors on nitrogen uptake, grain yield and the yield components of wheat. The factorial combination of three nitrogen fertilizers (urea, large granular urea and ammonium sulphate), two nitrogen rates (60 and 120 kg/ha) and three times of nitrogen application (all at sowing, all at mid tillering, and 1/3 at planting plus 2/3 at mid tillering) plus one control treatment (without nitrogen), for a total of 19 treatments, were assigned to each block of ET13, bread wheat, and of Boohai, durum wheat, within one replicate at each location. The experiment was laid out in a randomized complete block design with three replications. The results of the study were highly influenced by seasonal conditions and site factors. In three out of the four season trials, nitrogen fertilizers had a similar effect on grain yield. However, under poor rainfall distribution in 1991 at Akaki, large granular urea > ammonium sulphate > urea in grain yield. Large granular urea, the high nitrogen rate, and split application, which were the most effective treatments for nitrogen, increased grain yield, 1000 kernel weight, numbers of grains per spike and grains per square m, and improved grain and total nitrogen uptake, and the nitrogen harvest index. The significant effects of two or three way interactions of nitrogen factors on the different parameters were most commonly from a beneficial interaction of large granular urea, the high nitrogen rate, and split nitrogen application across seasons and locations. In this experiment, nitrogen rate had the dominant effect, followed by time of nitrogen application. These nitrogen factors were found to be the major areas of research focus. Nitrogen fertilizer sources were less important. Grain yields of ET13 and Boohai were strongly correlated with grains per spike and per square m, harvest index, grain and total nitrogen uptake, and nitrogen harvest index.

4349 Traenkle, L. (1994) **[Influence of greencover between the rows and required N-min levels on the N-min contents in the soil profile and the yield of strawberries on loamy soil]. Einfluss von Fahrgasseneinsaaten und Duengung nach Stickstoffsollwerten auf die N-min-Werte im Bodenprofil und die Ertraege der Erdbeersorte 'Elsanta' auf einem schweren Boden.** *Erwerbsobstbau (Germany) v. 36(7) p. 179-184.* 4 ill., 4 tables; 7 ref. German. (AGRIS 95-098094).

4350 Valgus, T. (1994) **[Dynamics of effectiveness and guarantee of fertilizers in crop rotation on podzolic sandy-clay soil]. Vaetlse efektiivsuse duenaamika ja tagatus leetunud liivsavimullal paiknevas kuelvikorras.** Academical Agricultural Society, Tartu (Estonia). *[Agrarian Science] (Estonia); Journal of Agricultural Science v. 5(1) p. 36-44.* 3 fig., 3 tables; 10 ref. Estonian. (AGRIS 95-110084).

The dynamics of mineral fertilizer and manure effectiveness were studied in long-term fertilizer trials over 17 years. The trials were established on a highly cultivated podzolic sandy-clay soil. Field grass, a mixture of clover and timothy, constituted 33 per cent of the crop rotation, which helped to avoid the decrease in yield ability of the background. Therefore, the fertilizer effectiveness did not increase at the cost of a decrease yield from the background, but due to the after-effect of fertilizers. The results verify an earlier study, according to which in fertilized variants higher yields were accompained by higher fertilizer effectiveness. The correlation with yield was, in the case of mineral fertilizer effectiveness 0, 77, and in the case of manure effectiveness 0, 64. An earlier, 8 year long study, according to which the optimum manure dose per ha was 9, 4 t, was completed. As the trial conditions were improved and trial period prolonged, the after-effect of manure increased, and the optimum manure rate on podzolic sandy-clay soil turned out to be 15 t/ha. The mineral fertilizer and manure effectiveness increased over 17 years due to the increase in the after-effect of fertilizers. The application of N60P21, 8K49, 8 resulted in the effectiveness of 17, 5 feed units/kg N+P+K, which increased by 0, 37 FU, i.e. 2 per cent per year. The application of manure (15 t/ha) gave the average effectiveness of 30 FU/t, which increased 2, 4 FU, i.e. 8 per cent per year. The fertilizer effectiveness was better guaranteed over a longer trial period. An additional yield, obtained with mineral fertilizers or manure, could be obtained in the 1st rotation (1976-1981) with the frequency 2.4 times out of 10, but in the 3rd rotation with a frequency of 7 times out of 10.

4351 Vooremae, A. (Estonian Agricultural Univ., Tartu (Estonia). Inst. of Field Crop Husbandry) (1994) **[The effect of nitrogen fertilization on quality parameters of spring wheat varieties]. Laemmastikvaetlse mojust monede suvinisu sortide kvaliteedinaeitajatele 1993. aasta poldkatses.** *Transactions of Estonian Agricultural University (Estonia); Agronomy (no.178) p. 156-158.* 2 ref., 2 tables. Estonian. (AGRIS 95-110061).

The objective of this study was to determine the effect of nitrogen fertilization on quality parameters of eight spring wheat (Triticum aestivum L.) varieties in different fertilization conditions (0.135 kg N ha (-1)). The varieties 'Heta', 'Satu', 'Poka', 'Bastian', 'Runar', 'Reno', 'Luja' and 'Planet' were used. Accumulated research results showed that protein content was significantly higher for 'Heta' in all fertilization conditions. Protein content increased with increasing nitrogen supply for all varieties. The effect of nitrogen fertilization on protein content was highest for cultivars 'Heta', 'Satu' and 'Polkka'. The protein content of the cultivar 'Heta' varied from 13.5 per cent nitrogen fertilization to 15.7 per cent with 105.135 kg N ha (-1). Varieties 'Runar', 'Satu' and 'Polkka' had the highest 1000 kernel weight and test weight. Alpha-amylase activity by falling number showed that cultivars 'Heta' and 'Planet' had relatively high enzyme activity, particularly at higher rates of N fertilizers. The results suggest that cultivars 'Satu', 'Polkka' and 'Runar' had quality parameters adequate to bread wheat. The optimum N rates were 75.105 kg ha (-1).

4352 Walter, I.; Bigeriego, M. (Instituto Nacional de Investigacion y Tecnologia Agraria y Alimentaria, Madrid (Espana). Area de Conservacion del Medio Natural); Calvo, R. (1994) **[Fertilizer and contamination effect of sewage sludges on wheat production]. Efecto fertilizante y contaminante de lodos residuales en la produccion de trigo en secano.** *Investigacion Agraria. Produccion y Proteccion Vegetales (Espana) v. 9(3) p. 501-507.* 5 tab.; 16 ref. Spanish. (AGRIS 95-097974).

4353 Webb, J.; Sylvesterbradley, R. (1995) **A COMPARISON OF THE RESPONSES OF TWO CULTIVARS OF LATE-AUTUMN-SOWN WHEAT TO APPLIED NITROGEN.** *Journal of Agricultural Science. 125(Part 1):11-24.* English. [AGR DEV & ADVISORY SERV ROSEMAUND RES CTR WERGS RD WOLVERHAMPTON WV6 8TQ ENGLAND].

At four pairs of sites in the UK, two cultivars of wheat, bred either for autumn (cv. Mercia) or for spring (cv. Tonic) sowing were sown in November 1988 and 1989 and their yield response to spring-applied fertilizer N assessed over the range 0-320 kg/ha N. Grain samples were taken at harvest and analysed for those qualities regarded as indicators of suitability for milling. In five experiments, the grain yield of Mercia was up to 1 t/ha greater than that of Tonic, but overall there was no consistent difference between the two cultivars in the optimum economic yield (Y-opt) or in the amount of fertilizer N needed to produce it (N-opt). Both cultivars produced c. 17.5 kg of grain per kg of fertilizer N applied up to N-opt. In the five experiments in which Tonic yielded less, it produced grain of greater N concentration than Mercia when given the same amount of fertilizer N. Differences in grain N concentration, while small (< 0.3 %), were significant when analysed across sites. In six experiments both cultivars produced grain of 11% protein at N-opt. There were no consistent or worthwhile increases in specific weight, Hagberg falling number (HFN) or response to the sodium dodecyl sulphate (SDS) sedimentation test of either cultivar from applying more fertilizer N than N-opt. The average specific weight of Mercia grain was 2.5 kg/hl greater than that of Tonic, while Tonic gave larger SDS values of c. 8. There was little difference in HFN. It was concluded that the yield requirement for fertilizer N was similar for these two cultivars of wheat when sown in late autumn, and there was no need to apply differential fertilizer N applications to the cultivars to produce grain of the quality needed for breadmaking. In four experiments the application of plant growth regulator(PGR) increased the yields of both cultivars by c. 0.5 t/ha. [References: 27].

4354 Zaki, N.M.; Ahmed, M.A.; El Gazzar, M.M. (National Research Centre, Cairo (Egypt). Field Crops Research Dept.) (1993) **Effect of cutting and nitrogen fertilization dates on productive efficiency of wheat and barley.** *Annals of Agricultural Science, Moshtohor (Egypt) v. 31(1) p. 1-11.* 3 tables; 14 ref. English. (AGRIS 95-110065).

4355 Zourarakis, D.P. (1992) **Recovery and residuality of applied N in a corn/soft red winter wheat/double-crop soybean rotation grown on a well**

drained soil: by Demetrio Periferachis Zourarakis. Kentucky Univ. (USA). ill. bibliographic ref. (l. 248-275). Includes vita and abstract. 277 leaves. English. (AGRIS 95-098086).

F06 IRRIGATION

4356 Allen, R.R.; Musick, J.T. (1993) **Furrow irrigated wheat with runoff control.** *American Society of Agricultural Engineers. Meeting (USA); no. 932035 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 95-110403).

4357 Guerra, AF. (1995) **IRRIGATION SCHEDULING ON WHEAT FOR MAXIMUM YIELD IN THE CERRADO REGION.** *Pesquisa Agropecuaria Brasileira. 30(4):515-521.* Portuguese. [CTR PESQUISA AGROPECUARIA CERRADOS CAIXA POSTAL 08233 BR-73301970 PLANALTINA DF BRAZIL].

The response of wheat (Triticum aestivum L.) to six levels of soil-water tension was studied under field conditions in a Dark-Red Latossol of the Brazilian Savannah Region. The crop was irrigated when the soil-water tension measured with tensiometers or gypsum blocks reached values of 41, 51, 69, 185, 562 and 993 kPa at a depth of 10 cm throughout the crop cycle. The water was applied to the crop by using a plastic hose connected to a PVC perforated tube to assure uniform water distribution on the experimental plots. The results indicate a reduction in grain yield with the increase in soil-water tension. The highest yield (6.952 kg/ha) was obtained with the lowest soil-water tension (41 kPa). The yield components that caused reduction in yield were the number of spikes per square meter, number of spikelets per spike and number of grains per spike. No significant difference was observed for 1.000-grain weight and hectoliter-grain weight. The results indicate that plants define their development and yield as a function of soil-water tension to maintain grain quality.

4358 Haq, K.A.; El Din Khatib, G.; Salih, A.A. (1993) **Irrigation water management and wheat production in Sudan Gezira scheme.** *American Society of Agricultural Engineers. Meeting (USA); no. 932029 23 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 95-110391).

4359 Shahin, M.M.; Mosa, E.M. (Ministry of Agriculture, Cairo (Egypt). Soil and Water Research Inst.) (1994) **Irrigation cycles in relation to yield and water relations for wheat.** *Annals of Agricultural Science, Moshtohor (Egypt) v. 32(1) p. 35-49.* 7 tables; 12 ref. English. (AGRIS 95-110402).

4360 Singh, G. (Asian Institute of Technology, Bangkok (Thailand)); Mushtaq, R.K. (1992) **Energy inputs in irrigated wheat crop in Pakistan.** *American Society of Agricultural Engineers. Meeting (USA); no. 928011 15 p.* references. Paper presented at the "1992 International Summer Meeting sponsored by The American Society of Agricultural Engineers, " June 21-24, 1992, Charlotte, North Carolina. English. (AGRIS 95-110370).

F07 SOIL CULTIVATION

4361 Allen, RR.; Musick, JT.; Schneider, AD. (1995) **RESIDUAL DEEP PLOWING EFFECTS ON IRRIGATION INTAKE FOR PULLMAN CLAY LOAM.** *Soil Science Society of America Journal. 59(5):1424-1429.* English. [USDA ARS CONSERVAT & PROD RES LAB PO DRAWER 10 BUSHLAND, TX 79012 USA].

Pullman clay loam (fine, mixed, thermic Torrertic Paleustoll) and related soils predominate in the southern High Plains of the USA. They are slowly permeable but respond to deep tillage with increased irrigation water intake, A one-time deep moldboard plowing to 0.4-, 0.6-, or 0.8-m depths was performed in 1966 to evaluate the inversion and mixing of the slowly permeable Bt1 horizon with the Ap horizon. We hypothesized that these deep tillage effects would still be present after 25 yr, We report irrigation intake effects with 5 yr (four growing seasons) of cropping to winter wheat (Triticum aestivum L.) beginning in 1988. After moldboard plowing to 0.2 m to restore surface tillage layer permeability, residual effects from the 1966 deep plowing caused an average increase in intake of 26% (129-163 mm) for the 0.4-m plow depth, compared with the 0.2-m check, for the first irrigation after tillage from 1988 to 1992, Irrigation intake increased 40% (52 mm) with 0.6-m deep plowing; however, there was no additional increase for 0.8-m plowing. Grain yields increased from 4.2 to 5.0 Mg ha(-1) (19%) for the 0.4-m or deeper plowing. The 1966 deep tillage also increased deep soil water storage between the 1- and 2.3-m depths during 1988 to 1992. Water use efficiencies were approximate to 8% greater for the deep plowing treatments. [References: 15].

4362 Beri, V.; Sidhu, BS.; Bahl, GS.; Bhat, AK. (1995) **NITROGEN AND PHOSPHORUS TRANSFORMATIONS AS AFFECTED BY CROP RESIDUE MANAGEMENT PRACTICES AND THEIR INFLUENCE ON CROP YIELD.** *Soil Use & Management. 11(2):51-54.* English. [PUNJAB AGR UNIV DEPT SOILS LUDHIANA 141004 PUNJAB INDIA].

A 15-year field experiment investigated crop residue management practices, with crop residue removal, burning and incorporation as the main treatments and nitrogen levels as subtreatments. The effects of crop residue management practices on rice and wheat yield were measured for 11 years. Surface soil samples were taken to study nitrogen and phosphorus immobilization/adsorption and their release under laboratory conditions. The field experiment indicated that residue burning and residue removal resulted in greater grain yields of rice (5.57 and 5.53 t/ha, respectively) and wheat (4.12 and 4.02 t/ha, respectively) than residue incorporation (4.51 t/ha rice and 3.72 t/ha wheat). Laboratory experiments indicated that by the addition of crop residues nitrogen and phosphorus were converted to unavailable forms through immobilization and adsorption, respectively. Crop residue management practices were discontinued after 13 years and wheat and maize crops were grown in sequence. There were significantly greater yields of wheat (3.57 t/ha in 1992-93 and 3.6 t/ha in 1993-94) and of maize (2.1 t/ha in 1993) in plots where the residues had previously been incorporated than where the residues were previously either removed or burned. This is attributed to release of nitrogen and phosphorus from the incorporated residues.

4363 Biskupski, A.; Sienkiewicz, J. (Instytut Uprawy Nawozenia i Gleboznawstwa, Jelcz Laskowice (Poland). Zaklad Uprawy Roli) (1994) **[Efficiency of different after harvest and pre-sowing cultivation manner for winter wheat and winter rape]. Efektywnosc roznych sposobow pozniwnej i przedsiewnej uprawy roli pod pszenice ozima i rzepak ozimy.** *Fragmenta Agronomica (Poland) v. 11(1) p. 72-81.* 4 fig., 4 tables; 8 ref. Polish. (AGRIS 95-098237).

The paper presents results of different soil preparation and its influence on yielding, labour-consuming and fuel-use. The most favourable was after harvest cultivation performed by disc-harrow connected with pre-sowing cultivator use. Obtained winter wheat and rape yield was not less than in case of traditional cultivation, but labour-consumption and fuel-use was the least.

4364 Cizner, P. (1995) **THE EFFECT OF SOIL PREPARATION ON THE QUALITY OF SPRING MALTING BARLEY.** *Rostlinna Vyroba. 41(8):357-361.* Czech. [AGRO BRNO OSEVA SRO PRIZOVA 8-10 CR-65792 BRNO CZECH REPUBLIC].

Three-year trial was carried out at Zabcice u Brna (185 m above sea level, average annual temperature 10.4 degrees C, average annual precipitation 463 mm, clay loam, fluvi-eutric gley soil) aimed at comparing the effect of different technology of soil preparation for spring barley before sowing on soil physical properties, yield and grain quality. Methodology of the trial was made up to find the differences between traditional and reduced tillage technologies. Factors which were verified: 1) tillage to a depth of 150 or 200 mm; 2) soil in spring before sowing treated by rotary harrow (STEYR-Lely of 6 mm engagement) or smoothed; 3) rolled (smooth field-roller VAH-5, without filling) before sowing or not rolled at all. The combination of tillage to 200 mm, soil smoothed and rolled before sowing in the spring, was considered as comparing treatment. A whole area of the trial was treated in the spring before sowing by a rate of 60 kg N.ha(-1). The experimental area was sown in the spring as soon as the conditions allowed it - at suitable soil moisture, by the Perun variety. The grain was deposited at a 30 mm depth. The sowing rate was 4.5 million germinating seed grains. Neither significant infestation of barley by diseases and pests, nor lodging occurred in any year. All values presented in tables are means for three experimental

years with marking the value of significance based on the analysis of variance. Results of trial can be summed up into the following items: In the treatment when rotary harrow was used higher porosity (Tab. III) was found out in a whole layer up to 200 mm in the term 1 and in upper layer of a part of profile up to 100 mm in the term 2 (Tab. IV) from which faster infiltration of precipitation water can be assumed. In the treatment when rotary harrow was used, lower relative humidity in the surface layer up to 100 mm was found and the other way round, higher relative humidity was ascertained in a 100 to 200 mm layer in the term 2 (Tabs V and VI), from what follows that root system of barley should have higher deficit of water. Highest percentage of agronomically most valuable aggregates (Tab. VII) occurred in treatments when rotary harrow was used (highest amount of aggregates of size 2 to 5 mm and the lowest percentage of lumps and non-structural particles). A depth of soil preparation had significant impact on the yield, higher yield was acquired with tillage up to 150 mm depth (4.93 t.ha(-1)) in distinction from tillage to a 200 m depth (4.79 t.ha(-1). Highly significant difference was found out between soil treatment by rotary harrow and smoothing harrow in percentage of front grain (Tabs I and II, Fig. 1) and in the content of proteins (Tab. VIII). Significant differences were found out in 1 000-kernel weight (Tab. VIII) and starch content (Tab. IX). Statistically insignificant difference was found in extract (Tab. VIII). In all investigated traits shown in Tabs I, II and VIII more favourable values were attained when rotary harrow was used. The yield and quality of spring barley grain were significantly influenced by the course of weather conditions of the year (Tab. IX). The highest yield and percentage of front grain (Tab. IX) were achieved in 1991, the most favourable content of proteins was in 1992, the highest content of starch and extract was acquired in this year. The most favourable values of bulk density and 1 000-kernel weight were in 1993. Significance of differences between treatments for grain yield (size of caryopses above 2.5 mm) are presented in Fig. 1. Various types of hatching shows that statistically significant difference based upon results of LSD analysis in all three years was between treatments: tillage 200 mm, smoothing, not-rolled and tillage 200 mm, rotary harrow, not-rolled. The difference in the grain yield - size of caryopses above 2.5 mm (between values 2.7 t.ha(-1) and 3.3 t.ha(-1)) amounts to 0.6 t.ha(-1), consequently an increase is 19% (Tab. II). In treatment with combination of factors: tillage up to 150 mm depth, where soil was treated only by rotary harrow and was not rolled, higher yields and better quality of malting barley were acquired compared with the other tested treatments. This combination can be recommended for practice for conditions of transfer of heavy and medium soils in maize-production type.

4365 El Basioni, S.M.; Hassan, H.M.; Dahroug, A.A. (Ministry of Agruclture, Cairo (Egypt). Soils and Water Research Inst.) (1994) **Wheat production in calcareous soils in relation to tillage practices and sewage sludge.** *Menofiya Journal of Agricultural Research (Egypt) v. 19(1 part 2) p. 715-731.* 5 tables; 21 ref. English. (AGRIS 95-110535).

4366 Francis, GS.; Haynes, RJ.; Speir, TW.; Williams, PH. (1995) **THE EFFECTS OF A NITRIFICATION INHIBITOR ON LEACHING LOSSES AND RECOVERY OF MINERALIZED NITROGEN BY A WHEAT CROP AFTER PLOUGHING-IN TEMPORARY LEGUMINOUS PASTURES.** *Fertilizer Research. 41(1):33-39.* English. [NEW ZEALAND INST CROP & FOOD RES LTD PRIVATE BAG 4704 CHRISTCHURCH NEW ZEALAND].

The effect of a nitrification inhibitor on the accumulation of ammonium (NH_4^+-N) and nitrate (NO_3^--N) in the profile was investigated in two field experiments in Canterbury, New Zealand after the ploughing of a 4-year old ryegrass/white clover pasture in early (March) and late autumn (May). Nitrate leaching over the winter, and yield and N uptake of a following wheat crop were also assessed. The accumulation of N in the soil profile by the start of winter was greater in the March fallow (76-140 kg N ha(-1)) than in the May fallow treatment (36-49 kg N ha(-1)). The nitrification inhibitor dicyandiamide (DCD) did not affect the extent of net N mineralization, but it inhibited nitrification when applied to pasture before ploughing, especially at its depth of incorporation (100-200 mm). Nitrification inhibition in spring was greater when DCD was applied in May rather than in March due to its reduced degradation over the winter. Cumulative nitrate leaching losses were substantial from the March fallow treatment in both years (about 100 kg N ha(-1)). A delay in the cultivation of pasture and the application of DCD both reduced nitrate leaching losses. When leaching occurred early in the winter (in 1991), losses were less when pasture was cultivated in May (2 kg N ha(-1)) than when DCD was applied to pasture cultivated in March (68 kg N ha(-1)). When leaching occurred late in the winter (in 1992), similar losses were measured from pasture cultivated in May (49 kg N ha(-1)) and from DCD-treated pasture cultivated in March (57 kg N ha(-1)). Grain harvest yield and N uptake of the following spring wheat crop were generally unaffected by the size of the N leaching loss over the winter. This was due to the high N fertility of the soil after four years of a grazed leguminous pasture.

4367 Lang (1994) **[Balancing of soil cultivation and plant protection. Consequences of different cropping systems]. Bodenbearbeitung und Pflanzenschutz abstimmen. Folgewirkungen unterschiedlicher Bearbeitungssysteme.** *dlz. Die landwirtschaftliche Zeitschrift fuer Produktion - Technik - Management (Germany) v. 45(4) p. 32-34, 36, 38-39.* 5 ill., 5 tables. German. (AGRIS 95-098224).

4368 Marelli, Hugo; Arce, Juan (Instituto Nacional de Tecnologia Agropecuaria, Cordoba (Argentina). Estacion Experimental Agropecuaria Marcos Juarez) (1994) **[Direct seeding in a wheat - soybean sequential cropping system]. La siembra directa en la secuencia trigo - soja.** Serie Carillanca - Instituto de Investigaciones Agropecuarias. Centro Regional de Investigacion Carillanca (Chile); no. 43 p. 31-49. INIA. 10 ref. p. 31-49. Spanish. (AGRIS 95-098232).

4369 Ormeno N, Juan (Instituto de Investigaciones Agropecuarias, Santiago (Chile). Centro Regional de Investigacion La Platina); Chahin A, Maria Gabriela; Vega O, Bolivar (1994) **[Analysis and evaluation of productivity of zero-tillage as an alternative of wheat production in the inner drylands and coastal area of the fifth and the Metropolitan regions]. Analisis y evaluacion a nivel productivo de la cero labranza como alternativa de produccion de trigo en el secano interior y costero de la quinta Region y Metropolitana.** Serie Carillanca - Instituto de Investigaciones Agropecuarias. Centro Regional de Investigacion Carillanca (Chile); no. 43 p. 115-127. INIA. 9 ref. p. 115-127. Spanish. (AGRIS 95-098233).

4370 Pozo L, Alejandro del (Instituto de Investigaciones Agropecuarias, Chillan (Chile). Centro Regional de Investigacion Quilamapu); Canto S, Pedro del; Riquelme S, Jorge; Iriarte, Luis; Aliaga, Claudio (1994) **[Wheat growth and production under conventional, minimum and zero tillage, in the Andean piedmont: extraction and efficiency of nitrogen absorption]. Crecimiento y produccion de trigo en labranza convencional, minima y cero, en la precordillera andina: extraccion y eficiencia de recuperacion de nitrogeno.** Serie Carillanca - Instituto de Investigaciones Agropecuarias. Centro Regional de Investigacion Carillanca (Chile); no. 43 p. 189-206. INIA. 13 ref. p. 189-206. Spanish. (AGRIS 95-098235).

4371 Rahman, S.M.; Khalil, M.I. (1992) **Impact of deep tillage on water use and yield of wheat [in Bangladesh].** *Bangladesh Journal of Soil Science (Bangladesh) v. 23(1-2) p. 113-118.* 11 ref. English. (AGRIS 95-110534).

4372 Rodriguez S, Nicasio; Ruz J, Emilio (Instituto de Investigaciones Agropecuarias, Chillan (Chile). Centro Regional de Investigacion Quilamapu); Sloot, Petrus (1994) **[Comparison of soil and nutrient losses in wheat cultivation under three tillage systems in the Nuble piedmont [Chile]]. Comparacion de las perdidas de suelo y nutrientes en el cultivo de trigo con tres sistemas de labranza en la precordillera de Nuble.** Serie Carillanca - Instituto de Investigaciones Agropecuarias. Centro Regional de Investigacion Carillanca (Chile); no. 43 p. 177-187. INIA. 6 ref. p. 177-187. Spanish. (AGRIS 95-098234).

F08 CROPPING PATTERNS AND SYSTEMS

4373 Adamiak, J.; Adamiak, E.; Zawislak, K. (Akademia Rolniczo Techniczna, Olsztyn (Poland). Katedra Ogolnej Uprawy Roli i Roslin) (1994) **[Response of winter wheat to the concentration of cereals in crop rotation and the kind of fore-crops]. Reakcja pszenicy ozimej na udzial zboz w plodozmianie i dobor przedplonow.** *Fragmenta Agronomica (Poland) v. 11(1) p. 82-88.* 2 tables; 12 ref. Polish. (AGRIS 95-098328).

A field experiment was conducted on a brown soil to study the response of two winter wheat cultivars (Liwilla and Gama) and to increased

concentration of cereals from 50 percent in a six-field crop rotation to 67 percent in three-field crop rotation and to continuous cultivation. The forecrops for winter wheat in three-field rotations were: oat, spring barley, spring wheat and field bean. Shortening rotation and increasing concentration of cereals of 50-60 percent decreased yields of winter wheat by 8.5 percent on average but the extent of negative depended on the kind of forecrops.

4374 Chan, K.Y. (New South Wales Agriculture, Rydalmere (Australia). Biological and Chemical Research Inst.); Bowman, A. (New South Wales Agriculture, Trangie (Australia)); Munnich, D. (1994) **Strategies for sustained wheat production on the low rainfall cracking clays of North West NSW (II) [New South Wales].** New South Wales Agriculture. 2 fig. 17 p. English. (AGRIS 95-098311).

Gives details of a four year project to assess the differences in grain quality, protein level and yield for wheat grown under continuous cropping conditions, and that grown after the land had been sown to pastures for various lengths of time. While results were variable, depending on soil types and seasonal conditions, yields after pasture phases were improved. Improvements in soil structure and fertility, with available nitrogen, microbial biomass and organic carbon being measured after at least three years after pasture conversion. Discussion of suitable pasture species for the climatic conditions and soils are included.

4375 Forman, P. (Western Australian Dept. of Agriculture, Merredin) (1994) **Pasture rotations in the eastern wheatbelt of Western Australia.** *Australian Farm Manager (Australia) v. 5(3) p. 14-16.* 3 tables, 1 graph. English. (AGRIS 95-110642).

4376 French, RJ. (1995) **MULTI-DISCIPLINARY TEAMS TO CONDUCT INTEGRATED RESEARCH ON FARMING SYSTEMS - A CHALLENGE.** *Australian Journal of Soil Research. 33(4):659-671.* English. [DEPT AGR DIV SOIL CONSERVAT ADELAIDE SA AUSTRALIA].

This paper reviews changes in farming practices that helped farmers to reduce soil erosion, and increase water-use efficiency and yield on their specific soils and climate. The program initially involved working with Soil Conservation Boards and conducting research on farmers' properties and on research stations. This work then extended from evaluating single factor effects to assessing the combined factors limiting yield in specific crop and pasture rotations. Benchmarks were established for different soils and climates as guides for farmers to measure their success. These included yield and water use efficiency, adequate and lower limit levels of soil organic nitrogen, and the need to maintain a nutrient input-output balance to provide a sustainable agriculture. The paper highlights the need for future research to adopt an integrated systems approach to overcome the major limitations to growth. This will require a cooperative effort between farmer groups and teams of soil scientists and agronomists to conduct multifactor research in farmers' paddocks. [References: 25].

4377 Gramatikov, B. (Nauchnoizsledovatelski Institut po Echemika, Karnobat (Bulgaria)) (1995) **[Mixed growing of peavine and Mexican wheat]. Smeseno otglezhdane na sekirche s meksikanska pshenitsa.** Selskostopanska Akademiya, Sofia (Bulgaria). *Zemedelie (Bulgaria); Agriculture v. 93(1) p. 8.* Bulgarian. (AGRIS 95-110720).

4378 Hofstetter, B. (1994) **Farmers lead the way to no-till covers: rye, vetch and wheat enrich conservation tillage systems.** *The New farm (USA) v. 16(6) p. 20-23.* English. (AGRIS 95-110678).

4379 Kanal, A. (Estonian Agricultural Univ., Tartu (Estonia). Inst. of Soil Science and Agrochemistry); Kuldkepp, P. (1994) **[Budget of macroelements in the phytoproduction of barley]. Makroelementide bilanss odra fuetoproduktsioonis.** *Transactions of Estonian Agricultural Univ., Tartu (Estonia); Agronomy (no.178) p. 68-72.* 2 fig., 1 table; 7 ref. Estonian. (AGRIS 95-110649).

This study was conducted to determine the effect of N-fertilizers, straw and manuring on phytoproduction as well as on the balance of macroelements in the barley field. A three-field crop rotation (potato, summer wheat, barley) was used, where straw of cereals and cattle manure 60 Mg ha (-1) for potato were ploughed every autumn. Immediately after harvesting with a frame across seeding rows the amount of stubble and spillage was estimated in free replications. The stubble was removed so that it consisted also of stem bases and coarse roots approximately 5 cm below the soil surface. It was thus possible to differentiate the above-ground and below-ground parts of the stem. The total nitrogen content was determined by the Kjeldhahl procedure, P with colometric and K photometric in flames and Ca and Mg with the method of triloon-B. The phytoproduction of barley (PB) depended strongly on N80 and the application of straw. The after-effect of manure was insignificant. The amount of stubble remaining in the barley field increased considerably only in case of combined use of organic and mineral fertilizers. In the budget of secondary macroelements Ca dominated, whereas the portion of Mg remained reserved. The application of mineral fertilizers significantly affected the removal of Ca, in unfertilized background N0 from 36 to 56 per cent and in N80, accordingly from 14 to 25 per cent. Soil management practice should be aimed at preserving actual soil productivity in active condition, which is guaranteed by balanced fertilizer application.

4380 Krezel, R. (Akademia Rolnicza, Wroclaw (Poland). Katedra Ogrodnictwa) (1994) **[Chemical constitution of cereal plants grown in conditions of specialistic crop succession on the light soil]. Sklad chemiczny roslin zbozowych uprawianych w zmianowaniach specjalistycznych na glebie lekkiej.** *Zeszyty Naukowe Akademii Rolniczej we Wroclawiu. Rolnictwo (Poland) (no.238) p. 49-54.* 2 tables; 4 ref. Polish. (AGRIS 95-098320).

Straw and grain of cereal crops, grown from 1971 in the static succession experiment, were assayed for major chemical compounds in the years 1986-89. It was found that the rate of fertilizing was the major factor effecting the differentiation of the level of these compounds and proteins in particular. In the crop succession of Norfolk type, when compared with others, the protein content in barley grain was determined to be higher for 1.4 percent on the average. As to the rye straw, was found the tendency towards the increase of ash amount and potassium content when grown after potatoes.

4381 Krezel, R. (Akademia Rolnicza, Wroclaw (Poland). Katedra Ogolnej Uprawy Roli i Roslin) (1994) **[Effect of many years specialistic crop successions on selected chemical properties of the light soil]. Wplyw wieloletnich zmianowan specjalistycznych na wybrane wlasciwosci chemiczne gleby lekkiej.** *Zeszyty Naukowe Akademii Rolniczej we Wroclawiu. Rolnictwo (Poland) (no.238) p. 55-60.* 2 tables; 6 ref. Polish. (AGRIS 95-098326).

The amounts of organic C, humus fractions, P2O5, K2O, CaO as well as the pH value of the soil were determined. The experiment was carried out on the light soil containing 8-10 percent of clay in the 16-19th year of static crop succession. It was shown that in the experiments where potatoes were included, the levels of the compounds examined in the soil were higher than in case of cereal crop succession or in case of rye monoculture. In the crop succession with potatoes there was more humins in humus but less fulvic acid.

4382 Krezel, R.; Parylak, D.; Szumilak, G. (Akademia Rolnicza, Wroclaw (Poland). Katedra Ogrodnictwa) (1994) **[Influence of different crop rotations on yielding of plants on light soil]. Wplyw zroznicowanych zmianowan na plonowanie roslin na glebie lekkiej.** *Zeszyty Naukowe Akademii Rolniczej we Wroclawiu. Rolnictwo (Poland) (no.238) p. 35-47.* 1 fig., 6 tables; 14 ref. Polish. (AGRIS 95-098325).

In the work the results of the field experiments set up in 1971 on the light soil containing 8-10 percent of clay and 1 percent of humus are presented. 10 crop succession were compared in this project. They differed with the structure of sowing and the length of rotation. The yields of plants, their more significant yield effecting factors as well as the extents of weediness were determined. In was found that in rotations with root crops the yields of rye were higher than in cereal monocultures. The weediness was smaller. In the rye monoculture the yields were always lower than in case of multi-species rotations of cereal plants, despite heavier fertilization and ploughing of aftercrop.

4383 Kus, J.; Mroz, A.; Kaminska, M. (Instytut Uprawy Nawozenia i Gleboznawstwa, Pulawy (Poland)) (1994) **[Chemical plant protection as a compensation factor of negative effect of the position in crop rotation]. Mozliwosc kompensacji niekorzystnego stanowiska w uprawie zboz**

poprzez chemiczna ochrone zasiewow. 33 Research Session of Institute of Plant Protection; Poznan (Poland); 1993. *Materials of the 33rd Research Session of Institute of Plant Protection. Pt. 2. Posters. Pruszynski, S.; Lipa, J.J. (eds.). Instytut Ochrony Roslin, Poznan (Poland) p. 248-252.* Panstwowe Wydawnictwo Rolnicze i Lesne. 3 tables; 9 ref. Polish. (AGRIS 95-110647).

In this experiment conducted during the years 1988-92 the influence of plant protection on the yield of some cereals was examined. In the paper the results of the static field experiments carried out on good wheat and very good rye complexes are presented. Application of fungicides increased winter wheat yield (average 6-8 percent), but there was not interaction with the position in crop rotation. Efficiency of chemical plant protection of spring barley was lower (2-5 percent). Degree of infestation by Pseudocercosporella herpotrichoides was lower after fungicide use, but it has not been always reflected in the yield.

4384 Mahapatra, BS.; Sharma, GL. (1995) **EFFECT OF SUMMER LEGUMES ON GROWTH AND YIELD OF LOWLAND RICE (ORYZA SATIVA) AND ITS RESIDUAL EFFECT ON SUCCEEDING WHEAT (TRITICUM AESTIVUM) IN RICE-WHEAT SYSTEM.** *Indian Journal of Agricultural Sciences. 65(8):557-561.* English. [GOVIND BALLABH PANT UNIV AGR & TECHNOL DEPT AGRON PANTNAGAR 263145 UTTAR PRADESH INDIA].

Summer cropping of prickly sesban or dhaincha [Sesbania cannabina (Red.) Pers.] for green-manure and of cowpea [Vigna unguiculata (L.) Walp.] for fodder had significant effect on growth. yield and nitrogen uptake of rice crop. Mean data of 2 years showed that green-manure crop (helping produce 5.7 tonnes/ha rice grain) and fodder cowpea (helping produce 4.3 tonnes/ha rice grain) could contribute equivalent to 90 and 60 kg N/ha applied through prilled urea respectively in lowland transplanted rice. The mean yields obtained with 120 kg Nma applied through prilled urea(6.50 tonnes/ha) and dhaincha green-manuring + 30 kg N/ha through prilled urea (6.45 tonnes/ha) were at par. The difference in yield and nitrogen uptake by rice could be attributed to significant difference in ammonium-N of the soil at tillering and panicle-initiation stages, and was significantly positive. Summer cropping of Sesbonia and cowpea significantly increased the yield and nitrogen uptake by the succeeding wheat compared with 120 kg N/ha applied to rice through prilled urea. This could be attributed to significant positive correlation with available soil N at rice harvesting and nitrate production at the time of planting.

4385 Negi, G.C.S. (1994) **High yielding vs. traditional crop varieties: a socio-agronomic study in a Himalayan village in India.** *Mountain research and development (USA) v. 14(3) p. 251-254.* references. English. (AGRIS 95-110683).

4386 Ntayombya, P.; Gordon, AM. (1995) **EFFECTS OF BLACK LOCUST ON PRODUCTIVITY AND NITROGEN NUTRITION OF INTERCROPPED BARLEY.** *Agroforestry Systems. 29(3):239-254.* English. [UNIV GUELPH DEPT ENVIRONM BIOL GUELPH ON N1G 2W1 CANADA].

Effects of black locust (Robinia pseudoacacia L.) on productivity and N nutrition of barley (Hordeum vulgare L.) were evaluated under various management regimes (2 soil types, 3 levels of N fertilizer, and 3 cropping systems - barley alone, and barley intercropped with trees pruned or unpruned). Intercropping did not affect productivity and N nutrition of barley in 1988 when trees were small. However, there was a significant yield decline in 1989 as the trees grew bigger. On average, productivity of the sole crop was 8% higher in both soil types. pruning and mulching moderated the yield reduction compared with the unpruned treatment. Competition for soil moisture was considered a major constraint. Nonetheless, the overall productivity (barley + black locust) from the intercropped treatments was 53% higher than sole cropping. In 1989 and 1990, intercropped barley had significantly higher grain and straw N concentrations (%). In 1989, for example, grain N content was 11% higher than in the sole crop. Removal of trees in 1990 resulted in significant increase in productivity and N content of subsequent barley crop relative to continuous sole cropping. From N nutrition viewpoint, barley from previously intercropped treatments showed superior quality and it had, on average, 23% higher grain N content than the sole crop. This was attributed to N-2-fixation and N return by black locust. It was estimated that black locust contributed about 36 kg N ha(-1) to the system. This study underscores the role black locust is potentially capable of playing in the development of sustainable and low-input agricultural systems in temperate regions. Nonetheless, the study also illustrates the importance of the below and above-ground interactions that occur in intercropped systems and the need for further research in this area.

4387 Rubenis, J.; Melngalvis, I. (Latvia University of Agriculture, Jelgava (Latvia)) (1994) **[Influence of different fallows on the weeds in winter wheat corn - fields]. Dazadu papuvju ietekme uz ziemas kviesu nezalainibu.** *Raziba (Latvia) (no.6) p. 24-25.* 2 tables. Latvian. (AGRIS 95-098319).

4388 Thevathasan, NV.; Gordon, AM. (1995) **MOISTURE AND FERTILITY INTERACTIONS IN A POTTED POPLAR-BARLEY INTERCROPPING.** *Agroforestry Systems. 29(3):275-283.* English. [UNIV GUELPH DEPT ENVIRONM BIOL GUELPH ON N1G 2W1 CANADA].

Through proper design and management of a tree-based intercropping system, 'competitive' interactions can be reduced and 'complementary' interactions promoted so that tree and crop components maximize sharing of resource pools. In this experiment, main and interaction effects of three levels of soil moisture (15 KPa, 15-50 KPa and 15-300 KPa) and three levels of soil N (35, 70 and 140 kg N ha(-1)), on growth, development and yield of intercropped poplar (Populus spp.) clone DN 177 and barley (Hordeum vulgare, var. OAC Kippen), were investigated in a potted greenhouse experiment. Barley growth and development and grain yield were significantly ($p < 0.05$) affected by the levels of soil moisture and N tested but, growth and development of poplar was not. Moisture and N levels contributed their maximum effect to final grain yield when the other was presented in adequate quantities. However, the treatment combination of highest levels of moisture and N did not significantly affect the grain yield when compared to the combination of medium levels of moisture and N. It appears therefore that an increase in the level of moisture and N beyond an optimum level is not likely to significantly affect final grain yield or above ground biomass. There was no difference in the final grain yield or other parameters between the monocropped and intercropped barley, suggesting that poplar did not compete for moisture or N with barley. The total aboveground biomass produced per pot in the intercropped system was 14% higher than in the monocropped system. As there was no difference in the final grain yield, the tree intercropped treatment has an advantage over monocropped systems in terms of resource utilization.

F30 PLANT GENETICS AND BREEDING

4389 **[Cereal crops - Results of State variety trials in 1993]. Obilniny - vysledky statnich odrudovych zkousek 1993** (1994) Statni Kontrolni a Zkusebni Ustav Zemedelsky, Brno (Czech Republic). Statni Kontrolni a Zkusebni Ustav Zemedelsky. 1 map, 61 tables. 70 p. Czech. (AGRIS 95-111375).

4390 **Data summary for the 1st and 2nd international heat stress genotype experiments (IHSGE), 1990-1992** (1994) Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). *CIMMYT International Heat Stress Genotype Experiments IHSGE (CIMMYT); no. 1-2 6 p.* CIMMYT. 31 tables. English. (AGRIS 95-098353).

4391 **Data summary for the 3rd international heat stress genotype experiments (IHSGE), 1992-1993** (1994) Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). *CIMMYT International Heat Stress Genotype Experiments IHSGE (CIMMYT); no. 3 13 p.* CIMMYT. 11 tables. English. (AGRIS 95-098354).

4392 **[Guideline for the efficacy evaluation of growth regulators. No. 182: Chemical hybridizing agents in cereals (except maize)]. Directive pour l'evaluation biologique des regulateurs de croissance. No. 182: Agents chimiques d'hybridation des cereales (excepte le mais)** (1994) Organisation Europeenne et Mediterraneenne de Protection des Plantes, Paris (France). *Bulletin OEPP (EPPO) v. 24(2) p. 251-258.* (En, Fr). (AGRIS 95-098459).

4393 **[ICARDA/CIMMYT Results of the 1990-91 barley nurseries]. ICARDA/CIMMYT Resultados de los viveros de cebada de 1990-91** (1994)

Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). *ICARDA/CIMMYT Results of the Barley Nurseries (CIMMYT); ICARDA/CIMMYT Resultados de los Viveros de Cebada (CIMMYT) 72 p.* CIMMYT. 49 tables. (En, Es). (AGRIS 95-098487).

4394 **[International maize testing program 1992: Final report]. Programas de ensayos internacionales de maiz 1992: Informe final** (1995) Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). *CIMMYT International Maize Testing Program: Final Report (CIMMYT); CIMMYT Programa de Ensayos Internacionales de Maiz: Informe Final (CIMMYT) 362 p.* CIMMYT. 303 tables; 3 ref. (En, Es). (AGRIS 95-098511).

The 1992 final report on the international maize testing program covers trials sent to cooperators in 1992 and for which data were received by May 1, 1994. It also includes trials results from 1991 for which data arrived too late to be included in earlier reports. In 1992 the international testing program distributed three types of standard trials: International Progeny Testing Trials (IPTT's), Experimental Variety Trials (EVT's), and Preliminary Evaluation Trials (PET's). The trials were distributed to national programs upon request as a product of CIMMYT's ongoing germplasm improvement work. Agro-climatic information, when available, along with agronomic data has been included in the summary tables for each location. Information on elevation, date planted and harvested, weather, soil properties, and agronomic operations should allow for a meaningful interpretation of trial results.

4395 **Laboratory protocols: CIMMYT applied molecular genetics laboratory** (1994) Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). CIMMYT. 2 ed. 51 p. English. (AGRIS 95-098388).

Aimed at scientists who are setting up or operating program in applied molecular genetics. This lab manual provides step-by-step descriptions of procedures that are being used routinely in RFLP, RAPD and related research at CIMMYT. All procedures are developed for large-scale analyses and are based on chemiluminescent (non radioactive) detection.

4396 **NIAB recommended lists of cereals 1994** (1994) National Institute of Agricultural Botany, Cambridge (United Kingdom). National Institute of Agricultural Botany (NIAB). 128 p. English. (AGRIS 95-098522).

4397 **Results from the second facultative and winter wheat observation nursery (2FAWWON, 1992-1993)** (1994) Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Ankara (Turkey). *CIMMYT Facultative and Winter Wheat Observation Nursery FAWWON (CIMMYT); no. 2 110 p.* CIMMYT. 19 tables. English. (AGRIS 95-098455).

The facultative and winter wheat observation nursery (FAWWON) is a collection of advanced lines and cultivars varying in level of winter-hardiness selected by scientists of the Turkey/CIMMYT/ICARDA partnership for distribution to cooperators in winter wheat growing areas. The entries in the 2nd FAWWON were selected as having the best overall performance at several locations in Turkey for one or more years. Performance traits normally evaluated are adaptation, disease resistance, drought tolerance, winter hardiness, and grain yield. Entries submitted by cooperators for distribution in the FAWWON were included without further testing in Turkey. The 2nd FAWWON was distributed in August 1992 to 97 cooperators in 45 countries. Data were returned by 49 cooperators. The nursery consisted of 180 entries. The germplasm in the 2nd FAWWON originated from programs of Turkey, Bulgaria, the People's Republic of China, Hungary, France, Germany, Romania, Switzerland, the USA (Colorado State University, Florida State University, Kansas State University, University of Nebraska, Ohio State University, Oklahoma State University, Oregon State University, and Texas A and M), Yugoslavia, CIMMYT/Mexico, CIMMYT/Turkey and CIMMYT/ICARDA/Syria.

4398 **Results from the third facultative and winter wheat observation nursery (3rd FAWWON, 1993-1994)** (1995) Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Ankara (Turkey). *CIMMYT Facultative and Winter Wheat Observation Nursery FAWWON (CIMMYT); no. 3 84 p.* CIMMYT. 17 tables. English. (AGRIS 95-098456).

The facultative and winter wheat observation nursery (FAWWON) is a collection of advanced lines and cultivars varying in level of winter-hardiness selected by scientists of the Turkey/CIMMYT/ICARDA Partnership for distribution to cooperators in winter wheat growing areas. The entries in the 3rd FAWWON were selected as having the best overall performance at several locations in Turkey and Syria for one or more years. Performance traits normally evaluated are adaptation, disease resistance, drought tolerance, winter hardiness, and grain yield. Entries submitted by cooperators for distribution in the FAWWON were included without further testing in Turkey. The 3rd FAWWON was distributed in August 1993 to 128 cooperators in 46 countries. Data were returned by 58 cooperators. The nursery consisted of 150 entries. The germplasm in the 3rd FAWWON originated from programs of Turkey, Bulgaria, the People's Republic of China, Croatia, Hungary, Italy, Romania, Ukraine, the USA (Kansas State University, Oregon State University, and Texas A and M) Yugoslavia, CIMMYT/Mexico, CIMMYT/Turkey and CIMMYT/ICARDA/Syria.

4399 **[Results of the 1989-90 specialized screening nurseries for CIMMYT bread wheats]. Resultados de los viveros de seleccion para propositos especiales de trigos harineros del CIMMYT 1989-90** (1993) Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). *CIMMYT Results of the 1989-90 Specialized Screening Nurseries for Bread Wheat (CIMMYT); CIMMYT Resultados de los Viveros de Seleccion para Propositos Especiales de Trigos Harineros del CIMMYT 1989-90 (CIMMYT) 139 p.* CIMMYT. 147 tables. (En, Es). (AGRIS 95-098562).

4400 **[Results of the 1990-91 specialized screening nurseries for CIMMYT bread wheats]. Resultados de los viveros de seleccion para propositos especiales de trigos harineros del CIMMYT 1990-91** (1994) Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). *CIMMYT Results of the 1990-91 Specialized Screening Nurseries for Bread Wheat (CIMMYT); CIMMYT Resultados de los Viveros de Seleccion para Propositos Especiales de Trigos Harineros del CIMMYT 1990-91 (CIMMYT) 131 p.* CIMMYT. 51 tables. (En, Es). (AGRIS 95-098582).

4401 **[Results of the 21st and 22nd international triticale screening nurseries (ITSNs) 1989-90 and 1990-91]. Resultados del 21 y 22 viveros internacionales de seleccion de triticale (ITSNs) 1989-90 y 1990-91** (1994) Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). *CIMMYT International Triticale Screening Nursery ITSN (CIMMYT);CIMMYT Resultados del los Viveros Internacionales de Seleccion de Triticale ITSN (CIMMYT); no. 21-22 34 p.* CIMMYT. 4 tables. (En, Es). (AGRIS 95-098448).

The 21st and 22nd ITSNs were sent to cooperators in 1989 and 1990, respectively. CIMMYT sent 125 nurseries to 108 cooperators in 65 countries in the 21st ITSN and 119 nurseries to 96 cooperators in 58 countries in the 22nd ITSN. The 290 advanced lines and checks (150 in the 21st and 140 in 22nd) had been chosen from among CIMMYT's best materials. All had been grown and observed in a high-yielding environment with pressure from major diseases in the Yaqui Valley of Northwestern Mexico. The seed source for these international nurseries was the Hermosillo Experiment Station, Sonora, Mexico. The seed was cleaned and treated with a mixture of Terrazan and Vitavax before shipment. Enough seed from each line was provided for an unreplicated double row, at least 2 m long. 53 (21st ITSN) and 61 (22nd ITSN) of the cooperators receiving the nursery returned field books. The choice of variables measured and the data returned rest with the individual cooperators. We have summarized selected variables that were reported. The number of observations differs from variable to variable. The reader is urged to note the number of observations at the head of each variable column in the tables; this may be an important indication of the level of credibility that should be inferred. Also bear in mind that the yield reported is from a single, unbordered plot grown for observation rather than as a rigorous, replicated yield trial.

4402 **[Results of the eighth acid soil wheat screening nursery (ASWSN) 1989-90]. Resultados del octavo vivero de seleccion de trigo para suelos acidos (ASWSN) 1989-90** (1993) Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). CIMMYT Results of the 1989-90 Specialized Screening Nurseries for Bread Wheat (CIMMYT); CIMMYT Resultados de los Viveros de Seleccion para Propositos Especiales

de Trigos Harineros del CIMMYT 1989-90 (CIMMYT) p. 81-101. CIMMYT. 22 tables. 22 tables. p. 81-101. (En, Es). (AGRIS 95-098581).

The 8th ASWSN was despatched in 1989. The 49 advanced lines and checks in the nursery had been chosen from among CIMMYT's best materials. Many entries were developed in Mexico through the Ciudad Obregon-Toluca shuttle and laboratory testing under conditions of extreme aluminum toxicity (46 ppm). 15 cooperators representing 10 countries returned field books with performance data from their locations in time to be included in this report. The choice of variable measured and the data returned rests with the individual cooperator. We have included in this summary selected variables reported to us. The number of observations, therefore, differs from variable to variable. The reader is advised to note the number of observations at the head of each variable column this may be an important indicator of the level of credibility that should be inferred. The reader should also bear in mind that the yield reported is from a single unbordered plot, grown for observation rather than as a rigorous, replicated yield trial.

4403 [Results of the eighth semi-arid wheat screening nursery (SAWSN) 1989-90]. Resultados del octavo vivero de seleccion de trigo para zonas semiaridas (SAWSN) 1989-90 (1993) Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). CIMMYT Results of the 1989-90 Specialized Screening Nurseries for Bread Wheat (CIMMYT); CIMMYT Resultados de los Viveros de Seleccion para Propositos Especiales de Trigos Harineros del CIMMYT 1989-90 (CIMMYT) p. 1-48. CIMMYT. 56 tables. p. 1-48. (En, Es). (AGRIS 95-098563).

The 8th SAWSN, comprising 142 entries including checks, was sent to cooperators in September 1989. These lines were selected in Mexico especially for tolerance to drought and resistance to disease and, in many cases, yield potential as well. 63 cooperators representing 27 countries returned field books with performance data from their locations in time to be included in this report. The choice of variables measured and the data returned rests with the individual cooperator. We have included in this summary selected variables reported to us. The number of observations, therefore, differs from variable to variable. The reader is advised to note the number of observations at the head of each variable column. This may be an important indicator of the level of credibility that should be inferred. The reader should also bear in mind that the yield reported is from a single unbordered plot, essentially grown for observation rather than for yield estimation. It is CIMMYT's intent that the information in this report be used by national programs in their recombination and selection efforts. For easy reference to the data tables, see the Table of Contents for the 8th SAWSN.

4404 [Results of the first high rainfall areas wheat screening nursery (HRAWSN) 1989-90]. Resultados del primer vivero de seleccion de trigo para areas de alta precipitacion (HRAWSN) 1989-90 (1993) Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). CIMMYT Results of the 1989-90 Specialized Screening Nurseries for Bread Wheat (CIMMYT); CIMMYT Resultados de los Viveros de Seleccion para Propositos Especiales de Trigos Harineros del CIMMYT 1989-90 (CIMMYT) p. 102-139. CIMMYT. 44 tables. p. 102-139. (En, Es). (AGRIS 95-098564).

The First HRAWSN (high rainfall areas wheat screening nursery) is descriptive of the environment with septoria tritici blotch, stripe rust, leaf rust stem rust, and BYD problems. The nursery was shipped in 1989, consisted of 110 advanced lines including checks chosen from among CIMMYT's best materials, along with some introductions from other programs. The lines had been grown and observed under high pressure of septoria tritici blotch in Patzcuaro, Michoacan, and under artificial epidemics at the Toluca Experiment Station in Central Mexico. These lines carry rust resistance and high yield potential under Mexican conditions and most are of semidwarf stature and medium maturity. 40 cooperators from 31 countries receiving the nursery returned field books with performance data from their locations. The choice of variables measured and the data returned rests with the individual cooperator. We have included in this summary selected variables reported to us. The number of sites differs from variable to variable. The reader is urged to note the number of sites at the head of each variable column; this may be an important indicator of the level of credibility that should be inferred. The reader should also bear in mind that the yield reported is from a small unbordered area, grown for observation rather than as a rigorous, replicated yield trial. It is our intent that the results reported here will assist cooperators in utilizing this germplasm for further genetic improvement.

4405 [Results of the ninth acid soil wheat screening nursery (ASWSN) 1990-91]. Resultados del noveno vivero de seleccion de trigo para suelos acidos (ASWSN) 1990-91 (1994) Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). CIMMYT Results of the 1990-91 Specialized Screening Nurseries for Bread Wheat (CIMMYT); CIMMYT Resultados de los Viveros de Seleccion para Propositos Especiales de Trigos Harineros del CIMMYT 1990-91 (CIMMYT) p. 53-69. CIMMYT. 13 tables. p. 53-69. (En, Es). (AGRIS 95-098583).

The 9th ASWSN was despatched in 1990. The 70 advanced lines and checks in the nursery had been chosen from among CIMMYT's best materials. Many entries were developed in Mexico through the Ciudad Obregon-Toluca shuttle and laboratory testing under conditions of extreme aluminum toxicity (46 ppm). 25 cooperators representing 21 countries returned data to be included in this report. The choice of variables measured and the data returned rests with the individual cooperator. We have included in this summary selected variables. The number of observations, therefore, differs from variable to variable. The reader should bear in mind that the yield reported is from a single unbordered plot, grown for observation rather than as a rigorous, replicated yield trial.

4406 [Results of the ninth semi-arid wheat screening nursery (SAWSN) 1990-91]. Resultados del noveno vivero de seleccion de trigo para zonas semiaridas (SAWSN) 1990-91 (1994) Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). CIMMYT Results of the 1990-91 Specialized Screening Nurseries for Bread Wheat (CIMMYT); CIMMYT Resultados de los Viveros de Seleccion para Propositos Especiales de Trigos Harineros del CIMMYT 1990-91 (CIMMYT) p. 1-52. CIMMYT. 13 tables. 13 tables. p. 1-52. (En, Es). (AGRIS 95-098565).

The 9th SAWSN, comprising 237 entries (including checks), was sent to cooperators in 1990. These lines were selected in Mexico especially for tolerance to drought and resistance to disease and, in many cases, yield potential as well. 60 cooperators representing 31 countries returned data to be included in this report. The choice of variables measured and the data returned rests with the individual cooperator. We have included in this summary selected variables reported to us. The number of observations, therefore, differs from variable to variable. The reader should bear in mind that the yield reported is from a single, unreplicated and unbordered plot, essentially grown for observation rather than for yield estimation. It is CIMMYT's intent that the information in this report be used by national programs in their recombination and selection efforts.

4407 [Results of the second high rainfall areas wheat screening nursery (HRAWSN) 1990-91]. Resultados del segundo vivero de seleccion de trigo para areas de alta precipitacion (HRAWSN) 1990-91 (1994) Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). CIMMYT Results of the 1990-91 Specialized Screening Nurseries for Bread Wheat (CIMMYT); CIMMYT Resultados de los Viveros de Seleccion para Propositos Especiales de Trigos Harineros del CIMMYT 1990-91 (CIMMYT) p. 101-131. CIMMYT. 12 tables. p. 101-131. (En, Es). (AGRIS 95-098585).

The nursery has been designated the second high rainfall areas wheat screening nursery (HRAWSN) a name we believe is more descriptive of the environment with Septoria tritici blotch, stripe rust, leaf rust, stem rust, and BYD problems. This nursery was shipped in 1990, consisted of 148 advanced lines including checks chosen from among CIMMYT's best materials, along with some introductions from other programs. The advanced lines had been grown and observed by CIMMYT scientists under high pressure of septoria tritici blotch in Patzcuaro, Michoacan, and under artificial epidemics at the Toluca Experiment Station in Central Mexico. These lines carry rust resistance and high yield potential under Mexican conditions and most are of semidwarf stature and medium maturity. 43 cooperators from 29 countries returned data included in this report. The choice of variables measured and the data returned rests with the individual cooperator. We have included in this summary selected variables reported to us. The reader should bear in mind that the yield reported is from a small, unreplicated and unbordered area, grown for observation rather than as a rigorous, replicated yield trial. It is our intent

that the results reported here will assist cooperators in utilizing this germplasm for further improvement.

4408 **[Results of the twelfth elite selection wheat yield trial (ESWYT) 1990-91]. Resultados del 12avo. ensayo de rendimiento de seleccion elite de trigo harinero (ESWYT) 1990-91** (1994) Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). *CIMMYT Results of the Elite Selection Wheat Yield Trial ESWYT (CIMMYT); CIMMYT Resultados del Ensayo de Rendimiento de Seleccion Elite de Trigo Harinero ESWYT (CIMMYT) 80 p.* CIMMYT. 41 tables; 17 illus. (En, Es). (AGRIS 95-098586).

The 12th ESWYT was distributed in 1990. Its 29 advanced lines were all of Mexican origin, except for V763-153 from Pakistan. The lines were previously evaluated in the high-yielding environment of CIANO Experiment Station in the Yaqui Valley of Northwestern Mexico. The selected lines thus comprised an elite collection that cooperators tested under their own conditions. ESWYT is now specifically targeted towards conditions in Mega-environment 1, which represents temperate, optimally irrigated, and low rainfall areas. Seed for this nursery was multiplied at the Hermosillo Experiment Station in Northwester Mexico. The seed was cleaned and treated with a mixture of Terrazan and Vitavax before shipment. A randomized complete block design with three replicates and plots of six 3m rows sown 30 cm apart was recommended. However, plot configuration may be adjusted to conform to local equipment. Sixty-five cooperators receiving the nursery returned field books reporting performance at their locations in time to be included in this report.

4409 **[The results of the fourth warmer areas wheat screening nursery (WAWSN) 1990-91]. Resultados del cuarto vivero de seleccion de trigo para zonas calidas (WAWSN) 1990-91** (1994) Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). CIMMYT Results of the 1990-91 Specialized Screening Nurseries for Bread Wheat (CIMMYT); CIMMYT Resultados de los Viveros de Seleccion para Propositos Especiales de Trigos Harineros del CIMMYT 1990-91 (CIMMYT) p. 71-100. CIMMYT. 13 tables. p. 71-100. (En, Es). (AGRIS 95-098584).

The 4th WAWSN included 136 advanced lines and varieties carrying resistance to spot blotch (Helminthosporium sativum) at Poza Rica, Veracruz, Mexico. Some of these lines may show different reactions to H. sativum at other locations. Resistance to this disease, combined with tolerance to high temperature, is needed to facilitate the adaptation of wheat in the nontraditional warm areas. Hopefully, some of the germplasm described here will be useful to cooperators in the warmer regions. 32 cooperators from 23 countries returned data included in this report. The choice of variables measured rested with the individual cooperator. We have included in this summary selected variables. The number of sites differs from variable to variable. The reader should bear in mind that the yield reported is from a small unbordered area, grown for observation rather than as a rigorous, replicated yield trial.

4410 **[The results of the third warmer areas wheat screening nursery (WAWSN) 1989-90]. Resultados del 3er. vivero de seleccion de trigo para zonas calidas (WAWSN) 1989-90** (1993) Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). CIMMYT Results of the 1989-90 Specialized Screening Nurseries for Bread Wheat (CIMMYT); CIMMYT Resultados de los Viveros de Seleccion para Propositos Especiales de Trigos Harineros del CIMMYT 1989-90 (CIMMYT) p. 49-80. CIMMYT. 25 tables. p. 49-80. (En, Es). (AGRIS 95-098580).

The third WAWSN included 113 advanced lines and varieties, carry resistance to Helminthosporium sativum measured at Poza Rica, Mexico. Some of these lines may show different reactions to H. sativum at other locations. Resistance to this disease, combined with tolerance to high temperature, is needed to facilitate the adaptation of wheat in the nontraditional warm areas. Hopefully, some of the germplasm described here will be useful to cooperators In the warmer regions. 23 cooperators from 16 countries returned field books with performance data from their locations in time to be included in this report. The choice of variables measured rested with the individual cooperator. We have included in this summary selected variables. The number of sites differs from variable to variable. The reader is urged to note the number of sites at the head of each variable column. The reader should also bear in mind that the yield reported is from a small unbordered area, grown for observation rather than as a rigorous, replicated yield trial.

4411 Aalen, RB. (1995) **THE TRANSCRIPTS ENCODING TWO OLEOSIN ISOFORMS ARE BOTH PRESENT IN THE ALEURONE AND IN THE EMBRYO OF BARLEY (HORDEUM VULGARE L) SEEDS.** *Plant Molecular Biology. 28(3):583-588.* English. [UNIV OSLO DIV GEN GENET POB 1031 N-0315 OSLO NORWAY].

Two transcripts (Ole-1 and Ole-2) encoding two oleosin isoforms homologous to the 18 and 16 kDa oleosins of maize, respectively, have been isolated from developing barley embryos and aleurone layers where lipid bodies are highly abundant organelles. For each of the isoforms the aleurone and embryo transcripts are identical, indicating that the same genes are expressed in both tissues. The temporal accumulation of the two transcripts during seed development is similar. At a low frequency, lipid bodies are found also in starchy endosperm cells of barley. Accordingly, a low transcript level is observed for both oleosins during starchy endosperm development. [References: 23].

4412 Abd El Monem, A.M. (Suez Canal Univ., El Arish (Egypt). Faculty of Environ and Agricultural Sciences) (1993) **Variability and heritability of some durum wheat traits under low rain-fed conditions in North Sinai [Egypt].** *Zagazig Journal of Agricultural Research (Egypt) v. 20(6) p. 1727-1737.* 5 tables; 21 ref. English. (AGRIS 95-111439).

4413 Acevedo Gasman, Maria Francisca Jose (1993) **[Mapping of slow leaf-rusting resistance in wheat]. Mapeo de la resistencia al progreso lento de la roya de la hoja en trigo.** Colegio de Postgraduados, Montecillo (Mexico). Centro de Genetica. 7 ilus.; 12 tablas; 74 ref. 76 p. Spanish. (AGRIS 95-098554).

4414 Acevedo, A. (1993) **A strategy to determine chromosomal location and linkage analysis of complementary dominant lethal genes in barley (H. vulgare L.).** *Barley genetics newsletter (USA) v. 22 p. 8-9.* references. English. (AGRIS 95-111059).

4415 Adamska, E.; Patyna, H. (Polska Akademia Nauk, Poznan (Poland). Inst. Genetyki Roslin) (1993) **[Gene effects for some quantitative traits in crosses between mutants and initial form in winter barley]. Efekty dzialania genow dla cech ilosciowych u wybranych kombinacji krzyzowkowych mutantow jeczmienia ozimego z forma wyjsciowa.** 3. Symposium: Quantitative Genetics of Crops; Kudowa-Zdroj (Poland); 24-25 May 1993. *Zeszyty Naukowe Akademii Rolniczej we Wroclawiu. Rolnictwo (Poland) (no.223) p. 209-214.* 4 tables; 3 ref. Polish. (AGRIS 95-098485).

The paper presents the results of the study concerning the inheritance of the 5 traits (plant, hight, spike lenght, grain number per spike, grain weight per spike, 100-grain number) in crosses between initial form R-5139 and 3 mutants: 0177, 0540, 0219. On the basis of P1, P2, F1, F2, F3 generations genetic parameters associated with the additive gene action dominance and non-allelic interaction (homozygote x homozygote and heterozygote x heterozygote) have been estimated using the method of Kaczmarek et all.

4416 Adamska, E.; Patyna, H. (Polska Akademia Nauk, Poznan (Poland). Inst. Genetyki Roslin) (1993) **[Multivariate estimation of the breeding value of winter barley mutants based of block experiments]. Wielocechowa ocena wartosci hodowlanej mutantow jeczmienia ozimego na podstawie doswiadczen blokowych.** 3. Symposium: Quantitative Genetics of Crops; Kudowa-Zdroj (Poland); 24-25 May 1993. *Zeszyty Naukowe Akademii Rolniczej we Wroclawiu. Rolnictwo (Poland) (no.223) p. 201-208.* 1 fig., 2 tables; 5 ref. Polish. (AGRIS 95-098484).

Using different estimation criteria, 54 selected mutants were divided into 3 groups, each consisting of 18 objects. In individual experiments covering 20 objects each the following traits were traced: grain number per spike, grain weight per spike, 1000 grains weight and grain yield per plot. The general hypotheses about the lack of differences between the objects with regard to all studied characters as well as particular hypotheses concerning interesting contrasts between individual mutants and initial forms and between groups of mutants derived from 2 different initial forms were verified. The studied mutants were also presented graphically in the relevant systems of canonical variables.

4417 Ainsworth, C.; Hosein, F.; Tarvis, M.; Weir, F.; Burrell, M.; Devos, KM.; Gale, MD. (1995) **ADENOSINE DIPHOSPHATE GLUCOSE PYROPHOSPHORYLASE GENES IN WHEAT - DIFFERENTIAL EXPRESSION AND GENE MAPPING.** *Planta. 197(1):1-10.* English. [UNIV LONDON WYE COLL DEPT BIOL SCI PLANT MOLEC BIOL LAB WYE TN25 5AH KENT ENGLAND].

A full-length cDNA clone representing the large (shrunken-2) subunit of ADP-glucose pyrophosphorylase (AGP; EC 2.7.7.27) has been isolated from a cDNA library prepared from developing grain of hexaploid wheat (Triticum aestivum L., cv. Chinese Spring). The 2084-bp cDNA insert contains an open reading frame of 1566 nucleotides and primer-extension analysis indicated that the 5' end is 10 nucleotides shorter than the mRNA. The deduced protein contains 522 amino acids (57.8 kDa) and includes a putative transit peptide of 62 amino acids (6.5 kDa). The similarity of the deduced protein to the small subunit of AGP and to other AGP genes from plants and microorganisms is discussed. Northern hybridisation shows that the Agp1 genes (encoding the small subunit in the wheat endosperm) and the Agp2 genes (encoding the large subunit in the wheat endosperm) are differentially expressed in the wheat grain. Transcripts from both gene sets accumulate to high levels in the endosperm during grain development with the majority of the expression in the endopsperm rather than the embryo and pericarp layers. Although enzyme activity is detected in developing grains prior to 10 d post anthesis, only the Agp1 genes are active at this time (the Agp2 genes are not expressed until 10 d post anthesis). The possibility that the enzyme expressed during early grain development is a homotetramer of small subunits is discussed. The Agp1 and Agp2 genes are arranged as triplicate sets of single-copy homoeoloci in wheat. The Agp2 genes are located on the long arms of chromosomes 1A, 1B and 1D, about 80 cM from the centromere. The Agp1 genes have been mapped to a position just distal to the centromere on the long arms of chromosomes 7A, 7B and 7D. [References: 37].

4418 Al Kaddoussi, A.R.; Eissa, M.M.; Salama, S.M. (Zagazig Univ. (Egypt). Faculty of Agriculture) (1994) **Combining ability over sowing dates for main spike characteristics in wheat.** *Annals of Agricultural Science, Moshtohor (Egypt) v. 32(1) p. 75-82.* 3 tables; 10 ref. English. (AGRIS 95-111001).

4419 Al'derov, A.A. (1994) **[On pleiothrophic effect of genes controlling dwarfism of Durum wheat plants (Triticum durum Desf.)]. Plejotropnyj ehffekt genov, kontroliruyushchikh nizkoroslost' rastenij tverdoj pshenitsy (Triticum durum Desf.).** *Sel'skokhozyajstvennaya biologiya. Seriya Biologiya rastenij (Russian Federation) (no.3) p. 40-47.* 11 ref. Russian. (AGRIS 95-111442).

Experimental data are presented on the revealing of dwarfism donors and the realization of genetic factors of this property in various hybrid combinations. It has been shown that genes determining the dwarfism of durum wheat forms (the sphaerococcum type) possessed a broad spectrum of the pleiotrophic influence on some properties of tetraploid wheat forms. It has been found that the pleiotrophy did not affect the properties determining the adaptation to biotic and abiotic environmental factors and some morphological properties which were of interest for the systematics.

4420 Alkaddoussi, A.R.; Eissa, M.M.; Salama, S.M. (Zagazig Univ. (Egypt). Faculty of Agriculture) (1994) **Components of the genetic variance for heading date and some morphophysiological traits in wheat.** *Journal of Agricultural Sciences, Mansoura Univ. (Egypt) v. 19(4) p. 1267-1280.* 5 ill. 4 tables; 23 ref. English. (AGRIS 95-111415).

4421 Alves, F.P. (Estacao Nacional de Melhoramento de Plantas, Elves (Portugal)); Gusmao, L. (Estacao Agronomica Nacional, Oeiras (Portugal)); Mexia, J.T. (Nova de Lisboa Univ., Monte da Caparica (Portugal). Faculdade de Ciencias e Tecnologia) (1992) **[Borbilho: the first triticale multivar from the ENMP (Estacao Nacional de Melhoramento de Plantas - National Plant Breeding Station) [Portugal]]. "Borbilho": primeira multivar de triticale da ENMP? [Estacao Nacional de Melhoramento de Plantas].** [International Symposium on Plant Breeding]; Elvas (Portugal); 27-29 May 1992. Instituto Nacional de Investigacao Agraria, Elvas (Portugal). Estacao Nacional de Melhoramento de Plantas. *Melhoramento (Portugal) v. 33(1) p. 161-167.* issued 1994; 2 tables; 9 ref. Portuguese. (AGRIS 95-110957).

4422 Anderson, JA.; Maan, SS. (1995) **INTERSPECIFIC NUCLEAR-CYTOPLASMIC COMPATIBILITY CONTROLLED BY GENES GROUP 1 CHROMOSOMES IN DURUM WHEAT.** *Genome. 38(4):803-808.* English. [N DAKOTA STATE UNIV DEPT PLANT SCI FARGO, ND 58105 USA].

Triticum longissimum cytoplasm is incompatible with the T. turgidum nuclear genome. Two nuclear genes, scs and Vi, derived from the nuclear genome of T. timopheevii and by a spontaneous mutation, respectively, restore nuclear-cytoplasmic compatibility, normal plant vigor, and male fertility in these alloplasmic genotypes. The objectives of this study were (i) to determine the chromosomal locations of scs and Vi; (ii) to identify DNA markers for scs and Vi; and (iii) to determine the interactions involving the dosage of scs and Vi. Two populations segregating for scs and Vi were produced and scored for seedling vigor (indicating presence of scs) and degree of self-fertility (indicating presence of Vi). Four RFLP markers were mapped near scs. Aneuploid analysis revealed that these markers, and hence the scs gene, are located on the long arm of chromosome 1A. Four RFLP markers were mapped near Vi on 1BS. Results indicated that other factors may be inhibiting the expression of Vi. We determined the dosage of scs and Vi in both populations with the aid of the linked RFLP markers. Individuals with two versus one dose of scs had reduced self-fertility, while individuals with two versus one dose of Vi had similar self-fertility. [References: 27].

4423 Aniol, AM. (1995) **PHYSIOLOGICAL ASPECTS OF ALUMINIUM TOLERANCE ASSOCIATED WITH THE LONG ARM OF CHROMOSOME 2D OF THE WHEAT (TRITICUM AESTIVUM L) GENOME.** *Theoretical & Applied Genetics. 91(3):510-516.* English. [PLANT BREEDING & ACCLIMATIZAT INST DEPT PLANT BIOCHEM & PHYSIOL RADZIKOW POB 1019 PL-00950 WARSAW POLAND].

Aluminum (Al) uptake in roots of wheat near-isogenic lines having differing tolerances to aluminium toxicity was studied using roots and root segments immersed in a nutrient solution at a controlled pH and temperature. At low Al concentrations a mechanism preventing root tips from accumulating too much Al was observed in an Al-tolerant isoline and a 'BH1146' euploid. This mechanism was more efficient when divalent cations of calcium or magnesium were present in the nutrient medium. Al accumulation steadily increased in root tips of the Al-sensitive wheat isoline during all 24 h of incubation, and the presence of divalent cations in the medium even increased Al concentration in root tissue. However, at higher Al concentrations in the medium the mechanism preventing the root tips of Al-tolerant genotypes from accumulating too much Al was not observed, and in effect Al concentration in root tips of both Al-tolerant and Al-sensitive isolines increased. It is concluded that genetical factors are located on the long arm of chromosome 2D from the BH1146 euploid that control the mechanism preventing root apical meristems from accumulating too much Al at low Al concentrations in the medium. However, there must be other genetical factors also located on this chromosome segment that control Al detoxication in root tips of Al-tolerant lines at higher external Al concentrations. [References: 36].

4424 Backes, G.; Fischbeck, G.; Graner, A.; Jahoor, A. (1993) **Localisation of agronomically important traits in barley (Hordeum vulgare L.) by means of RFLP marker.** *Barley genetics newsletter (USA) v. 23 p. 60-64.* references. English. (AGRIS 95-111100).

4425 Badea, E.M.; Lupusanschi, I. (Institutul de Biologie, Bucuresti (Romania)); Sandulescu, D. (Institutul de Cercetari pentru Protectia Plantelor, Bucuresti (Romania)); Raicu, P. (Bucuresti Univ. (Romania). Facultatea de Biologie) (1994) **[Effects of toxin produced by Fusarium graminearum on androgenesis process at varieties and F1 hybrids of Triticum aestivum]. Efectul toxinei produse de Fusarium graminearum asupra procesului de androgeneza la soiuri si hibrizi F1 de Triticum aestivum.** *Cercetari de genetica vegetala si animala (Romania) v. 3 p. 27-35.* 3 tables; 1 ill., 1 graph. Romanian. (AGRIS 95-111426).

The effect of toxin produced by Fusarium graminearum on the androgenesis induction process, on the regeneration capacity of pollen calli and on green plants yields was studied for 12 F1 hybrids and 4 varieties.

Mitotic abnormalities were higher in toxic than in non-toxic medium. This suggests a mutagene of the F2 toxin. Although the toxin had various effects depending on the variety genotype and the toxin concentration, it generally stimulated anther productivity. The resulting calli yielded green plants, the regeneration rate depending on the variety genotype and the toxin concentration. On some genotypes the toxin had a stimulating effect whereas on others it had an inhibiting one, suggesting a possible selective and/or mutagen action. The effect of the toxin on the regeneration rate and on yield of green plants is obvious in hybrids where the number of albino plants increases and green plant yield decreases with a higher toxin concentration. This could be due to a mutagen action of the F2 toxin.

4426 Bailey, KL.; Hucl, P.; Harding, H. (1995) **FOUR INTERSPECIFIC GERMPLASM LINES (302-1, 302-3, 302-5, 302-20) OF SPRING WHEAT WITH RESISTANCE TO COMMON ROOT ROT (COCHLIOBOLUS SATIVUS) DERIVED FROM AEGILOPS OVATA.** *Canadian Journal of Plant Science. 75(3):693-694.* English. [AGR & AGRIFOOD CANADA 107 SCI PL SASKATOON SK S7N 0X2 CANADA].

Germplasm resistant to common root rot was developed from crossing Aegilops ovata with Triticum aestivum, using Chinese Spring ph Ib genetic stock and the cultivar Leader. The germplasm lines had yellow flour pigment and a longer mixing time and lower SDS sedimentation volume, falling number, and mixograph peak height than Leader. Yet, for most agronomic and quality traits, the germplasm was similar to that of Leader and Neepawa. Seed was classed as CWRS. This germplasm represents a different source of genes for resistance to common root rot than currently available in red spring wheat cultivars or breeding lines. [References: 3].

4427 Bailey, KL.; Hucl, P.; Harding, H. (1995) **THREE SPRING WHEAT GERMPLASM LINES (839-984, 841-2, AND 839-1076) WITH RESISTANCE TO COMMON ROOT ROT.** *Canadian Journal of Plant Science. 75(3):695-696.* English. [AGR & AGRIFOOD CANADA RES CTR 107 SCI PL SASKATOON SK S7N 0X2 CANADA].

Three spring wheat germplasm lines were developed with higher levels of resistance to common root rot than is currently available in CWRS and CPS wheats. Grain yield, plant height, flour yield, flour protein, sedimentation volume, and other quality traits of the lines were similar to those of Biggar. [References: 3].

4428 Beratto M, Edmundo (Instituto de Investigaciones Agropecuarias, Temuco (Chile). Estacion Experimental Carillanca) (1994) **[Centauro - INIA, a spring naked grain barley]. Centauro - INIA, cebada de primavera de grano desnudo.** *Agricultura Tecnica (Chile) v. 54(2) p. 206-207.* Spanish. (AGRIS 95-098467).

Centauro-INIA a new spring naked grain barley cultivar with good grain yield and high test weight was selected from advanced barley breeding germplasm introduced to Carillanca Experimental Station (INIA, IX Region, Temuco) from CIMMYT. Morphological and agronomic characteristics, grain yield and grain quality are given.

4429 Bernicot, M.H. (Institut Technique des Cereales et des Fourrages, Paris (France)) (1995) **[Barley varieties]. Le point sur les varietes d'orge.** *Perspectives Agricoles (France) (no 202) p. 89-108.* 14 tableaux. French. (AGRIS 95-098470).

4430 Bernicot, M.H. (Institut Technique des Cereales et des Fourrages, Paris (France)) (1995) **[Innovation: taking stock about hybrid wheats]. Innovations: le point sur les bles hybrides.** *Perspectives Agricoles (France) (no 202) p. 30-36.* French. (AGRIS 95-098462).

4431 Bernicot, M.H. (Institut Technique des Cereales et des Fourrages, *Paris* (France)); Braun, P.; Mahaut, B. (1995) **[Hard wheat varieties]. Les varietes de ble dur.** *Perspectives Agricoles (France) (no 202) p. 76-88.* French. (AGRIS 95-098553).

4432 Bjarnason, M. (Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). Maize Program) (1994) **Research on maize for the subtropics.** *The subtropical, midaltitude, and highland maize subprogram. Bjarnason, M. (ed.) (Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). Maize Program) p. 1-18.* CIMMYT. 12 tables; 8 ref. English. (AGRIS 95-098513).

4433 Bouard, A. (Secobra Recherches, Maule (France). Laboratoire d'Identification Varietale); Guyomard, O. (1995) **[New identification key for major barley varieties grown in France]. Une nouvelle cle d'identification des principales varietes d'orge cultivees en France.** *BIOS Boissons (France) v. 26(254) p. 31-37.* 15 ref. French. (AGRIS 95-098469).

4434 Brennan, J.P.; Murray, G.M.; Ballantyne, B.J. (New South Wales Agriculture, Wagga Wagga (Australia)) (1994) **Assessing the economic importance of disease resistance in wheat.** New South Wales Agriculture. 32 ref. 41 p. English. (AGRIS 95-098453).

Presents results of a project undertaken to explore new areas of research in evaluating economic aspects of disease resistance. Analysis is made of potential losses from different diseases over the years, or the costs of chemical control measures, and these are balanced against the costs of breeding and cultivar replacement programs. The significance of maintaining and developing resistance for the major wheat diseases in Australia was clearly shown by the project, with many demonstrated benefits well in excess of the costs of developing that resistance.

4435 Brites, C.; Macas, B.; Coutinho, J.; Bagulho, F. (Instituto Nacional de Investigacao Agraria, Elvas (Portugal). Estacao Nacional de Melhoramento de Plantas) (1992) **[Stability in the expression of the genetic characteristics which determine the technological quality in 4 soft wheat cultivars]. Estabilidade na expressao das caracteristicas geneticas que determinam a qualidade tecnologica em 4 cultivares de trigo mole.** *Melhoramento (Portugal) v. 33(2) p. 431-440.* issued 1994; 4 graph. 2 tables; 7 ref. Portuguese. (AGRIS 95-111423).

4436 Brown, JKM. (1995) **RECOMBINATION AND SELECTION IN POPULATIONS OF PLANT PATHOGENS.** *Plant Pathology. 44(2):279-293.* English. [JOHN INNES CTR PLANT SCI RES CEREALS RES DEPT COLNEY LANE NORWICH NR4 7UH NORFOLK ENGLAND].

A theoretical model has been used to study the dynamics of the frequencies of the following: a virulence gene which is selected by part of the host plant population; an unnecessary virulence gene, which is not required for infection of the host; and the gametic disequilibrium between the two genes. If the two genes are not initially in gametic equilibrium, the frequency of the unnecessary virulence may be altered greatly by hitch-hiking selection, because of the increased frequency of the selected virulence. The hitchhiking effect is strongest if reproduction is entirely asexual, but can still be significant if the frequency of recombination is less than the fraction of the host population which consists of selectively resistant plants. The frequency of recombination may be reduced if reproduction is partly clonal, rather than fully sexual, or if the two genes are linked. Selection against unnecessary virulence may give rise to complex dynamics of both virulence alleles; in particular, the frequency of an unnecessary virulence can rise substantially, by hitch-hiking selection, even if there is some sex or recombination. The direction in which the unnecessary virulence's frequency changes depends on the sign of the gametic disequilibrium between it and the selected gene, and on the existence of selection against unnecessary virulence. If there is no such selection, the long-term dynamics of genotype frequencies in a largely asexual pathogen population may be unpredictable. Consequently, disease control strategies based on planned replacements of one resistance gene by another are unlikely to be effective. [References: 40].

4437 Cabrera, A.; Friebe, B.; Jiang, J.; Gill, BS. (1995) **CHARACTERIZATION OF HORDEUM CHILENSE CHROMOSOMES BY C-BANDING AND IN SITU HYBRIDIZATION USING HIGHLY REPEATED DNA PROBES.** *Genome. 38(3):435-442.* English. [UNIV CORDOBA ESCUELA TECN SUPER INGN AGRON & MONTES DEPT GENET E-14080 CORDOBA SPAIN].

C-banding patterns of Hordeum chilense and of Triticum aestivum 'Chinese Spring' H. chilense disomic addition lines were analyzed and compared with in situ hybridization patterns using a biotin-labeled highly repetitive Triticum tauschii DNA sequence, pAsl, and a wheat 18S-26S rDNA probe. All seven H. chilense chromosomes pairs and the added H. chilense chromosomes present in the addition lines were identified by their characteristic C-banding pattern. Chromosome morphology and banding patterns were similar to those of the corresponding chromosomes present in

the parent H. chilense accession. A C-banded karyotype of the added H. chilense chromosomes was constructed and chromosome lengths, arm ratios, and relative length, as compared with chromosome 3B, were determined. The probe pAsl was found to hybridize to specific areas on telomeres and interstitial sites along the chromosomes, allowing the identification of all seven pairs of the H. chilense chromosomes. Comparison of the patterns of distribution of the hybridization sites of clone pAsl in the T. tauschii and H. chilense chromosomes was carried out by in situ hybridization on somatic metaphase chromosomes of the (HHDD)-H-ch-D-ch amphiploid. In situ hybridization using the 18S-26S rDNA probe confirmed that the H. chilense chromosomes 5H(ch) and 6H(ch) were carrying nucleolus organizer regions. The results are discussed on the basis of phylogenetic relationships between D and H-ch genomes. [References: 49].

4438 Cagirgan, M.I. (1993) **Multivariate statistical analysis of yield and related characters in control and macromutant populations of 'Quantum' barley.** *Barley genetics newsletter (USA) v. 23 p. 16-18.* references. English. (AGRIS 95-111089).

4439 Calderini, DF.; Torresleon, S.; Slafer, GA. (1995) **CONSEQUENCES OF WHEAT BREEDING ON NITROGEN AND PHOSPHORUS YIELD, GRAIN NITROGEN AND PHOSPHORUS CONCENTRATION AND ASSOCIATED TRAITS.** *Annals of Botany. 76(3):315-322.* English. [UNIV BUENOS AIRES FAC AGRON DEPT PROD VEGETAL CATEDRA CEREALICULTURA AV SAN MARTIN 4453 RA-1417 BUENOS AIRES DF ARGENTINA].

Several studies have analysed the effects of wheat breeding on dry matter accumulation and partitioning. but little has been done to understand the effects on nutrient economies. The objective of this study was to identify the changes produced by wheat breeding in the economy of nitrogen and phosphorus under field conditions. Two experiments were carried out with seven genotypes (including a commercial hybrid) representing different eras of plant breeding. Wheat breeding has increased grain nitrogen and phosphorus yield but total absorbed nutrients have not shown any trend during this century. The main attribute closely related to the increase in grain nitrogen and phosphorus yields was their harvest indices. The higher nutrient partitioning in the newer cultivars was associated with lower grain nitrogen and phosphorus concentrations in their grains. Therefore, there was a negative effect of genetic improvement in grain nitrogen and phosphorus concentrations. The main cause for the decreased concentration of these nutrients in the grains of the modern cultivars appeared to be a dilution by an even more increased dry matter partitioning. It is suggested that future breeding should be aimed to select for higher nitrogen uptake as a way to increase the level of this nutrient in grain. (C) 1995 Annals of Botany Company [References: 38].

4440 Campuzano Duque, Luis Fernando (1993) **[Behaviour of four varieties of wheat (Triticum aestivum L. em Thell) with regard to leaf rust (Puccinia recondita F. sp. tritici) and studies on heredity under field conditions]. Comportamiento de cuatro variedades de trigo (Triticum aestivum L. em Thell) con relacion a la roya de la hoja (Puccinia recondita f. sp. tritici) y estudios de herencia en condiciones de campo.** Colegio de Postgraduados, Montecillo (Mexico). Centro de Genetica. 3 ilus.; 16 tablas; 72 ref. 80 p. Spanish. (AGRIS 95-098555).

4441 Carvalho, M.J.G.P.R. (Evora Univ. (Portugal). Dept. de Fitotecnia) (1992) **[The join contribution of breeding and crop husbandry to wheat production in Portugal in the light of the Common Agricultural Policy]. A contribuicao conjunta do melhoramento e da fitotecnia na producao de trigo em Portugal face a politica agricola comum.** Instituto Nacional de Investigacao Agraria, Elvas (Portugal). Estacao Nacional de Melhoramento de Plantas. *Melhoramento (Portugal) v. 33(2) p. 577-608.* issued 1994; 4 grap. 10 tables; 40 ref. Portuguese. (AGRIS 95-111005).

4442 Carver, BF.; Rayburn, AL. (1995) **COMPARISON OF RELATED WHEAT STOCKS POSSESSING 1B OR T1BL-CENTER-DOT-1RS CHROMOSOMES - GRAIN AND FLOUR QUALITY.** *Crop Science. 35(5):1316-1321.* English. [OKLAHOMA STATE UNIV DEPT AGRON STILLWATER, OK 74078 USA].

The agronomic advantage of the T1BL . 1RS translocation and the potential importance of chromosome 1BS to end-use quality of bread wheat (Triticum aestivum L.) warrant a more precise definition of the relationship of T1BL . 1RS to bread wheat quality. This study was conducted to determine the effect of T1BL . 1RS from 'Aurora' on grain and flour quality in multiple near-isoline pairs with varying genetic background, and to examine the genetic variation among random inbred lines selected only for 1B or T1BL . 1RS. Two experiments were conducted, each with a different set of genetic materials derived from the same pair of crosses. In one experiment, 25 pairs of F-5-derived near-isolines homozygous for either 1B or T1BL . 1RS were evaluated in at least two environments; in the second experiment, plants homozygous for either 1B or T1BL . 1RS were selected in the F-2, and 40 inbred lines per chromosome type in each cross were evaluated in four environments. The near-isolines showed high isogenecity for all traits based on comparison of duplicate lines within pairs. The translocated chromosome, on the average, increased grain protein concentration and decreased mixogram rating, mixogram band width, and sedimentation volume in both crosses. Kernel hardness, flour yield, and mixing time either decreased or did not change in the T1BL . 1RS lsolines depending on the cross. Water absorption did not change. The T1BL . 1RS and 1B isolines showed similar mixograph properties in eight of the 25 pairs. Genetic variance of T1BL . 1RS random inbred lines was not reduced for those traits where deleterious effects were most notable, e.g., mixing tolerance and sedimentation volume. Hence, the detrimental effect of T1BL . 1RS on dough properties might be mitigated, relative to non-T1BL . 1RS genotypes with equivalent pedigree, by rigorous selection of background genotype. Special attention must be given to mixing tolerance and sedimentation. [References: 27].

4443 Ceccarelli, S. (ICARDA, PO Box 5466, Aleppo (Syria)) (1993) **Plant breeding technologies relevant to developing countries.** *Occasional Publication - British Society of Animal Production (United Kingdom) (no.16) p. 37-46.* 32 ref. English. (AGRIS 95-098366).

4444 Cervantes Martinez, Cuahutemoc T. (1993) **[Effect of gamma radiation 60Co in wheat (Triticum aestivum L.) with different recurrent radiation levels]. Efecto de la irradiacion gamma de 60Co. En poblaciones de trigo (Triticum aestivum L.) con diferente nivel de irradiacion recurrente.** Colegio de Postgraduados, Montecillo (Mexico). Centro de Genetica. 2 ilus.; 10 tablas; 67 ref. 77 p. Spanish. (AGRIS 95-098556).

4445 Chen, JM.; Gustafson, JP. (1995) **PHYSICAL MAPPING OF RESTRICTION FRAGMENT LENGTH POLYMORPHISMS (RFLPS) IN HOMOEOLOGOUS GROUP 7 CHROMOSOMES OF WHEAT BY IN SITU HYBRIDIZATION.** *Heredity. 75(Part 3):225-233.* English. [UNIV MISSOURI USDA ARS PLANT GENET RES UNIT COLUMBIA, MO 65211 USA].

In situ hybridization with biotin-labelled DNA probes was used to determine the physical locationmarkers from an RFLP-based genetic map of homoeologous group 7 in wheat (Triticum aestivum L.). The observed results indicated all probes hybridized to the corresponding group 7 chromosomes of all three wheat genomes and that the gene orders on the physical map were basically the same as that of the RFLP-based genetic map. The distance for each marker from the centromere on the physical map was different from those shown on the genetic map. Comparison of the genetic distance and the physical distance between two pairs of markers (Xpsr129 to Xpsr121, and Xpsr129 to Xpsr117) showed that the region between Xpsr129 and Xpsr121 contains a potential 'hot' spot of recombination on the chromosome arm. There appears to be considerable differences in crossing-over along the chromosomes. Most of the polymorphic markers are physically located in the middle portion of the chromosome arm to which they were genetically located, indicating reduced recombination in the centromeric and telomeric regions. Markers on the physical map were located outside the C-banded regions. The translocation break point involving 7BS and a colinear relationship among the homoeologous group 7 chromosomes are discussed. [References: 47].

4446 Coutinho, J.; Macas, B.; Bagulho, F.; Brites, C.; Goncalves, M.J.; Gomes, M.C. (Estacao Nacional de Melhoramento de Plantas, Elvas (Portugal)) (1992) **[Triticale - evolution and breeding of the species -**

results from the ENMP (Estacao Nacional de Melhoramento de Plantas - National Plant Breeding Station) [Portugal]]. Triticale - evolucao e melhoramento da especie - resultados da ENMP [Estacao Nacional de Melhoramento de Plantas]. [International Symposium on Plant Breeding]; Elvas (Portugal); 27-29 May 1992. *Melhoramento (Portugal) v. 33(1) p. 131-142.* issued 1994; 5 graphs. 4 tables; 6 ref. Portuguese. (AGRIS 95-110955).

4447 Cuadrado, A.; Jouve, N. (1995) **FLUORESCENT IN SITU HYBRIDIZATION AND C-BANDING ANALYSES OF HIGHLY REPETITIVE DNA SEQUENCES IN THE HETEROCHROMATIN OF RYE (SECALE MONTANUM GUSS) AND WHEAT INCORPORATING S-MONTANUM CHROMOSOME SEGMENTS.** *Genome. 38(4):795-802.* English. [UNIV ALCALA DE HENARES DEPT CELL BIOL & GENET E-28871 ALCALA DE HENARES SPAIN].

The molecular characterization of C-banded regions of Secale montanum Cuss. by means of in situ hybridization was performed in order to provide new information about their chromosome structure relative to cultivated rye, Secale cereale L. Accurate identification of individual chromosomes was achieved using simultaneous and (or) successive fluorescent in situ hybridization (FISH) and C-banding. FISH identification was performed using total rye DNA, three highly repetitive rye DNA sequences (pSc119.2, pSc74, and pSc34), and the ribosomal RNA probes pTa71 (18S, 5.8S, and 26S rDNA) and pTa794 (5S rDNA). FISH was also used to identify the chromosome segment involved in two spontaneous translocation lines recovered from a 'Chinese Spring'-S. montanum wheat-rye addition line. FISH analysis revealed the exact translocation breakpoints and allowed the identification of the transferred rye segments. The value of this type of analysis is discussed. [References: 32].

4448 Cuadrado, A.; Jouve, N.; Heslopharrison, JS. (1995) **PHYSICAL MAPPING OF THE 5S RRNA MULTIGENE FAMILY IN 6X TRITICALE AND RYE - IDENTIFICATION OF A NEW RYE LOCUS.** *Genome. 38(3):623-626.* English. [UNIV ALCALA DE HENARES DEPT CELL BIOL & GENET E-28871 MADRID SPAIN].

In situ hybridization was used to physically map the 5S rRNA multigene family in three selected lines of hexaploid triticale and five lines of diploid rye. Using this technique, evidence for a new locus on the 3RS arm of the three triticale lines was first obtained, as well as confirmation of the presence of 5S rRNA loci on wheat and rye chromosomes of homoeologous groups 1 and 5. The new locus on the 3RS arm was confirmed in two lines of rye, Secale cereale L., although it was not present in the other rye varieties studied. We propose that the new 5S rRNA locus be referred to as 5SDna-R3. [References: 14].

4449 Delaney, DE.; Friebe, BR.; Hatchett, JH.; Gill, BS.; Hulbert, SH. (1995) **TARGETED MAPPING OF RYE CHROMATIN IN WHEAT BY REPRESENTATIONAL DIFFERENCE ANALYSIS.** *Genome. 38(3):458-466.* English. [KANSAS STATE UNIV AGR & APPL SCI DEPT PLANT PATHOL THROCKMORTON HALL MANHATTAN, KS 66506 USA].

A targeted mapping strategy using representational difference analysis (RDA) was employed to isolate new restriction fragment length polymorphism probes for the long arm of chromosome 6 in rye (6RL), which carries a gene for resistance to Hessian fly larvae. Fragments from the 6RL arm were specifically isolated using a 'Chinese Spring' (CS) wheat - rye ditelosomic addition line (CSDT6RL) as tester, and CS and (or) CS4R as the driver for the genomic subtraction. Three RDA experiments were performed using BamHI amplicons, two of which were successful in producing low-copy clones. All low-copy clones were confirmed to have originated from 6RL, indicating substantial enrichment for target sequences. Two mapping populations, both of which are derived from a cross between two similar wheat-rye translocation lines, were used to map five RDA probes as well as five wheat probes. One of the populations was prescreened for recombinants by C-banding analysis. Fifteen loci, including seven new RDA markers, were placed on a map oi the distal half of 6RL. The Hessian fly resistance gene was localized by mapping and C-banding analysis to approximately the terminal 1% of the arm. The utility of RDA as a method of targeted mapping in cereals and prospects for map-based cloning of the resistance gene are discussed. [References: 33].

4450 Delgado, M.I.; Reynolds, M.P.; Larque Saaverda, A.; Nava Sanchez, T. (Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). Wheat Program) (1994) **Genetic diversity for photosynthesis in wheat under heat-stressed environments and its relationships to productivity.** *CIMMYT Wheat Special Report (CIMMYT); no. 30 17 p.* CIMMYT. 5 tables; 4 graphs., 26 ref. English. (AGRIS 95-098587).

Genetic variation in photosynthetic rate, stomatal conductance, leaf chlorophyll content, and dark respiration was studied in 16 wheat genotypes (Triticum aestivum L.) grown under high-temperature field conditions in Central Mexico. Measurement was made on flag leaves in full sun light, at three different stages of plant development, and at different times of the day. Two experiments were conducted with sowing dates in December 1991 and March 1992. And the results compared with the grain yields of the experiment plots on which measurements was made. Photosynthetic rate was fairly stable during the day between 10:00 and 14:00, and cross experiments, despite differences in leaf temperature of up to 4 deg C. However, rates of photosynthesis fell noticeably at successively later stages of plant development, and showed a strong interaction with genotype. For both planting dates, there was a clear association among the parameters photosynthetic rates, stomatal conductance, leaf temperature, and chlorophyll content, and all of these parameters were correlated significantly with grain yield. Photosynthetic rate in the post anthesis period was strongly associated with chlorophyll loss after anthesis, which suggest that genetic variability in the onset of senescence may be an important variable determining the yield of wheat in hot environments.

4451 Dorregaray Llerena, Flor de Maria (1992) **[Detection of genes of resistance to Russian wheat aphid (Diuraphis noxia Mordvilko) in barley using RFLPs]. Deteccion de genes de resistencia al afido ruso del trigo (Diuraphis noxia Mordvilko) en cebada, usando RFLPs.** Colegio de Postgraduados, Montecillo (Mexico). Centro de Genetica. 7 ilus.; 13 tablas; 62 ref. 65 p. Spanish. (AGRIS 95-098471).

4452 Doucet, R. (Institut Technique des Cereales et des Fourrages, Paris (France)) (1995) **[Wheat varieties for Eure-et-Loir area [France]]. Eure-et-Loir : une sole productive, panifiable et rustique [France].** *Perspectives Agricoles (France) (no 202) p. 37-41.* French. (AGRIS 95-098550).

4453 Drozd, D. (Akademia Rolnicza, Wroclaw (Poland). Katedra Hodowli Roslin i Nasiennictwa) (1993) **[Determination of GCA:SCA ratio in spring wheat and its genetic interpretation]. Okreslenie stosunku GCA:SCA u pszenicy jarej i jego interpretacja genetyczna.** 3. Symposium: Quantitative Genetics of Crops; Kudowa-Zdroj (Poland); 24-25 May 1993. *Zeszyty Naukowe Akademii Rolniczej we Wroclawiu. Rolnictwo (Poland) (no.223) p. 285-290.* 2 tables; 10 ref. Polish. (AGRIS 95-098577).

The studies were conducted in 6 years upon 5 homozygous lines of spring wheat and 20 F1 hybrids obtained from a full diallel cross. The lined were derived from the following cultivars: Azteca and Sari 70 (Mexico), Cesar (France), Sharbati Sonora (India) and 13932-USA (USA). The following characters were measured: plant height, tillering, number of grains per ear, plant yield and 1000 grain weight. GCA and SCA and the ratio of GCA:SCA were estimated. The results indicated that plant height is determinated by additive gene and for inheritance another characters is very important influence of environment.

4454 Drozd, D. (Akademia Rolnicza, Wroclaw (Poland). Katedra Hodowli Roslin i Nasiennictwa) (1994) **[Inheritance of plant height in a diallel cross of spring wheat lines]. Dziedziczenie wysokosci roslin linii pszenicy jarej w ukladzie diallelicznym.** *Zeszyty Naukowe Akademii Rolniczej we Wroclawiu. Rolnictwo (Poland) (no.230) p. 13-21.* 5 fig., 4 tables; 14 ref. Polish. (AGRIS 95-098578).

The aim of the study was to investigate the inheritance of plant height in a full diallel cross of 5 lines of spring wheat. The lines were derived from the following cultivars: Azteca, Cesar, Saric 70, Sharbati Sonora, 13932-USA. Statistical and genetical analysis was performed according to Griffing and Hayman and Jinks method. It was found that plant height was controlled by additive gene action in the 6-year period of experiments indicating high stability and efficiency of selection for this character. Saric 70 and 13932-USA lines could be used in breeding programmes aiming at short-strawed genotypes of wheat.

4455 Drozd, D. (Akademia Rolnicza, Wroclaw (Poland). Katedra Hodowli Roslin i Nasiennictwa) (1994) **[Relationships among some agronomic**

characters of spring wheat]. **Wspolzaleznosci miedzy niektorymi elementami struktury plonu pszenicy jarej.** *Zeszyty Naukowe Akademii Rolniczej we Wroclawiu. Rolnictwo (Poland) (no.230) p. 23-28.* 10 fig., 1 table; 7 ref. Polish. (AGRIS 95-098579).

Relationships between plant yield and plant height, productive tillering and 1000 grain weight were investigated in 10 hybrids obtained from 5 lines of spring wheat: Azteca, Cesar, Saric 70, Sharbati Sonora and 13932-USA. Phenotypic correlations between plant yield and plant height and between plant yield and productive tillering were significant in all hybrids, while between productive tillering and 1000 grain weight failed to reach significance. Path analysis showed direct effect of plant height, productive tillering and 1000 grain weight upon plant yield.

4456 Dubcovsky, J.; Dvorak, J. (1995) **RIBOSOMAL RNA MULTIGENE LOCI - NOMADS OF THE TRITICEAE GENOMES.** *Genetics. 140(4):1367-1377.* English. [UNIV CALIF DAVIS DEPT AGRON & RANGE SCI DAVIS, CA 95616 USA].

The nucleolus organizing regions (NORs) on the short arms of chromosomes 1A(m) and 5A(m) of diploid wheat, Triticum monococcum L., are at the most distal loci in the linkage maps of these two chromosome arms. This distal location differs from the interstitial location of the Nor loci on chromosome arms 1BS of tetraploid Triticum turgidum L. and hexaploid T. aestivum L., 5DS of T. aestivum and diploid Ae. tauschii Coss., and 5HS of barley. Moreover, the barley 5HS locus is at a different location than the 5DS locus. However, other markers, including the centromeres, are colinear. These findings showed that the major Nor loci have repeatedly changed position in the chromosome arms during the radiation of species in the tribe Triticeae without rearrangements of the linkage groups. It is suggested that Nm loci may change position via dispersion of minor loci, that are shown here to exist in the T. monococcum genome, magnification of gene copy numbers in these minor loci, and subsequent deletion of the original major loci. Implications of these findings for the use of rRNA nucleotide sequences in phylogenetic reconstructions are pointed out. [References: 76].

4457 Edmeades, G.O.; Lafitte, H.R.; Chapman, S.C.; Banziger, M. (Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). Maize Program) (1994) **Research on tolerance to abiotic stress in maize for subtropical, midaltitude, and highland ecologies.** *The subtropical, midaltitude, and highland maize subprogram. Bjarnason, M. (ed.) (Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). Maize Program) p. 70-81.* CIMMYT. 3 tables; 15 ref. English. (AGRIS 95-098518).

4458 Edwards, I. B.; Dorlencourt, G. (1992) **Hybrid wheat-current status and future role in European wheat production.** [International Symposium on Plant Breeding]; Elvas (Portugal); 27-29 May 1992. Instituto Nacional de Investigacao Agraria, Elvas (Portugal). Estacao Nacional de Melhoramento de Plantas. *Melhoramento (Portugal) v. 33(1) p. 87-104.* issued 1994; ill. 9 tables; 2 ref. English. (AGRIS 95-111007).

4459 Eissa, M.M. (Zagazig Univ. (Egypt). Faculty of Agriculture) (1993) **Combining ability for main spike characteristics in durum wheat, Triticum turgidum var. Durum.** *Zagazig Journal of Agricultural Research (Egypt) v. 20(6) p. 1673-1681.* 4 tables; 15 ref. English. (AGRIS 95-111913).

4460 Eissa, M.M. (Zagazig Univ. (Egypt). Faculty of Agriculture) (1993) **Genetical analysis for main spike yield and its related traits in durum wheat, Triticum turgidum var. durum L.** *Zagazig Journal of Agricultural Research (Egypt) v. 20(6) p. 1717-1726.* 6 ill. 4 tables; 22 ref. English. (AGRIS 95-111914).

4461 Eissa, M.M.; Al Kaddoussi, A.R.; Salama, S.M. (Zagazig Univ. (Egypt). Faculty of Agriculture) (1994) **Estimates of genetic variance for main spike characteristics in some wheat crosses.** *Annals of Agricultural Science, Moshtohor (Egypt) v. 32(1) p. 63-73.* 4 ill. 4 tables; 13 ref. English. (AGRIS 95-111000).

4462 Eissa, M.M.; Alkaddoussi, A.R.; Salama, S.M. (Zagazig Univ. (Egypt). Faculty of Agriculture) (1994) **Combining ability over sowing dates for earliness and some morphophysiological traits in wheat.** *Journal of Agricultural Sciences, Mansoura Univ. (Egypt) v. 19(4) p. 1281-1291.* 4 tables; 13 ref. English. (AGRIS 95-111416).

4463 Eissa, M.M.; Awaad, H.A (Zagazig Univ. (Egypt). Faculty of Agriculture) (1993) **Gene action and genetic system controlling earliness in ten bread wheat crosses, Triticum aestivum L.** *Zagazig Journal of Agricultural Research (Egypt) v. 20(6) p. 1695-1704.* 5 tables; 23 ref. English. (AGRIS 95-111413).

4464 Eissa, M.M.; Awaad, H.A. (Zagazig Univ. (Egypt). Faculty of Agriculture) (1993) **Gene action and gentic system controlling yield and yield attributes in ten wheat crosses, Triticum aestivum L.** *Zagazig Journal of Agricultural Research (Egypt) v. 20(6) p. 1705-1715.* 4 tables; 19 ref. English. (AGRIS 95-111414).

4465 Eissa, M.M.; Awaad, H.A. (Zagazig Univ. (Egypt). Faculty of Agriculture) (1993) **Prediction of new recombinant lines for earliness and some other traits using F3 generation of ten wheat crosses, Triticum aestivum L.** *Zagazig Journal of Agricultural Research (Egypt) v. 20(6) p. 1683-1693.* 5 tables; 6 ref. English. (AGRIS 95-111412).

4466 El Shamarka, S.A. (Monoufeyia Univ., SHebin El Kom (Egypt). Faculty of Agriculture) (1994) **Evaluation of some triticale genotypes under different nitrogen fertilizer levels.** *Menofiya Journal of Agricultural Research (Egypt) v. 19(5 part 1) p. 2379-2392.* 6 tables; 22 ref. English. (AGRIS 95-110954).

4467 Ellis, R.P.; Camm, J.P.; Morrison, W.R. (Scottish Crop Research Institute, Invergowrie, Dundee DD2 5DA (United Kingdom)) (1992) **A rapid test for malting quality in barley.** *HGCA Project Report (United Kingdom) (no.63) p. 76.* 38 ref. English. (AGRIS 95-098492).

4468 Erdogan, M.; Ordon, F.; Friedt, W. (1993) **Genetics of resistance of Hordeum spontaneum Koch from Turkey to the barley yellow mosaic virus complex.** *Barley genetics newsletter (USA) v. 23 p. 41-43.* references. English. (AGRIS 95-111014).

4469 Falak, I.; Falk, D.E. (1993) **Field reaction of a doubled haploid barley population (HAR/TR306) to leaf rust (Puccinia hordei).** *Barley genetics newsletter (USA) v. 23 p. 70-71.* English. (AGRIS 95-111102).

4470 Falk, D.E. (1993) **Coordinator's report: chromosome 6.** *Barley genetics newsletter (USA) v. 23 p. 154.* English. (AGRIS 95-111110).

4471 Falk, D.E. (1993) **Creation of a marked telo 6S trisomic for chromosome 6.** *Barley genetics newsletter (USA) v. 23 p. 32.* English. (AGRIS 95-111094).

4472 Fedak, G. (1993) **Coordinator's report: chromosome 7.** *Barley genetics newsletter (USA) v. 22 p. 79-80.* references. English. (AGRIS 95-111080).

4473 Fedak, G. (1993) **Coordinator's report: chromosome 7.** *Barley genetics newsletter (USA) v. 23 p. 155-156.* references. English. (AGRIS 95-111111).

4474 Ferrara, G.O. (1992) **Experiences, difficulties and prospects for stress resistance breeding in wheat in wana.** [International Symposium on Plant Breeding]; Elvas (Portugal); 27-29 May 1992. Instituto Nacional de Investigacao Agraria, Elvas (Portugal). Estacao Nacional de Melhoramento de Plantas. *Melhoramento (Portugal) v. 33(1) p. 105-118.* issued 1994; graph. 6 tables; 15 ref. English. (AGRIS 95-111008).

4475 Fettell, N.A. (New South Wales Agriculture, Condobolin (Australia)) (1994) **Regional wheat variety trials -Central West [New South Wales].** New South Wales Agriculture. 20 p. English. (AGRIS 95-098667).

Gives results of trials conducted in the Condobolin, Forbes, Parkes and West Wyalong agronomy districts of New South Wales from 1989 to 1992. Trials and demonstrations conducted included variety trials for wheat, barley, oats, field peas, lupins, chickpeas, canola, linseed and lentils, and management experiments of fertilizer requirements, take-all control, pasture cleaning, herbicide sensitivity, pasture species and new crops such as oilseed mustard and linola.

4476 Flehinghausroux, T.; Deimling, S.; Geiger, HH. (1995) **ANTHER-CULTURE ABILITY IN SECALE CEREALE L.** *Plant Breeding-Zeitschrift fur Pflanzenzuchtung. 114(3):259-261.* English. [UNIV HOHENHEIM INST PLANT BREEDING SEED SCI & POPULAT GENET 350 D-70593 STUTTGART GERMANY].

Success in anther culture of rye (Secale cereale L.) has mainly been restricted to genotypes whose genome is partly determined by S. vavilovii Grossh. The aim of this study was to identify true S. cereale genotypes with anther-culture ability. The plant material used included the semi-wild standard genotype SC35, six single crosses of the 'Petkus' and 10 of the 'Carsten' gene pool, plus a double cross between SC35 and one of the 'Carslen' single crosses. Three anther-culture experiments were performed. Several single crosses within the 'Carsten' gene pool produced green plants. The 'Petkus' single crosses tested did not show anther-culture ability. As expected, the induction and regen- eration rates of SC35 were higher than those of all other genotypes tested. The performance of the double cross was intermediate between its parents. The results demonstrate for the first time that anther culture in rye is a valuable tool in plant breeding. The data also show the possibility of transferring anther-culture ability from high- to low-responding genotypes. [References: 15].

4477 Forster, B.P. (1993) **Coordinator's report: chromosome 4.** *Barley genetics newsletter (USA) v. 22 p. 75-77.* references. English. (AGRIS 95-111078).

4478 Forster, B.P. (1993) **Coordinator's report: chromosome 4.** *Barley genetics newsletter (USA) v. 23 p. 148-150.* references. English. (AGRIS 95-111108).

4479 Franckowiak, J.D. (1993) **Identification of two additional loci that control genetic male sterility in barley.** *Barley genetics newsletter (USA) v. 22 p. 10-11.* references. English. (AGRIS 95-111060).

4480 Friebe, B.; Jiang, J.; Gill, B. (1995) **DETECTION OF 5S RDNA AND OTHER REPEATED DNA ON SUPERNUMERARY B CHROMOSOMES OF TRITICUM SPECIES (POACEAE).** *Plant Systematics & Evolution. 196(3-4):131-139.* English. [KANSAS STATE UNIV AGR & APPL SCI DEPT PLANT PATHOL CTR WHEAT GENET RESOURCE THROCKMORTON HALL MANHATTAN, KS 66506 USA].

The supernumerary B chromosomes of Tritticum speltoides and T. tripsacoides were analyzed in mitotic metaphases of spike primordium cells by C-banding and in situ hybridization (ISH) analyzes. B chromosomes of T. speltoides have larger telomeric and interstitial C-bands, whereas those of T. tripsacoides are almost completely devoid of C-bands. A prominent ISH site of rye related DNA sequences (using probe pSc119) was detected on B chromosomes of T. tripsacoides and only a minor ISH site was observed on the T. speltoides B chromosomes. However, two ISH sites of 5S rRNA loci were detected at a terminal and an interstitial location of the T, speltoides B chromosomes. These sites were absent on B chromosomes of T. tripsacoides. The results are discussed with respect to the phylogenetic origin of these B chromosomes. [References: 46].

4481 Friedt, W. (1993) **Coordinator's report: autotetraploids.** *Barley genetics newsletter (USA) v. 22 p. 103-109.* English. (AGRIS 95-111082).

4482 Friedt, W. (1993) **Coordinator's report: autotetraploids.** *Barley genetics newsletter (USA) v. 23 p. 164-172.* English. (AGRIS 95-111114).

4483 Fuentes, S.; Gilchrist, L. (Centro Internacional de Melhoramento de Milho e Trigo (Portugal)) (1992) **[The Septoria Programme in Cimmyt - 1979/1992]. O programa de Septoria no Cimmyt - 1970/1992.** Instituto Nacional de Investigacao Agraria, Elvas (Portugal). Estacao Nacional de Melhoramento de Plantas. *Melhoramento (Portugal) v. 33(2) p. 507-523.* issued 1994; 2 graphs. 16 tables; 26 ref. Portuguese. (AGRIS 95-111003).

4484 Fuentesdavila, G.; Rajaram, S.; Singh, G. (1995) **INHERITANCE OF RESISTANCE TO KARNAL BUNT (TILLETIA INDICA MITRA) IN BREAD WHEAT (TRITICUM AESTIVUM L).** *Plant Breeding-Zeitschrift fur Pflanzenzuchtung. 114(3):250-252.* English. [CIMMYT CTR INT MAIZE & WHEAT IMPROVEMENT LISBOA 27 APDO POSTAL 6-641 MEXICO CITY 06600 DF MEXICO].

The mode of inheritance and allelic relationships among genes conferring resistance to Karnal bunt were studied in seven bread-wheat (six resistant and one susceptible) genotypes. The resistant genotypes originated in China ('Shanghai#8'), Brazil (PF71131), the USA ('Chris'), and Mexico ('Amsel', CMH77.308 and 'Pigeon'). The susceptible line WL711 was from India. Evaluation of these wheat lines and all possible crosses among their F-1 and F-3 generations (about 100 progenies in each cross) revealed that two partially recessive genes conferred the resistance to Karnal bunt in 'Pigeon', whereas four par tially dominant genes were present in the other genotypes. 'Chris', 'Amsel and PF71131 carry one gene, whereas 'Shanghai#8' and CMH77.308 have two genes. 'Chris', 'Amsel, and PF71131 have different genes, whereas one gene was common to PF71131, CMH77.308 and 'Shanghai#8', and another to 'Chris' and CMH77.308. Gene symbols were formally designated to the resistant stocks. Resistance was incomplete and stable. [References: 5].

4485 Fukushima, Y.; Konishi, T. (1993) **Further studies on inheritance of hybrid sterility in barley.** *Barley genetics newsletter (USA) v. 22 p. 12-14.* references. English. (AGRIS 95-111061).

4486 Gaj, M.; Gaj, M.D. (1993) **Barley haploids from intergeneric crosses with maize (Zea mays L.).** *Barley genetics newsletter (USA) v. 23 p. 28-29.* references. English. (AGRIS 95-111210).

4487 Garcia del Moral, L.F.; Bonjennia, A. (Facultad Ciencias, Granada (Spain). Dept. Biologia Vegetal); Insa, J.A.; Arbones, A.; Royo, C. (Centro Udl IRTA, Lleida (Spain)) (1992) **Evaluation of a set of triticale genotypes for dual-purpose (forage and grain).** [International Symposium on Plant Breeding]; Elvas (Portugal); 27-29 May 1992. Instituto Nacional de Investigacao Agraria, Elvas (Portugal). Estacao Nacional de Melhoramento de Plantas. *Melhoramento (Portugal) v. 33(1) p. 291-296.* issued 1994; 2 graphs. 2 tables; 11 ref. English. (AGRIS 95-111868).

4488 Gaspar, I.; Zama, E. (Institutul de Cercetari pentru Cereale si Plante Tehnice, Fundulea (Romania)) (1994) **[Triticale variety - silver]. Soiul de triticale silver.** *Analele Institutului de Cercetari pentru Cereale si Plante Tehnice Fundulea (Romania) v. 61 p. 83-90.* 5 tables; 2 ill., 1 graph; 5 ref. Romanian. (AGRIS 95-110958).

The triticale variety Silver was created by individual, repeated selection from a complex hybrid population (TF 2 x Px. 159-74) x (Lv. 10 x S. segetale) at the Suceava Station and was registered in 1992. It is recommended for the more humid and cool areas in the northern half of the country, it is very suitable for livestock feeding. It has a good yielding potential and yielding stability. The yielding potential is on an average by 16 percent higher as compared to TF 2 variety, by 27 percent higher compared to the wheat variety Fundulea 29 and by 7 percent higher than that of the rye variety Gloria. A middle installment of the annual variation of 552 kg/ha has been noticed compared to 762 kg/ha of TF 2 and 844 kg/ha of rye. The yielding ability of the Silver variety was mainly due to its good resistance to lodging, frost and wintering as well as against the cryptogamous diseases.

4489 Gaudet, DA.; Puchalski, BJ. (1995) **INFLUENCE OF TEMPERATURE ON INTERACTION OF RESISTANCE GENES IN SPRING WHEAT DIFFERENTIALS WITH RACES OF COMMON BUNT (TILLETIA TRITICI AND T-LAEVIS).** *Canadian Journal of Plant Science. 75(3):745-749.* English. [AGR & AGRIFOOD CANADA RES CTR POB 3000 LETHBRIDGE AB T1J 4B1 CANADA].

Temperature affects the expression of resistance to common bunt and can influence the efficacy of tests to screen for resistance to this disease. A study was undertaken to determine the response of spring wheat differentials possessing bunt resistance genes to temperature and races of Tilletia tritici and T. laevis. Differential wheat lines carrying resistance genes Bt-2, Bt-7, Bt-8, Bt-9, and Bt-10, were individually inoculated with bunt races L3, T1, T15, and T27, and incubated at 8, 10 or 15 degrees C for 0-10 wk. Responses to bunt infection following low temperature incubation at 8, 10, and 15 degrees C differed among differentials carrying the Bt genes. The resistance of the Bt-10 differential was effective at all three temperatures for all incubation periods whereas the resistance in differentials carrying the Bt-2 or Bt-8 gene was effective at 15 degrees C but

not at 8 degrees C and 10 degrees C. Resistance in the Bt-9 differential was ineffective at all three temperatures. The four races of common bunt were similar in their level of infection in the differentials carrying individual Bt genes at the different temperatures although some differences in infection levels were observed. A screening test consisting of 2-4 wk growth at 15 degrees C followed by growth to maturity in the greenhouse can identify wheat lines containing Bt-8 and Bt-10. [References: 15].

4490 Ghiorghis Habtemariam; Dibaba Damesa (1994) **Characterization and Preliminary Evaluation of Ethiopian Tetraploid Wheat Germplasm.** *PGRC/E Germplasm Newsletter (Ethiopia) (no.2) p. 6-10.* 2 tables; 13 ref. English. (AGRIS 95-098454).

The study on Ethiopian wheat species is reviewed since the earliest description made in 1885 by Koernike and Warner until the present time. In this study, 3300 accessions from PGRC/E collections were used for the general investigation on Ethiopian wheat species and of these 368 randomly selected tetraploid wheat samples were evaluated for 15 characters. The results are compared with those of wheat of other origin and characteristics specific to each species are pointed out.

4491 Giauffret, C.; Lothrop, J.E. (Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). Maize Program) (1994) **Research on cold tolerance in highland maize.** *The subtropical, midaltitude, and highland maize subprogram. Bjarnason, M. (ed.) (Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). Maize Program) p. 43-44.* CIMMYT. 1 table. English. (AGRIS 95-098515).

4492 Giura, A. (Institutul de Cercetari pentru Cereale si Plante Tehnice, Fundulea (Romania)) (1994) **[Wheat haploids by wheat x maize crosses]. Haploizi de grau in incrucisarea grau x porumb.** *Cercetari de genetica vegetala si animala (Romania) v. 3 p. 18-26.* 3 tables; 1 ill., 21 ref. Romanian. (AGRIS 95-111146).

Wheat x maize hybridization is an alternative procedure for obtaining wheat haploids, the maize genome being insensitive to Kr alleles of wheat. Substantially progress has been made also by applying growth hormones especially 2, 4-D which enhanced fertilization rates and increased embryo development and viability. In the present study we tested the efficiency of these new procedures in one crossing cycle per year. The plant material was cultivated in a semicontrolled greenhouse with the average temperature of 15.5 degrees C./32.5 degrees C. night/day during pollination and embryo formation time. The crossability of fifteen wheat genotypes with one maize genotype were investigated using the tiller injection and floral treatment with 2, 4-D at 24 h after pollination. The GA 3 was also sprayed on florets two days later. Seed set ranged from 79, 4 percent to 93.9 percent, the frequencies among wheat genotypes being not significantly different. The frequency of seed quality (dissected seeds) was indeed significantly different varying from 41.1 percent to 82.0 percent. The embryo formation frequencies ranges from 5.7 percent to 20.5 percent with a general average of 12.1 percent. Statistical analyses by Hi square test revealed significant genotypical differences. Out of 1315 cultured embryos, 247 (18.8 percent) developed into callus, 301 (22.9 percent) presented an incomplete organogenesis and 381 (29.0 percent were successfully regenerated to plants. Frequencies of plant regeneration rate against cultured embryos ranged from 16.4 percent to 51.4 percent depending on wheat genotype. The low regenerating rates of haploid plants in this study could be explained by delaying optimum embryo extraction time by even 10-15 days. The continual presence of 2, 4-D in watery solution of seeds in which embryos were lying for a longer period affected embryo morphology, size and germination. The results suggest that further improvements are needed to increase embryo formation and germination and haploid plant regeneration rates.

4493 Golaszewski, J. (Akademia Rolniczo Techniczna, Olsztyn (Poland). Katedra Hodowli Roslin i Nasiennictwa); Koczowska, I.; Korona, A.; Idzkowska, M. (1993) **[Path coefficients method in estimation of relationship between some characters of winter rye and spring triticale]. Metoda wspolczynnikow sciezek w ocenie wspolzaleznosci wybranych cech zyta ozimego i pszenzyta jarego.** 3. Symposium: Quantitative Genetics of Crops; Kudowa-Zdroj (Poland); 24-25 May 1993. *Zeszyty Naukowe Akademii Rolniczej we Wroclawiu. Rolnictwo (Poland) (no.223) p. 157-163.* 1 fig., 2 tables; 9 ref. Polish. (AGRIS 95-098540).

Path coefficient method was applied to estimate the inter- and intrarelationship between some characters determining ear length and grain yield per ear of winter rye and grain yield per plant of spring triticale. The path coefficient indicated that the number of grain per ear (plant) and weight of 1000 grains had the main direct effect on the grain yield per ear (plant). The new graphics form was proposed for data presentation of path analysis.

4494 Gomes, M.C.; Goncalves, M.J.; Macas, B.; Coutinho, J.; Bagulho, F.; Brites, C. (Instituto Nacional de Investigacao Agraria, Elvas (Portugal). Estacao Nacional de Melhoramento de Plantas) (1992) **[Genetic breeding for resistance to the main diseases affecting wheat]. Melhoramento genetico para resistencia as principais doencas do trigo.** *Melhoramento (Portugal) v. 33(2) p. 525-536.* issued 1994; ill. 2 tables; 6 ref. Portuguese. (AGRIS 95-111004).

4495 Gouis, J. le; Ordon, F.; Friedt, W. (1993) **Isozyme-electrophoresis for chromosomal localization of barley mild mosaic virus resistance genes different from ym4.** *Barley genetics newsletter (USA) v. 23 p. 36-39.* references. English. (AGRIS 95-111096).

4496 Graner, A.; Bauer, E.; Kellermann, A.; Kirchner, S.; Muraya, J.K.; Jahoor, A.; Wenzel, G. (1993) **Progress of RFLP-map construction in winter barley.** *Barley genetics newsletter (USA) v. 23 p. 53-59.* references. English. (AGRIS 95-111099).

4497 Graner, A.; Mechelen, J.R. van (1993) **Genomic mapping of lipoxygenase genes.** *Barley genetics newsletter (USA) v. 22 p. 15-17.* references. English. (AGRIS 95-111062).

4498 Gymer, P.T. (1993) **An attempt to locate the sdw gene for prostate growth habit or the perils and pitfalls of classical genetics.** *Barley genetics newsletter (USA) v. 22 p. 19-22.* references. English. (AGRIS 95-111063).

4499 Hafez, A.A.; El Khayat, E.F.; Bakheet, M.M.M. (Zagazig Univ., Benha (Egypt). Faculty of Agriculture) (1994) **Screening of some local and exotic wheat genotypes for aphid infestation and some plant characters in Egypt.** *Annals of Agricultural Science, Moshtohor (Egypt) v. 32(1) p. 523-535.* 5 tables; 25 ref. English. (AGRIS 95-111411).

4500 Hagberg, A. (1993) **Coordinator's report: chromosome duplications.** *Barley genetics newsletter (USA) v. 23 p. 177.* references. English. (AGRIS 95-111119).

4501 Hagima, I. (Institutul de Cercetari pentru Cereale si Plante Tehnice, Fundulea (Romania)) (1994) **[Quantitative and qualitative aspects of amylases endogenous inhibitor in hexaploid wheat]. Aspecte cantitative si calitative ale amilazelor si ale inhibitorului endogen din genotipuri de grau hexaploid.** *Probleme de genetica teoretica si aplicata (Romania) v. 26(1) p. 15-22.* 1 table; 1 graph; 1 ill., 10 ref. Romanian. (AGRIS 95-111429).

The investigations were performed on 18 hexaploids wheat genotypes obtained from Research Institute for Cereals and Industrial Crops - Fundulea. Alpha-amylase and endogenous inhibitor from quantitative point of view were analyzed by two methods: first - radial diffusion in agarose gel and second - colorimetric method. These two methods are linearly related. The electrophoretic study of total beta-amylase isozymes classified the 18 analyzed genotypes by two enzymogram types: one type with two unequal isozymes as intensity activity and another type with three equal isozymes.

4502 Han, F.; Ullrich, S.E. (1993) **Mapping of quantitative trait loci associated with malting quality in barley.** *Barley genetics newsletter (USA) v. 23 p. 84-97.* references. English. (AGRIS 95-111105).

4503 Hang, A. (1993) **Coordinator's report: trisomic and aneuploid stocks.** *Barley genetics newsletter (USA) v. 23 p. 157.* English. (AGRIS 95-111112).

4504 Hang, A. (1993) **Trisomic analysis of the chlorina mutant B2-4.** *Barley genetics newsletter (USA) v. 22 p. 23-26.* references. English. (AGRIS 95-111064).

4505 Hayes, P.M.; Jyambo, O. (1993) **Summary of QTL effects in the Steptoe X Morex Population.** *Barley genetics newsletter (USA) v. 23 p. 98-143.* references. English. (AGRIS 95-111106).

4506 Helms, J. (1993) **Coordinator's report: disease and pest resistant genes.** *Barley genetics newsletter (USA) v. 22 p. 110-134.* references. English. (AGRIS 95-111083).

4507 Hendawy, F.A. (Monoufeyia Univ., Shebin El Kom (Egypt). Faculty of Agriculture) (1994) **Combining ability for grain yield and its contributory characters in bread wheat (Triticum aestivum L.).** *Menofiya Journal of Agricultural Research (Egypt) v. 19(5 part 1) p. 2315-2338.* 5 tables; 21 ref. English. (AGRIS 95-111410).

4508 Hendawy, F.A. (Monoufeyia Univ., Shebin El Kom (Egypt). Faculty of Agriculture) (1994) **Influence of locations on heterosis and combining ability in bread wheat (Triticum aestivum, L.).** *Menofiya Journal of Agricultural Research (Egypt) v. 19(5 part 1) p. 2201-2224.* 5 tables; 17 ref. English. (AGRIS 95-111409).

4509 Horvath, DP.; Dahleen, LS.; Stebbing, JA.; Penner, G. (1995) **A CO-DOMINANT PCR-BASED MARKER FOR ASSISTED SELECTION OF DURABLE STEM RUST RESISTANCE IN BARLEY.** *Crop Science. 35(5):1445-1450.* English. [USDA ARS NO CROP SCI LAB POB 5677 STATE UNIV STN FARGO, ND 58105 USA].

Screening individual barley plants for resistance to stem rust is difficult and time consuming. The objective of this work was to develop PCR-bascd markers for assisted selection of stem rust resistance in barley. Near isogenic barley lines (backcrossed 29 times) differing at the Rpg1 locus (where the gene that confers resistance to the stem rust pathogen Puccinia graminis f. sp. tritici is located) were screened for random amplified polymorphic DNAs (RAPDs) with 10 base primers. A total of 540 different primers were screened, and one was identified which amplified a DNA fragment closely linked to Rpg1. The DNA fragment was cloned, mapped, and sequenced, Specifically amplifying primers (SAPs) were designed to amplify related polymorphic DNA in other barley cultivars. The SAPs act as a co-dominant marker suitable for marker assisted selection of the Rpg1 gene. Three different amplification patterns were observed in the various cultivars tested, Surprisingly, no specific banding pattern is diagnostic for the presence or absence of Rpg1, despite the demonstrated linkage. Of the three amplification patterns, only one (the 500-bp banding pattern) was present in recently developed resistant cultivars. A similar amplification pattern is also found in many of the susceptible lines that have the cultivar Betzes in their pedigree. RFLP analysis can be used to differentiate the resistant and susceptible cultivars with this amplification pattern. [References: 10].

4510 Hraska, S. (Vyskumny Ustav Rastlinnej Vyroby, Piestany (Slovak Republic)) (1994) **[The relations of anatomical-morphological signs of wheats grain to proteins]. Vztahy anatomicko-morfologickych znakov zrna psenice k bielkovinam.** *Polnohospodarstvo (Slovak Republic) v. 40(7) p. 481-487.* 1 table; 8 ref. Slovak. (AGRIS 95-098589).

The aim of the study was to compare the relation of the anatomical-morphological structure of wheat grain to the gluten proteins and its using for individual selection. For this purpose 4 varieties of Triticum aestivum, 1 of Triticum durum and 2 of triticale grown during 3 years and the impact of defoliation of the flag leaf and double foliar fertilization by nitrogenous fertilizers were tested. The width and length of the grain, the width of aleuronic layer, the lobes length of aleuronic layer below the central part and the reserve protein contents were evaluated. Correlation relationships (from r=0.704++ to r=0.905++) show that it is possible to do individual spike selection for proteins in wheat grain and triticale according to the width of aleuronic layer and the lobes length of aleuronic layer below the central part already in the F2 generation with possibility to control the progeny grown from the reserve part of the analysed spike or grain.

4511 Hucl, P. (1995) **DIVERGENT SELECTION FOR SPROUTING RESISTANCE IN SPRING WHEAT.** *Plant Breeding-Zeitschrift fur Pflanzenzuchtung. 114(3):199-204.* English. [UNIV SASKATCHEWAN CTR CROP DEV SASKATOON SK S7N 0W0 CANADA].

The development of sprouting-resistant spring-wheat (Triticum aestivum L.) cultivars is a major breeding objective in many wheal-producing regions. Sprouting resistance is thought to be associated with delayed maturity. The primary objective of this study was to measure the reciprocal effects of selection for sprouting resistance and maturity. Two experiments were conducted over a 3-4-year period in Saskatoon, Canada. In the first experiment, two populations of hard red spring wheat were subjected to divergent selection (k = 10%) for maturity. In the second experiment, six populations derived from crosses between two sprouting-resistant, late-maturing, white-grained cultivars ('AUS1293' and 'AUS1408') and three early maturing, red-grained cultivars ('Park', 'PT516' and 'Roblin'), were subjected to divergent selection (k = 10%) for sprouting resistance. Selection for earliness reduced sprouting resistance in one population but had no effect in the second. For both populations, earlier maturity was associated with higher lest weight but lower grain yield. In the second experiment, selection for increased sprouting resistance was effective, with realized heritabilities averaging 0.74. Increased sprouting resistance was associated with a slight delay (1-2.5 days) in time to spike emergence in four out of six populations, but had little effect on time to maturity in most populations. There was a trend towards redder grain in the sprouting-resistant selections. The recovery of sprouting-resistant, early maturing segregants was relatively low, averaging less than 10% over the six populations. In conclusion, selection for increased sprouting resistance can result in delayed maturity, but the magnitude of that delay will vary among populations. [References: 16].

4512 Ilicevici, S.; Paunescu, G. (Institutul de Cercetari pentru Cereale si Plante Tehnice Fundulea, Simnic (Romania). Statiunea de Cercetari Agricole Simnic Craiova) (1994) **[Research and results of improving winter wheat at the SCA Simnic]. Cercetari si rezultate in domeniul ameliorarii graului de toamna la SCA Simnic.** *Lucrari stiintifice (Romania) v. 9 p. 15-19.* 12 ref. Romanian. (AGRIS 95-111430).

The improving of the genetic production potential in winter wheat began with the assessment of most suitable foreign varieties, followed by inculcation of varieties resulted on the base of improving activity in this country. The conditions of the zone SCA Simnic permitted the development of studies and the creation of some wheat lines resistant to bunt (Tilletia sp.), early and having a good production capacity, which resulted from the omologation of the variety "Simnic 30". Nowadays the improving work of winter wheat has been carried out at the Station, aiming to obtain a material which is genetically resistant to diseases, tolerant to summer drought, winterhardy and early.

4513 Islam, A.K.M.R. (1993) **Coordinator's report: wheat-barley genetic stocks.** *Barley genetics newsletter (USA) v. 22 p. 139-140.* references. English. (AGRIS 95-111086).

4514 Islam, A.K.M.R. (1993) **Coordinator's report: wheat-barley genetic stocks.** *Barley genetics newsletter (USA) v. 23 p. 182.* references. English. (AGRIS 95-111120).

4515 Ittu, G.; Saulescu, N.N. (Institutul de Cercetari pentru Cereale si Plante Tehnice, Fundulea (Romania)) (1994) **[Reduced height plant genes used in the Fundulea triticale (X Triticosecale Witt.) breeding programme]. Gene pentru reducerea taliei plantei utilizate in programul de ameliorare la Triticale (X Triticosecale Witt) de la Fundulea.** *Cercetari de genetica vegetala si animala (Romania) v. 3 p. 37-44.* 1 table; 1 ill., 3 graphs; 9 ref. Romanian. (AGRIS 95-110959).

Based on the pedigree analyses, length of coleoptile and on reaction in the seedling stage to exogenic gibberellic acid, a survey was made to identify the genes for reduced height present in our short triticale lines. The results showed that Rht 1 gene is common in most short triticale lines (crosses 318 Tr and 5735 TW). Other short straw long coleoptile and gibberellic acid sensitivity carried the short straw gene from rye (Snoopy-Danae). Also, in a few lines Rht 3 was present. Among the short straw triticale lines most promising are those with the Rht 1 gene. Some of them in the preliminary trials had the same yield performances as normal height cultivars.

4516 Jeffers, D. (Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). Maize Program) (1994) **Maize**

pathology research for the subtropics and highlands. *The subtropical, midaltitude, and highland maize subprogram. Bjarnason, M. (ed.) (Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). Maize Program) p. 63-69.* CIMMYT. 10 ref. English. (AGRIS 95-098517).

4517 Jensen, J. (1993) **Coordinator's report: chromosome 5.** *Barley genetics newsletter (USA) v. 22 p. 77-78.* references. English. (AGRIS 95-111079).

4518 Jensen, J. (1993) **Coordinator's report: chromosome 5.** *Barley genetics newsletter (USA) v. 23 p. 151-153.* references. English. (AGRIS 95-111109).

4519 Jezowski, S.; Adamski, T.; Surma, M. (Polska Akademia Nauk, Poznan (Poland). Inst. Genetyki Roslin) (1993) **[Genetic parameters for some morphological and physiological characters of the stem of barley DH lines]. Parametry genetyczne wybranych cech morfologicznych i fizycznych zdzbla linii podwojonych haploidow jeczmienia.** 3. Symposium: Quantitative Genetics of Crops; Kudowa-Zdroj (Poland); 24-25 May 1993. *Zeszyty Naukowe Akademii Rolniczej we Wroclawiu. Rolnictwo (Poland) (no.223) p. 215-221.* 3 tables; 10 ref. Polish. (AGRIS 95-098486).

Barley DH lines derived from the F1 hybrids (Grit x Havila) were studied under field conditions. The following characters were analysed: lodging grade, length of the stem, length, diameter and wall thickness of 2 lower internodes, and stem elasticity. Genetic parameters determining additive gene action and nonallelic interaction as well as heritability coefficient were estimated. It was found that additive effects were significant for all studied characters whereas epistatic effects were significant only for the length and wall thickness of lower internodes, and stem elasticity. Heritability coefficients in narrow sense were the highest for lodging grade (85.8 percent) and stem elasticity (82.3 percent).

4520 Jin, Y.; Franckowiak, J.D.; Statler, G.D. (1993) **Linkage among some of the morphological markers in Wolfe's stocks.** *Barley genetics newsletter (USA) v. 22 p. 25-26.* references. English. (AGRIS 95-111065).

4521 Jorgensen, J.H. (1993) **Coordinator's report: disease and pest resistance genes.** *Barley genetics newsletter (USA) v. 23 p. 173.* references. English. (AGRIS 95-111115).

4522 Kadlubiec, W. (Akademia Rolnicza, Wroclaw, (Poland). Katedra Hodowli Roslin i Nasiennictwa) (1993) **[Variability and genetical differentiation of agronomic traits of winter wheats lines in point and row sowing]. Zmiennosc i genetyczne zroznicowanie cech uzytkowych linii pszenicy ozimej w siewie punktowym i zwartym.** 3. Symposium: Quantitative Genetics of Crops; Kudowa-Zdroj (Poland); 24-25 May 1993. *Zeszyty Naukowe Akademii Rolniczej we Wroclawiu. Rolnictwo (Poland) (no.223) p. 273-278.* 4 tables; 5 ref. Polish. (AGRIS 95-098575).

Investigations were carried out for 6 lines of winter wheat in 2 experiments (point and row sowing). There were estimated following characters: plant height, ear's lenght, number and grains weight per ear and 1000 grains weight. For the most of traits one line at least differently reacted to the way of sowing. Only for the plant height there were not observed significant differences between point and row sowing in spite of occurred competition among plant. Competition should be consistered to the genetic material and not to the traits.

4523 Kaji, R.; Makino, T. (1993) **A proposed method for selecting obligate apomictic mutants.** *Barley genetics newsletter (USA) v. 23 p. 30-31.* references. English. (AGRIS 95-111093).

4524 Karabinova, M.; Prochazkova, M. (Vysoka Skola Polnohospodarska, Nitra (Slovak Republic). Katedra Rastlinnej Vyroby) (1994) **[Variability in yield and content of wet gluten in winter wheat in dependence on weather conditions and variety]. Variabilita urody a obsahu mokreho lepku ozimnej psenice v zavislosti od poveternostnych podmienok a odrody.** *Polnohospodarstvo (Slovak Republic) v. 40(8) p. 561-571.* 3 ill., 3 tables; 9 ref. Slovak. (AGRIS 95-098590).

The effect of climatic conditions and variety on winter wheat yield forming factors, grain yield and quality (gluten content) was examined during 10-year field trials (1980-1990) with 9 winter wheat varieties. Results proved a highly significant influence of weather and variety on yield formation and its structure. Variation caused by weather conditions and year was in spring 70.0 % in the number of plants, 86.9 % in number of spikes (spike area), 27.5 % in grain weight and 92.2 % in total grain yield. The Viginta variety (with the 0.7 % seasonal variation of grain yield) reached the most stable grain yields. Its yield components variability ranged from 5.7 % (grain weight) up to 98.0 % (number of plants per square m in spring). Regina and Livia varieties indicated lower stability. Their yearly yield variation was 85.4 % and 79.3 %, resp. The effect of year on wet gluten content represented 49.8 %. The most balanced gluten content was found in the Viginta variety with yearly variability as low as 6.9 %.

4525 Kasha, K.J.; Kleinhofs, A. (1993) **Mapping of the barley cross Harrington X TR306.** *Barley genetics newsletter (USA) v. 23 p. 65-69.* English. (AGRIS 95-111101).

4526 Khadartsova, L.F.; Kaminskaya, L.M. (Akadehmiya Navuk Belarusi, Minsk (Belarus). Instytut Genetyki i Tsytalogii) (1994) **[Specific and genotypic specificity of wheat and rye compatibility manifestation]. Vidavaya i genatypovaya spetsyfichnasts' prayawlennya sumyashchal'nastsi pshanitsy z zhytam.** *Vestsi Akadehmii Navuk Belarusi. Seryya Biyalagichnykh Navuk (Belarus) (no.3) p. 33-36.* 1 table, 7 ref. Byelo Russian. (AGRIS 95-111348).

4527 Kintzios, S.; Jahoor, A.; Fischbeck, G. (1995) **POWDERY-MILDEW-RESISTANCE GENES MLA29 AND MLA32 IN H-SPONTANEUM DERIVED WINTER-BARLEY LINES.** *Plant Breeding-Zeitschrift fur Pflanzenzuchtung. 114(3):265-266.* English. [BIOMA KITHERONOS ST 109 GR-11141 ATHENS GREECE].

Allelism to the highly polymorphic Mla locus was demonstrated for the powdery-mildew resistance of two Hordeum spontaneum derived winter-barley lines, '110-4 x Sonja' and '142-29 x Dura', by testing the F-2 progeny of crosses between these lines and the winter-barley cv. 'Triton' (Mla13) with two appropriate isolates. The results were confirmed by RFLP analysis, using the probe MWG 1H036, which is very closely linked to the Mla locus. The designations Mla29 and Mla32 are proposed for the genes identified in the two lines. [References: 12].

4528 Kirichenko, E.B.; Martynov, O.L. (1993) **[Correlation between pigment content in generative organs and caryopse biomass in parental forms and hybrids of Triticale]. Korrelyatsionnye otnosheniya mezhdu pigmentnym potentsialom generativnykh organov i massoj zerna u iskhodnykh form i gibridov tritikale.** *Byulleten' Glavnogo botanicheskogo sada (Russian Federation) (no.168) p. 114-121.* 14 ref. Russian. (AGRIS 95-098542).

The changes of chlorophylls a and b content during the growth and development of anthers and caryopses of parental forms and hybrids of winter and spring triticale were studied, as well as dry weight of mature seeds. The elevated pigment content in generative organs of hybrids appear to be due to the alteration of nuclear-plastid interactions in them. The positive correlation between integral content of pigments in developing caryopses and dry biomass in mature grains was found. This correlation was closer in hybrids than in parent forms. The triticale hybrids had higher protein content in developing caryopses than parent forms. This phenomenon can be explained by photosynthetic activity of pericarp plastids.

4529 Kleinhofs, A.; Ilian, A.; Kudrna, D. (1993) **The NABGMP mapping progress report, Spring 1993.** *Barley genetics newsletter (USA) v. 22 p. 27-41.* English. (AGRIS 95-111066).

4530 Kleinhofs, A.; Kilian, A.; Kudrna, D. (1993) **The NABGMP Steptoe X Morex mapping progress report.** *Barley genetics newsletter (USA) v. 23 p. 79-83.* English. (AGRIS 95-111104).

4531 Kloppers, FJ.; Pretorius, ZA. (1995) **HISTOLOGY OF THE INFECTION AND DEVELOPMENT OF PUCCINIA RECONDITA F SP TRITICI IN A WHEAT LINE WITH LR37.** *Journal of Phytopathology-Phytopathologische Zeitschrift. 143(5):261-267.* English. [UNIV ORANGE FREE STATE DEPT PLANT PATHOL POB 339 BLOEMFONTEIN 9300 SOUTH AFRICA].

The degree of adult-plant resistance conferred by the gene Lr37 in RL6081 (Thatcher*8/Lr37) to four avirulent leaf rust pathotypes was quantified by assessing histological components as well as latent period, uredinium density and uredinium size. Histological observations on the adaxial flag leaf surfaces revealed significant arrest of fungal structures in RL6081 at early infection stages. Furthermore, host cell necrosis typical of a posthaustorial host-resistance mechanism was conspicuous in sizeably reduced colonies on this genotype. Lr37 significantly decreased the rate of uredinial appearance of all four pathotypes. Compared with Thatcher, fewer uredinia of smaller dimensions developed on flag leaves of RL6081. Characterization of resistance indicated that disease development in genotypes with the gene Lr37 should be extremely limited. [References: 30].

4532 Kociuba, W. (Akademia Rolnicza, Lublin (Poland). Inst. Genetyki i Hodowli Roslin) (1993) **[Variability and correlation of major agricultural properties in population of winter triticale (Triticosecale Wittmack)]. Zmiennosc i wspolzaleznosc wazniejszych cech rolniczych w populacji pszenzyta ozimego (Triticosecale Wittmack).** 3. Symposium: Quantitative Genetics of Crops; Kudowa-Zdroj (Poland); 24-25 May 1993. *Zeszyty Naukowe Akademii Rolniczej we Wroclawiu. Rolnictwo (Poland) (no.223) p. 193-199.* 1 fig., 2 tables; 7 ref. Polish. (AGRIS 95-098548).

The results presented concern the variability and correlation of the major yield-forming properties for 493 forms of winter triticale in a 4-year study. For a population of winter triticale it was found that the highest variability is displayed by such properties as the number and weight of grains per ear. At the same time a considerable effect of environmental variability on the values of the properties is observed. The weight of grains per ear shows the highest correlation with the number of grains per ear, ear productivity, and with the weight of 1000 grains. The weight of 1000 grains as well as the protein content in grain display low, frequently negative coefficients of correlation with other elements of the yield structure under study.

4533 Konishi, T. (1993) **Coordinator's report: chromosome 3.** *Barley genetics newsletter (USA) v. 22 p. 74-75.* references. English. (AGRIS 95-111077).

4534 Konishi, T. (1993) **Coordinator's report: chromosome 3.** *Barley genetics newsletter (USA) v. 23 p. 147.* references. English. (AGRIS 95-111107).

4535 Konishi, T.; Yoshimi, R. (1993) **Segregation distortion at the Est5 locus in doubled haploid lines of barley.** *Barley genetics newsletter (USA) v. 23 p. 26-27.* references. English. (AGRIS 95-111092).

4536 Koshkin, V.A.; Koshkina, A.A.; Matvienko, I.I.; Pryadekhina, A.K. (1994) **[Use of initial forms with low photoperiodic sensitivity for development of early high-yielding spring wheat lines]. Ispol'zovanie iskhodnykh form yarovoj pshenitsy so slaboj fotoperiodicheskoj chuvstvitel'nost'yu dlya sozdaniya skorospelykh produktivnykh linij.** *Doklady Rossijskoj akademii sel'skokhozyajstvennykh nauk (Russian Federation) (no.2) p. 8-10.* 6 ref. Russian. (AGRIS 95-098588).

Isogenic lines with a low photoperiodic sensitivity differing in the plant height, the awn formation, and the head color have been shown to ripen reliably earlier as compared to the high-sensitive initial cultivar Leningradka both under a short photoperiod and a long day. The tested lines were similar to the standard in the photosynthesis activity and the yielding capacity.

4537 Krzymuski, J.; Laudanski, Z.; Oleksiak, T. (Inst. Hodowli i Aklimatyzacji Roslin, Radzikow (Poland)) (1993) **[Methods of genetic progress estimation]. Metody oceny postepu genetycznego.** 3. Symposium: Quantitative Genetics of Crops; Kudowa-Zdroj (Poland); 24-25 May 1993. *Zeszyty Naukowe Akademii Rolniczej we Wroclawiu. Rolnictwo (Poland) (no.223) p. 49-56.* 3 fig.; 4 ref. Polish. (AGRIS 95-098570).

The simplest estimation method is comparison of new varieties to control standard variety. Lack of standards stable yielding during longer period of time is the main fault of that method. This is the reason why we apply the method of changing collective weighted standard. Genetic progress (PG) is calculated on the basis of trial data with taking into consideration varietal structure, existing in production. The value of PG is calculated as an increase of yield in result of changes in Recommended List in comparison to the previous year. Methods based on testing relative yields of varieties in trials are also presented. Methods applied abroad are similar to those applied in Poland.

4538 Kueuets, H. (Estonian Agricultural Univ., Tartu (Estonia). Jogeva Plant Breeding Inst.); Kukk, V.; Tamm, I. (1994) **[The new cereal cultivars developed at Jogeva]. Jogeval aretatud uuematest teraviljasortidest.** *Transactions of Estonian Agricultural University (Estonia); Agronomy (no.178) p. 159-163.* 4 tables. Estonian. (AGRIS 95-111026).

There are developed 13 new cultivars at the Jogeva Plant Breeding Institute during last five years. In this article there is a review about four cereal cultivars - winter rye 'Elvi', barley cultivars 'Anni' and 'Elo' and oat cultivar 'Jaak'. Winter rye cultivar 'Elvi' is obtained by crossing. 'Elvi' has a stable yield, very good winter hardiness and lodging resistance. 'Elvi' is on the recommended list of varieties of Estonia from 1993. Barley cultivar 'Elo' is developed by crossing between 'Lofa' and 'Triumph'. 'Elo' is the best malting barley cultivar in Estonia, is on the recommended list of varieties from 1989. Barley cultivar 'Anni' is developed by crossing between cultivars 'Lofa' and 'Liisa'. 'Anni' is a food and malting barley cultivar having a very good yield capacity and lodging resistance. 'Anni' is on the recommended list of Estonia from 1993. Oat cultivar 'Jaak' has been developed by crossing 'Flaemingsnova' x '6.1S. 'Jaak' is a medium late food cultivar having high yield capacity and large seed size. 'Jaak' was included into the Official State Testing Trials of Estonia in 1993.

4539 Kuncl, L.; Stach, J. (Jihoceska Univ., Ceske Budejovice (Czech Republic). Zemedelska Fakulta) (1994) **[Utilization of selected genotypes of spring barley as forage nurse crops in potato-growing and montaneous regions of southern Bohemia]. Moznosti vyuziti vybranych genotypu jarniho jecmene jako picnich krycich plodin v bramborarske a horske oblasti jiznich Cech.** *Sbornik Zemedelske Fakulty Jihoceske Univerzity v Ceskych Budejovicich (Czech Republic) v. 11(1) p. 35-45.* 11 tables; 6 ref. Czech. (AGRIS 95-111038).

4540 Kunzel, G. (1993) **Coordinator's report: translocations and balanced tertiary trisomics.** *Barley genetics newsletter (USA) v. 22 p. 80-102.* references. English. (AGRIS 95-111081).

4541 Kunzel, G. (1993) **Coordinator's report: translocations and balanced tertiary trisomics.** *Barley genetics newsletter (USA) v. 23 p. 157-163.* references. English. (AGRIS 95-111113).

4542 Kunzel, G.; Sorokin, A. (1993) **A new approach towards physical mapping of DNA sequences to barley chromosomes.** *Barley genetics newsletter (USA) v. 23 p. 22-23.* references. English. (AGRIS 95-111091).

4543 Kurauchi, N.; Makino, T.; Hirose, S. (1993) **Inheritance of cleistogamy-chasmogamy in barley.** *Barley genetics newsletter (USA) v. 23 p. 19.* English. (AGRIS 95-111125).

4544 Kutcher, H.R.; Bailey, K.L. (1993) **Association of the glossy sheath/spike (gs4) and orange lemma (o) traits and a random amplified polymorphic DNA (RAPD) marker with reaction to common root rot [Cochliobolus sativus] in barley.** *Barley genetics newsletter (USA) v. 23 p. 33-35.* references. English. (AGRIS 95-111095).

4545 Kweon, S.J.; Hong, S.P.; Ko, J.M.; Park, D.S.; Lim, S.G.; Suh, D.Y.; Suh, H.S. (Rural Development Administration, Milyang (Korea Republic). National Yeongnam Agricultural Experiment Station) (1995) **A new large grain and high yielding barley variety "Keunalbori".** *RDA Journal of Agricultural Science (Korea Republic) v. 37(1) p. 122-127.* 2 illus.; 9 tables; 10 ref. Korean. (AGRIS 95-111054).

4546 Laroche, G. (Institut Technique des Cereales et des Fourrages, Paris (France)) (1995) **[Triticale varieties]. Le point sur les varietes de triticale.** *Perspectives Agricoles (France) (no 202) p. 109-112.* French. (AGRIS 95-098463).

4547 Laroche, G. (Institut Technique des Cereales et des Fourrages, Paris (France)) (1995) **[Wheat varieties for Limagne area [France]]. Limagne: un imperatif, la qualite [France].** *Perspectives Agricoles (France) (no 202) p. 42-43.* French. (AGRIS 95-098551).

4548 Laurie, DA.; Pratchett, N.; Bezant, JH.; Snape, JW. (1995) **RFLP MAPPING OF FIVE MAJOR GENES AND EIGHT QUANTITATIVE TRAIT LOCI CONTROLLING FLOWERING TIME IN A WINTERXSPRING BARLEY (HORDEUM VULGARE L) CROSS.** *Genome. 38(3):575-585.* English. [JOHN INNES CTR PLANT SCI RES NORWICH RES PK NORWICH NR4 7UH NORFOLK ENGLAND].

A genetic map of 92 RFLP loci and two storage protein loci was made using 94 doubled-haploid lines from a cross between the winter barley variety Igri and the spring variety Triumph. The markers were combined with data from two field experiments (one spring sown and one autumn (fall) sown) and a glasshouse experiment to locate a total of 13 genes (five major genes and eight quantitative trait loci (QTL)) controlling flowering time. Two photoperiod response genes were found; Ppd-H1 on chromosome 2(2H)S regulated flowering time under long days, while Ppd-H2 on chromosome 5(1H)L was detected only under short days. In the field experiments Ppd-HI strongly affected flowering time from spring and autumn sowings, while Ppd-H2 was detected only in the autumn sowing. The glasshouse experiment also located two vernalization response genes, probably Sh and Sh(2), on chromosomes 4(4H)L and 7(5H)L, respectively. The vernalization response genes had little effect on flowering time in the field. Variation in flowering time was also affected by nine additional genes, whose effects were nor specifically dependent on photoperiod or vernalization. One was the dense dwarfing gene on chromosome 3(3H)L. The remaining eight were QTLs of smaller effect. One was located on chromosome 2(2H), one on 3(3H), one on 4(4H), one on 7(5H), two on 6(6H), and two on 1(7H). Model fitting showed that the 13 putative genes, and their interactions, could account for ail the observed genetical variation from both spring and autumn sowings, giving a complete model for the control of flowering time in this cross. [References: 33].

4549 Lee, J.H.; Kim, J.G.; Suh, S.J.; Yoon, E.B.; Nam, J.H.; Park, M.W.; Song, H.S.; Lee, C.K.; Ha, Y.W. (Rural Development Administration, Suwon (Korea Republic). National Crop Experiment Station); Kim, S.J. (Rural Development Administration, Suwon (Korea Republic). Research Management Bureau); Shin, M.G.; Lee, E.S. (Rural Development Administration, Suwon (Korea Republic). National Horticultural Research Institute) (1995) **A new winter-hardy lodging resistant and high yielding syrup barley variety "Saekangbori".** *RDA Journal of Agricultural Science (Korea Republic) v. 37(1) p. 128-132.* 3 illus.; 8 tables; 11 ref. Korean. (AGRIS 95-111055).

4550 Liljeroth, E.; Hagberg, P.; Hagberg, A. (1993) **Bacterial abundance on roots of a high yielding duplication and some related varieties.** *Barley genetics newsletter (USA) v. 23 p. 49-52.* references. English. (AGRIS 95-111098).

4551 Lonc, W.; Kadlubiec, W.; Strugala, J. (Akademia Rolnicza, Wroclaw (Poland). Inst. Hodowli Roslin i Nasiennictwa) (1993) **[Genetic determination of agronomy characters in F2 hybrids of winter wheat]. Sposoby dzialania genow warunkujacych cechy uzytkowe mieszancow F2 pszenicy ozimej.** 3. Symposium: Quantitative Genetics of Crops; Kudowa-Zdroj (Poland); 24-25 May 1993. *Zeszyty Naukowe Akademii Rolniczej we Wroclawiu. Rolnictwo (Poland) (no.223) p. 229-247.* 13 fig., 2 tables; 16 ref. Polish. (AGRIS 95-098572).

In the experiment there were used full diallel crossing of six different lines which were derived from cultivars and strains of winter wheat. Plant height, lenght of the main ear and lenght of the flag lamina were determined by the additive action of genes. General and productive tillering, flag lamina width and leaf area, number of spiklets per main, ear's compactness, number and weight of grains per main ear and mean weight of grains per ear, grains weight per plant and 1000 grains weight were determined by the different degree of partial dominance. Plant height is increased by the dominant genes whereas by the dominant genes whereas grains weight per plant, flag leaf area and ear's compactness by the recessive genes.

4552 Lonc, W.; Kadlubiec, W.; Zalewski, D. (Akademia Rolnicza, Wroclaw (Poland). Katedra Hodowli Roslin i Nasiennictwa) (1993) **[Combining ability of the qualitative characters of winter wheat's grains]. Zdolnosc kombinacyjna cech jakosciowych ziam linii pszenicy ozimej.** 3. Symposium: Quantitative Genetics of Crops; Kudowa-Zdroj (Poland); 24-25 May 1993. *Zeszyty Naukowe Akademii Rolniczej we Wroclawiu. Rolnictwo (Poland) (no.223) p. 255-264.* 4 tables; 20 ref. Polish. (AGRIS 95-098574).

Combining ability of 4 qualitative characters of winter wheat's grains for 6 lines (derived from cultivars Parada, Alba, Hammer, Ikarus, Milan, Norman) and their 15 half-diallel hybrids F1 were determined. The grain had been harvested from single space-planted plants. It appeared that superiority of additive over nonadditive genes action controls 1000 grains weight and falling number. Approximated values of GCA and SCA control total protein contents and only GCA determines sedimentation value.

4553 Lonc, W.; Zalewski, D. (Akademia Rolnicza, Wroclaw (Poland). Katedra Hodowli Roslin i Nasiennictwa) (1993) **[Diallel analysis of quantitative traits of winter wheat F2 hybrids]. Analiza dialleliczna cech ilosciowych mieszancow F2 pszenicy ozimej.** 3. Symposium: Quantitative Genetics of Crops; Kudowa-Zdroj (Poland); 24-25 May 1993. *Zeszyty Naukowe Akademii Rolniczej we Wroclawiu. Rolnictwo (Poland) (no.223) p. 265-272.* 4 fig., 1 table; 3 ref. Polish. (AGRIS 95-111421).

Seven different lines derived from the cultivars of winter wheat: Salzmuender, Parada, Hammer, Ikarus, Milan, Alba, and Norman were crossed in a half-diallel fashion. There were determined genes action for the following characters: plant height, productive tillering, number of grains per ear and grains weight per mean ear by the graphic analysis of Hyman and Jinks. Line Norman causes epistatic heredity of number of grains per ear, Salzmuender grains weight per ear. Plant height is governed by additive action of genes and productive tillering is controlled by almost dominance action of genes. On the base of determined correlation coefficient there has been found that number of grains per ear increased by dominant genes.

4554 Lothrop, J.E. (Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). Maize Program) (1994) **Research on maize for highland regions.** *The subtropical, midaltitude, and highland maize subprogram. Bjarnason, M. (ed.) (Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). Maize Program) p. 19-42.* CIMMYT. 12 tables; 1 graph., 19 ref. English. (AGRIS 95-098514).

4555 Lundqvist, U. (1993) **Coordinator's report: ear morpholgy genes.** *Barley genetics newsletter (USA) v. 23 p. 175-176.* references. English. (AGRIS 95-111118).

4556 Lundqvist, U. (1993) **Coordinator's report: ear morphology genes.** *Barley genetics newsletter (USA) v. 22 p. 137-139.* references. English. (AGRIS 95-111085).

4557 Lundqvist, U. (1993) **Coordinator's report: Eceriferum genes.** *Barley genetics newsletter (USA) v. 23 p. 174.* references. English. (AGRIS 95-111116).

4558 Lyubimova, V.F.; Dorofeeva, L.V. (1993) **[Production of a new wheat variety]. Sozdanie novogo vida pshenitsy Triticum duromedium Lub.** *Byulleten' Glavnogo botanicheskogo sada (Russian Federation) (no.168) p. 151-160.* 17 ref. Russian. (AGRIS 95-098595).

The paper reports a new Triticum durum X Agropyron glaucum hybrid with a wide range of desirable traits inherited from both parents. The hybrid can be classified as a bread-and-fodder wheat. The progeny of 5-7 hybrid generations were studied.

4559 Ma, H.; Singh, RP.; Mujeebkazi, A. (1995) **SUPPRESSION EXPRESSION OF RESISTANCE TO STRIPE RUST IN SYNTHETIC HEXAPLOID WHEAT (TRITICUM TURGIDUM X T-TAUSCHII).** *Euphytica. 83(2):87-93.* English. [CIMMYT INT MAIZE & WHEAT IMPROVEMENT CTR LISBOA 27 APDO POSTAL 6-641 MEXICO CITY 06600 DF MEXICO].

Seventy-four hexaploid wheats, synthesized by either crossing resistant Triticum turgidum L. var. durum with susceptible/intermediate T. tauschii or susceptible/intermediate T. turgidum with resistant T. tauschii, and their parents were evaluated as seedlings in the greenhouse and as adult-plants at two field locations in Mexico for resistance to pathotype 14E14 of stripe (or yellow) rust (caused by Puccinia striiformis Westend). The seedlings of different synthetic hexaploids showed high phenotypic

diversity for resistance. However, the resistance level of only 15 of the 74 synthetic hexaploid wheats were similar to the low infection types of the respective donor parents. The remaining synthetic wheats displayed either intermediate or high infection types. A similar result was also obtained in field tests, where only 18 synthetic hexaploids were resistant as adult-plants. In general, genotypes with seedling resistance were also resistant as adult-plants. A few synthetic hexaploids, which displayed intermediate or susceptible infection types as seedlings were resistant as adult-plants, indicating that additional genes for adult-plant resistance were also present. The fact that resistance of some donor parents was not expressed, or only partially expressed, in a synthetic hexaploid background suggests the presence of suppressor genes in the both the A or B, and D genomes of T. turgidum and T. tauschii, respectively. The resistance of a donor parent was expressed in a synthetic hexaploid only if the corresponding suppressor was absent in the second parent. Moreover, the suppressors appeared to be resistance gene specific. [References: 21].

4560 Macas, B.; Coutinho, J.; Bagulho, F.; Goncalves, M.J.; Gomes, M.C.; Brites, C. (Estacao Nacional de Melhoramento de Plantas, Elvas (Portugal)) (1992) **[Alternative cycle soft wheat - genetic breeding]. Trigo mole de ciclo alternativo - melhoramento genetico.** [International Symposium on Plant Breeding]; Elvas (Portugal); 27-29 May 1992. *Melhoramento (Portugal) v. 33(1) p. 119-130.* issued 1994; 4 tables; 6 ref. Portuguese. (AGRIS 95-111425).

4561 Madre, M. (Secobra Recherches, Maule (France)) (1993) **[From barley to beer in France]. La filiere francaise: de l'orge a la biere.** *BIOS (France) v. 24(11-12) p. 49-51.* French. (AGRIS 95-098468).

4562 Maksimovic, D.; Krstic, D.; Knezevic, D. (Institut za istrazivanja u poljoprivredi "Srbija", Kragujevac (Yugoslavia). Centar za strna zita "Kragujevac") (1994) **[The investigation of some properties of new winter malt barley cultivar "Jagodinac" in trials of Yugoslav Federal Commission]. Ispitivanje nekih osobina nove sorte ozimog pivskog jecma "Jagodinac" u ogledima jugoslovenske komisije.** *Pivarstvo (Yugoslavia) v. 27(2) p. 87-90.* 3 tables; 8 ref. Serbian. (AGRIS 95-111123).

Winter malt barley cultivar Jagodinac has been investigated in trials of Approval Yugoslav Federal Commission, during 1989-1991. The Approval Yugoslav Federal Commission approved it as a new cultivar in 1992. The cultivar Jagodinac was developed by crossing Novosadski 313 x Kg-422. According to the botanical classification, cultivar Jagodinac belongs to Hordeum vulgare Yess, var. nutans. New cultivar Jagodinac in all places and three years of testing achieved average grain yield 7325 kg/ha on the level of check cultivar Novosadski 293. It was shown very high genetic potential for grain yield 9064 kg/ha. In comparison with standard cultivar Novosadski 293, the new cultivar Jagodinac had higher Hartongs coefficient VZ on 45 deg C for 2, 4, Colbach coefficient for 1, 0, and 1, 6 lower protein content in malt than in check cultivar.

4563 Marthe, F.; Kunzel, G. (1993) **Barley translocation with high efficiency for linkage studies as revealed by computer-assisted breakpoint mapping on somatic chromosomes.** *Barley genetics newsletter (USA) v. 23 p. 20-21.* references. English. (AGRIS 95-111090).

4564 Martin, G. (Institut Technique des Cereales et des Fourrages, Paris (France)); Bernicot, M.H. (1995) **[Soft wheat varieties]. Qualite: dix-sept varietes au banc d'essai. Le point sur les varietes de ble tendre.** *Perspectives Agricoles (France) (no 202) p. 44-75.* 21 tableaux. French. (AGRIS 95-098552).

4565 Maslowski, J. (Akademia Rolnicza, Lublin (Poland). Inst. Genetyki i Hodowli Roslin) (1993) **[Tolerance of various spring wheat genotypes to the stress effect of aluminium ions]. Tolerancyjnosc roznych genotypow pszenicy jarej na stresowe dzialanie jonow glinu.** 3. Symposium: Quantitative Genetics of Crops; Kudowa-Zdroj (Poland); 24-25 May 1993. *Zeszyty Naukowe Akademii Rolniczej we Wroclawiu. Rolnictwo (Poland) (no.223) p. 279-284.* 2 tables; 7 ref. Polish. (AGRIS 95-098576).

The tests involved 5 hybrid combinations F4, and their parent forms. Among the parent components, the highest tolerance to aluminium ions was that of the world model of reaction to that factor, the Brasilian variety, BH 1146. The remaining varieties confirmed their sensitivity to aluminium ions. Within each of the parent components 30 plants were subjected to biometric measurements, and within each hybrid combination - 60 singles. Variability coefficients, means and the significance of differences were calculated for all 10 properties under study. The modern plant ideotype and the required tolerance to toxic aluminium ions were characteristic of the hybrids BH 1146 x Kadet and BH 1146 x Henika.

4566 Matsumura, K.; Tosa, Y. (1995) **THE RYE MILDEW FUNGUS CARRIES AVIRULENCE GENES CORRESPONDING TO WHEAT GENES FOR RESISTANCE TO RACES OF THE WHEAT MILDEW FUNGUS.** *Phytopathology. 85(7):753-756.* English. [KOCHI UNIV FAC AGR NANKOKU KOCHI 783 JAPAN].

The common wheat cultivar Chancellor and its near-isogenic lines carrying resistance genes to Blumeria graminis f. sp. tritici, the wheat powdery mildew fungus, were inoculated with 60 F-1 cultures derived from a cross between B. graminis f, sp, secalis, the rye powdery mildew fungus, and B. graminis f. sp. tritici. Segregation patterns of avirulent and virulent cultures showed that the F-1 population carries avirulence genes corresponding to Pm1, Pm2, Pm3a, Pm3b, Pm3c, and Pm1a, resistance genes to races of the wheat mildew fungus. This result indicates that the rye mildew fungus, an inappropriate forma specialis for wheat, carries these avirulence genes. [References: 22].

4567 Mccormick, KM.; Panozzo, JF.; Eagles, HA. (1995) **STARCH PASTING PROPERTIES AND GENETIC RELATIONSHIPS OF WHEAT CULTIVARS IMPORTANT TO VICTORIAN WHEAT BREEDING.** *Australian Journal of Agricultural Research. 46(5):861-871.* English. [VICTORIAN COLL AGR & HORT LONGERENONG CAMPUS RMB 3000 HORSHAM VIC 3401 AUSTRALIA].

Starch quality, particularly high paste viscosity, is important in producing marketable wheat for several end uses. Peak starch paste viscosity was measured for 65 wheat cultivars significant to Victorian wheat breeding. Coefficients of kinship were calculated between these cultivars to assess their genetic relationships. In terms of paste viscosity, 15 of the 20 highest ranking cultivars were related. Currawa, a cultivar released in 1912, was the common ancestor and proposed source of high paste viscosity in this family of cultivars, which included the currently grown cultivar, Rosella. Most cultivars in the lower rank were closely related to WW15, which is a semi-dwarf parent from CIMMYT that was used extensively in Australian breeding programs in the past two decades. This survey provides information for choosing parental material for starch quality improvement and offers an explanation for the decrease in peak viscosity of modern Australian cultivars. [References: 35].

4568 Meikle, S.M.; Scarisbrick, D.H. (Farm Business Unit, Wye College, University of London, Wye, Ashford, Kent TN25 5AH (United Kingdom)) (1994) **Cereal breeding and varietal testing.** *British Food Journal (United Kingdom) v. 96(4) p. 11-16.* 7 ref. English. (AGRIS 95-098561).

4569 Mello Sampaio, T.; Barradas, M.C. (Estacao Nacional de Melhoramento de Plantas, Elvas (Portugal)); Cunha, Z. (Instituto Gulbenkian de Ciencia, Oeiras (Portugal)); Silva, J.P. (Beira Interior Univ., Covilha (Portugal)); Vieira, M.R. (Instituto Botanico, Coimbra (Portugal)) (1992) **[Reserve proteins in tetraploid hybrids of wheat which show chromosome alterations at the level of the homologous group]. Proteinas de reserva em hibridos tetraploides de trigo que manifestam alteracoes cromossomicas ao nivel do grupo homeologo.** Instituto Nacional de Investigacao Agraria, Elvas (Portugal). Estacao Nacional de Melhoramento de Plantas. *Melhoramento (Portugal) v. 33(2) p. 423-429.* issued 1994; 4 ill. 8 ref. Portuguese. (AGRIS 95-111441).

4570 Mexia, J. (Nova de Lisboa Univ., Monte da Caparica (Portugal). faculdade de Ciencias e Tecnologia); Baeta, J.; Gusmao, L. (Estacao Agronomica Nacional, Oeiras (Portugal)); Macas, B.; Coutinho, J. (Estacao Nacional de Melhoramento de Plantas, Elvas (Portugal)) (1992) **[Triticale adaptation trials: interpretation through joint rectified regression analysis]. Ensaios de adaptacao de triticales: interpretacao pela analise de regressao conjunta rectificada.** [International Symposium on Plant Breeding]; Elvas (Portugal); 27-29 May 1992. Instituto Nacional de Investigacao Agraria, Elvas (Portugal). Estacao Nacional de Melhoramento

de Plantas. *Melhoramento (Portugal) v. 33(1) p. 153-160.* issued 1994; 4 tables; 5 ref. Portuguese. (AGRIS 95-110956).

4571 Miazga, D. (Akademia Rolnicza, Lublin (Poland). Inst. Genetyki i Hodowli Roslin); Worland, A.J.; Kowalczyk, K. (1993) **[Pleiotropic effects of the chromosome 2D genes Ppd1 and Rth8 of wheat]. Plejotropowe efekty genow Ppd1 i Rht8 na chromosomie 2D pszenicy zwyczajnej.** 3. Symposium: Quantitative Genetics of Crops; Kudowa-Zdroj (Poland); 24-25 May 1993. *Zeszyty Naukowe Akademii Rolniczej we Wroclawiu. Rolnictwo (Poland) (no.223) p. 223-228.* 2 tables; 4 ref. Polish. (AGRIS 95-098571).

Pleiotropic effects of the chromosome 2D genes Ppd1 for day lenght intensitivity, Rht8 for GA responsive height reducing were investigated using homozygous recombinant lines Cappelle-Desprez (Mara 2D). Ppd1 grains 1 and 2 florets, grains in spikelet and grains/ear in 1991. Rht8 significantly reduces height in both years. In 1992 were observed more efficient pleiotropic effects Rht8 gen on more yields components.

4572 Milotova, J. (Zemedelsky Vyzkumny Ustav, Kromeriz (Czech Republic)) (1995) **[Malting barley varieties in developed European countries]. Sladovnicke jecmeny ve vyspelych zemich Evropy.** *Obilnarske Listy (Czech Republic) v. 3(2) p. 28-29.* 1 table. Czech. (AGRIS 95-111039).

4573 Moieni, A.; Sarrafi, A. (1995) **GENETIC ANALYSIS FOR HAPLOID-REGENERATION RESPONSES OF HEXAPLOID-WHEAT ANTHER CULTURES.** *Plant Breeding-Zeitschrift fur Pflanzenzuchtung. 114(3):247-249.* English. [INP ENSAT BIOTECHNOL & AMELIORAT PLANTES LAB EA DRED 832 145 AV MURET F-31076 TOULOUSE FRANCE].

Genetic variability in response to anther culture was investigated in 49 winter hexaploid wheats, comprising 33 pure lines (F-10) derived from a composite cross programme and their 16 parental genotypes. All genotypes were grown in a randomized block design with three replications in a controlled greenhouse. The number of embryoids and total plant regeneration per 100 anthers, as well as the numbers of green and albino plants regenerated per 100 embryoids, were measured. Significant genetic variability was observed among the 49 genotypes for all the traits studied. All traits showed high heritability. Among the genotypes compared, DC(2)30N and IBPT-40 gave the best results for the production of embryoids and IBPT-78 had the highest value for the production of green plants. The genotype IBPT-34 developed a large number of albino plants, and it should be useful as a parent in studies to determine the genetic control of albino plants in wheat. [References: 28].

4574 Moldovan, V.; Botezan, V.; Moldovan, M. (Statiunea de Cercetari Agricole, Turda (Romania)) (1994) **[Investigations into genetics of the harvest index in winter wheat]. Cercetari privind studiul genetic al indicelui de recolta la graul de toamna.** *Cercetari de genetica vegetala si animala (Romania) v. 3 p. 45-54.* 5 tables; 1 ill., 1 graph; 17 ref. Romanian. (AGRIS 95-111427).

The paper discusses some aspects related to the genetic determinism of the harvest index in winter wheat that might influence breeding strategies for improved yielding ability. The harvest index heredity mechanisms were studied within a 6-hybrid combinations system including parents P1 and P2, hybrids F1 and F2 and backcrosses BC1 and BC2 for each hybrid combination. The results indicated that the harvested index heredity is ruled by additive, dominating and epistatic genetic effects, function of each specific hybrid combination. The narrow sense heritability coefficients were scored high, ranging between 0.47-0.83, except for one combination of two parents exhibiting close harvest index values. The positive transgression rates for the harvest index scored between 3 per thousand and 271.3 per thousand depending on the genotype. A significant correlation was established between the harvest index and the individual plant yield, the main wheat year yield and TKW. Instead, the correlation with the biological production was poor, indicating, in some cases, that high harvest indices do not necessarily mean high grain yields as well and that they might be the result of low biological productions. The alternative suggested here for improvement of practical breeding works is the application of selection for the harvest index at the level of early generations with all ensuing advantages as well as continued selection performed on more advanced generations for the harvest index combined with the production per se.

4575 Molina Cano, J.L. (Institut de Recerca i Tecnologia Agroalimentaria (Spain)) (1992) **Induced mutations in malting barley genetics and breeding.** Instituto Nacional de Investigacao Agraria, Elvas (Portugal). Estacao Nacional de Melhoramento de Plantas. *Melhoramento (Portugal) v.33(2) p. 449-464.* issued 1994; 10 graphs. 3 tables; 28 ref. English. (AGRIS 95-111345).

4576 Mornhinweg, D.W.; Porter, D.R.; Webster, J.A. (1993) **Inheritance of Russian wheat aphid resistance in spring barley germplasm line, STARS-9301B.** *Barley genetics newsletter (USA) v. 23 p. 40.* references. English. (AGRIS 95-111097).

4577 Mornhinweg, DH.; Porter, DR.; Webster, JA. (1995) **INHERITANCE OF RUSSIAN WHEAT APHID RESISTANCE IN SPRING BARLEY.** *Crop Science. 35(5):1368-1371.* English. [USDA ARS 1301 N WESTERN ST STILLWATER, OK 74075 USA].

The Russian wheat aphid (RWA), Diuraphis noxia (Mordvilko), is a devastating pest of barley (Hordeum vulgare L.), An excellent source of RWA resistance (STARS-9301B) was recently released to the barley industry. This greenhouse study was conducted to determine the genetic control of RWA resistance in STARS-9301B. Crosses were made between Morex, a susceptible malting barley cultivar and STARS-9301B during 1992 and 1993. Genetic analysis was performed on the parents, F-1, reciprocal F-1, F-2, and backcross (BC) populations, as well as 231 F-2-derived F-3 Families. Segregation in the F-2 and BC populations indicated multiple gene control. Fourteen F-3 families were found to be homozygous resistant and 16 were homozygous intermediate, indicating that two genes control RWA resistance in STARS-9301B, Analysis of data from the F-2 and BCs to both parents suggested recessive epistasis of a dominant gene (Dnb2) on an incompletely dominant gene (Dnb1). This type of genetic control will necessitate screening for RWA resistance after each cycle of selection in a breeding program. [References: 10].

4578 Mundt, C.C. (Oregon State Univ., Cordley Hall 2082, Corvallis, OR97331 2902 (USA)) (1994) **Use of host genetic diversity to control cereal diseases: implications for rice blast.** *Rice blast disease. Zeigler, R.S.; Leong, S.A.; Teng, P.S. (eds.). International Rice Research Inst., Los Banos, Laguna (Philippines). Entomology and Plant Pathology Div.; CAB International, Wallingford, Oxon OX10 8DE (United Kingdom) p. 293-308.* IRRI. 6 tables; 42 ref. English. (AGRIS 95-111288).

4579 Murai, K.; Ogihara, Y.; Tsunewaki, K. (1995) **AN EMS-INDUCED WHEAT MUTANT RESTORING FERTILITY AGAINST PHOTOPERIOD-SENSITIVE CYTOPLASMIC MALE STERILITY.** *Plant Breeding-Zeitschrift fur Pflanzenzuchtung. 114(3):205-209.* English. [ISHIKAWA AGR COLL AGR RESOURCES RES INST NONOICHI ISHIKAWA 921 JAPAN].

Triticum aestivum cv. 'Norin 26' with Aegilops crassa cytoplasm shows photoperiod-sensitive cytoplasmic male sterility (PCMS). This alloplasmic line is almost completely male-sterile under long-day conditions (greater than or equal to 15 h), but highly male-fertile under short-day conditions (greater than or equal to 14.5 h). To obtain male-fertile mutants against PCMS, seeds of the alloplasmic line were treated with ethyl methane sulfonate (EMS). The M(3) generation was evaluated for PCMS expression, and one fertility-restoring (FR-mutant) line showing high male fertility under the long-day conditions was selected. Reciprocal F-1 hybrids between the FR-mutant and the alloplasmic 'Norin 26' showed male sterility under the long-day conditions, and continuous segregation with respect to the degree of fertility restoration occurred in their F-2 generations. These results indicate that multiple recessive mutations with minor effects, induced in the nuclear genome, are involved in the fertility restoration. In fact, no restriction-fragment-length polymorphisms of mitochondrial DNA between the FR-mutant and the alloplasmic 'Norin 26' are found. [References: 15].

4580 Mustatea, P. (Institutul de Cercetari pentru Cereale si Plante Tehnice, Fundulea (Romania)) (1994) **[Optimizing the replication number in multi-site testing in wheat breeding lines]. Aspecte ale optimizarii numarului de repetitii in testarea ecologica a materialului de ameliorarea a graului.** *Probleme de genetica teoretica si aplicata (Romania) v. 26(1) p. 1-14.* 3 tables; 4 graphs; 2 ref. Romanian. (AGRIS 95-111011).

In view of planning the early multi-site testing of a large number of lines, using small amounts of seeds, available in the early generations, a study was conducted on the effects of reducing the number of replications per site and/or the number of testing sites exactly according the obtained information. The use of unreplicated or of two replicate trials was simulated by randomly selecting one or two replications of the five normally used, in 12 sets of trials totaling 54 individual experiments. Using only the data of one randomly extracted replication per site which was significantly correlated in all sets of trials with the data averaged from 5 replications per site (r=0, 91, P<0, 001 on an average of all sets). Simulated one-replicate trials allowed identification of an average of 86 percent from the best genotypes identified by 5 replicate-trials. The produced correlation of data using randomly selected replication per site from only 9 representative sites, with data averaged from 5-replications from all sites, was also high (average r=0, 97), and the percentage of the best 10 identified genotypes was 70. Using two randomly selected replications per site increased only this percentage on an average of two years by 10 percent; this has to be weighed against halving the number of tested lines or doubling the expenses. Our data suggest the possibility of reducing the number of replications and testing sites without considerable loss of information and with benefits regarding the cost of the trials or the number of lines can be tested at the same expenses and the possibility of earlier selection, using smaller quantities of seeds.

4581 Mustatea, P. (Institutul de Cercetari pentru Cereale si Plante Tehnice, Fundulea (Romania)) (1994) **[Response of some winter wheat genotypes to late emergence]. Reactia la rasarirea intarziata a unor genotipuri de grau comun de toamna.** *Probleme de genetica teoretica si aplicata (Romania) v. 26(2) p. 73-89.* 5 tables; 5 graphs; 4 ref. Romanian. (AGRIS 95-111428).

Late emergence of winter wheat, caused by insufficient moisture or low temperatures at sowing by delayed planting, is afterwards associated with lower yields. This study was conducted to evaluate the response of several wheat genotypes and to detect characters associated with tolerance to late planting. 25 genotypes were tested during three years with normal and late planting dates. To describe the response to delayed planting a tolerance index, similar to the one suggested by FISHER and MAURER for draught, was computed using yields from normal and late plantings. Our results suggest that there are significant differences among present Romanian wheat cultivars for the tolerance to late planting. The values of the index expressing the tolerance to late planting have shown acceptable repeatability among years and had heritability than yields obtained at late planting dates. Tolerance to late planting was significantly correlated with better emergence ability under unfavourable conditions, with shorter grain filling duration and with lower lodging resistance. Progress in breeding for tolerance to late planting or emergence can be expected by improving coleoptile length and seed vigour and shortening grain filling duration with concomitant increase in rate of grain filling.

4582 Nagaki, K.; Tsujimoto, H.; Isono, K.; Sasakuma, T. (1995) **MOLECULAR CHARACTERIZATION OF A TANDEM REPEAT, AFA FAMILY, AND DISTRIBUTION AMONG TRITICEAE.** *Genome. 38(3):479-486.* English. [YOKOHAMA CITY UNIV KIHARA INST BIOL RES TOTSUKA KU MAIOKA CHO 641-12 YOKOHAMA 244 KANAGAWA JAPAN].

We have characterized a so-called D genome specific repetitive DNA sequence (pAsl) of Aegilops squarrosa L. (2n = 14, genome DD) with respect to its DNA sequence and its distribution among Triticeae species. The clone consisted of three units of a repetitive DNA sequence of 336 or 337 base pairs, and was AT rich (65.2%). DNA analyses revealed the presence of the pAsl-like sequences in other genomes of Triticeae species, although the repetition was greatly (as much as 100-fold) variable among the genomes. The repetitive sequences from 10 diploid species were amplified using PCR with specific primers, and the sequential variability was analyzed by the digestion pattern obtained with five restriction enzymes. Since the Afal site was the most conservatively present in the unit of the repetitive sequences, we named them "Afa family." The analysis clearly displayed the variation of the repetitive sequences regardless of the uniformity of the size of the amplified product. These results indicated that plural amplification events of these repetitive sequences happened independently in the genome evolution of Triticeae. [References: 20].

4583 Nagashima, H.; Ishikawa, N. (1993) **Novel types of hordein genotypes in Japanese barley cultivars.** *Barley genetics newsletter (USA) v. 23 p. 8-11.* references. English. (AGRIS 95-111124).

4584 Nasr, M.I.; El Halafawy, K.A.; Eissa, R.; Abou Ghalia, A. (Monoufeyia Univ., Sadat City (Egypt). Tissue Culture and Genetic Engineering Centre) (1994) **Effect of genotype and culture medium on wheat callus induction.** *Menofiya Journal of Agricultural Research (Egypt). v. 19(6 part 2) p. 3231-3242.* 2 fig. 3 tables; 11 ref. English. (AGRIS 95-110999).

4585 Nelson, JC.; Vandeynze, AE.; Autrique, E.; Sorrells, ME.; Lu, YH.; Merlino, M.; Atkinson, M.; Leroy, P. (1995) **MOLECULAR MAPPING OF WHEAT - HOMOEOLOGOUS GROUP 2.** *Genome. 38(3):516-524.* English. [CORNELL UNIV DEPT PLANT BREEDING & BIOMETRY 255 EMERSON HALL ITHACA, NY 14853 USA].

A molecular-marker map of bread wheat having many markers in common with other grasses in the Gramineae family is a prerequisite for molecular level genetic studies and breeding in this crop species. We have constructed restriction fragment length polymorphism maps of the A-, B-, and D-genome chromosomes of homoeologous group 2 of hexaploid wheat (Triticum aestivum L. em. Their) using 114 F-7 lines from a synthetic x bread wheat cross and clones from ii libraries. Chromosomes 2A, 2B, and 2D comprise 57, 60, and 56 markers and each spans about 200 cM. Comparisons between chromosomes are facilitated by 26 sets of homoeoloci. Genes mapped include a heterologous abscisic acid responsive locus cloned as pBS128, the epidermal waxiness inhibitor W2(1), and two presumed leaf rust and stem rust resistance genes. Anomalies suggesting ancestral rearrangements in chromosome 2B are pointed out and features of wheat group 2 chromosomes that are common to barley (Hordeum vulgare L.), rice (Oryza spp.), and T. tauschii are discussed. [References: 51].

4586 Nelson, JC.; Vandeynze, AE.; Autrique, E.; Sorrells, ME.; Lu, YH.; Negre, S.; Bernard, M.; Leroy, P. (1995) **MOLECULAR MAPPING OF WHEAT - HOMOEOLOGOUS GROUP 3.** *Genome. 38(3):525-533.* English. [CORNELL UNIV DEPT PLANT BREEDING & BIOMETRY 255 EMERSON HALL ITHACA, NY 14853 USA].

A prerequisite for molecular level genetic studies and breeding in wheat is a molecular marker map derailing its similarities with those of other grass species in the Gramineae family. We have constructed restriction fragment length polymorphism maps of the A-, B-, and D-genome chromosomes of homoeologous group 3 of hexaploid wheat (Triticum aestivum L. em. Thell) using 114 F-7-8 lines from a synthetic X bread wheat cross. The map consists of 58 markers spanning 230 cM on chromosome 3A. 62 markers spanning 260 cM on 3B, and 10 markers spanning 171 cM on 3D. Thirteen libraries of genomic or cDNA clones from wheat, barley, and T. tauschii, the wheat D genome donor, are represented, facilitating the alignment and comparison of these maps with maps of other grass species. Twenty four clones reveal homoeoloci on two of the three genomes and the associated linkages are largely comparable across genomes. A consensus sequence of orthologous loci in grass species genomes is assembled from this map and from existing maps of the chromosome 3 homoeologs in barley (Hordeum spp.). T. tauschii, and rice (Oryza spp.). It illustrates the close homoeology among the four species and the partial homoeology of wheat chromosome 3 with oat (Avena spp.) chromosome C. Two orthologous red grain color genes, R3 and R1, are mapped on chromosome arms 3BL and 3DL. [References: 36].

4587 Nelson, L.A. (University of Nebraska, Lincoln, NE); Elmore, R.W.; Nordquist, P.T.; Klein, R.N.; Baltensperger, D.D. (1993) **Nebraska grain sorghum hybrid tests: January 1994.** *E.C. (Nebraska Cooperative Extension Service) (USA); no. 93-106A 32 p.* English. (AGRIS 95-111127).

4588 Neto, AT.; Camargo, CED.; Alves, MC.; Santos, RR.; Defreitas, JG. (1995) **MUTATION BREEDING IN CULTIVAR IAC-24 OF WHEAT AIMING AT RESISTANCE TO DISEASES.** *Pesquisa Agropecuaria Brasileira. 30(4):497-504.* Portuguese. [USP CENA BR-13400970 PIRACICABA SP BRAZIL].

The objective of the present work was to obtain mutants with disease resistance in the wheat cultivar IAC-24. Seeds were irradiated with gamma-rays (25 and 35 krad) and the selection was started in the M(2) generation. Eight selected lines were compared with the control IAC-24 during three

years (M(6), M(7) and M(8) generations) in nine trials carried out in several locations with and without irrigation. Four mutant lines were immune to leaf rust and one of them showed also moderate resistance to powdery mildew. Another mutant line showed better reaction to leaf spot. Two of these mutant lines maintained the same yield, plant height and tolerance to aluminum toxicity as the control. These results show the usefulness of mutation breeding approach to correct defects in outstanding cultivars.

4589 Netsvetaev, V.P. (1993) **Chromosomal location of loci, Est12 and Amy2 in barley.** *Barley genetics newsletter (USA) v. 22 p. 42-43.* references. English. (AGRIS 95-111067).

4590 Netsvetaev, V.P.; Krestinkov, I.S. (1993) **Chromosomal position of the superoxide dismutase locus, Sod1 (=Sod B), in barley.** *Barley genetics newsletter (USA) v. 22 p. 44-45.* references. English. (AGRIS 95-111068).

4591 Neves, N.; Heslopharrison, JS.; Viegas, W. (1995) **RRNA GENE ACTIVITY AND CONTROL OF EXPRESSION MEDIATED BY METHYLATION AND IMPRINTING DURING EMBRYO DEVELOPMENT IN WHEAT X RYE HYBRIDS.** *Theoretical & Applied Genetics. 91(3):529-533.* English. [JOHN INNES CTR PLANT SCI RES DEPT CELL BIOL KARYOBIOL GRP NORWICH NR4 7UH NORFOLK ENGLAND].

Ribosomal RNA genes originating from one parent are often suppressed in interspecific hybrids. We show that treatments during germination with the cytosine analogue 5-azacytidine stably reactivate the expression of the suppressed rRNA genes of rye origin in the wheat x rye amphiploid, triticale, by preventing methylation of sites in the rye rDNA. When 5-azacytidine is applied to embryos of triticale and wheat x rye F-1 hybrids nine, or more, days after fertilization, rye rRNA gene expression is stably reactivated in the resulting seedling. Earlier treatments have no effect on rye rRNA gene expression, indicating that undermethylation of DNA early in embryo development is reversible. After 9 days, the methylation status of rRNA genes in maintained throughout development. Since the change in expression follows a methylation change at particular restriction-enzyme sites, the data establish a clear correlation between gene activity and methylation in plants. [References: 19].

4592 Ninno, M. de; Codianni, P.; Fares, C.; Di Fonzo, N.; Bianchi, A. (Istituto Sperimentale per la Cerealicoltura, Rome (Italy)); Dalli, A. (Fondazione Morando Bolognini, Sant'Angelo Lodigiano, Milan (Italy)) (1995) **[Presentation of a new Italian durum wheat variety - Fortore]. Presentazione di una nuova varieta' di frumento duro - Fortore.** *Sementi Elette (Italy) v. 41(2) p. 15-17.* 3 tables; 6 ref. Italian. (AGRIS 95-111440).

The description of a breeding method used to originate the new durum wheat cultivar Fortore is reported. A diallelic cross with six Italian durum wheat varieties was utilized. Trials results carried out over many years on yield and qualitative traits of Fortore were discussed and tabulated.

4593 Ohta, S. (1995) **CYTOGENETIC EVIDENCE FOR CRYPTIC STRUCTURAL HYBRIDITY CAUSING INTRASPECIFIC HYBRID STERILITY IN AEGILOPS CAUDATA L.** *Japanese Journal of Genetics. 70(3):355-364.* English. [KYOTO UNIV FAC AGR INST PLANT GERM PLASM MUKO KYOTO 617 JAPAN].

To elucidate the mechanism causing the intraspecific hybrid sterility in Aegilops caudata, chromosome pairing and segregation at meiosis and fertility were examined in sterile F-1 hybrids, a tetraploid derivative induced from one of the sterile hybrids, and their parental lines. The F-1 hybrids showed a normal configuration and frequency of chromosome pairing at MI but was completely sterile. At AI, chromosomes consisting of two sister chromatids different in length were observed. The induced tetraploid was shown to be an autotetraploid based on the configuration and frequency of chromosome pairing at MI, and it showed incomplete but obvious restoration of fertility. From the results, it was strongly suggested that the intraspecific hybrid sterility observed in this species is a chromosomal sterility caused by cryptic structural hybridity defined by Stebbins (1945, 1950). However, the differences in chromosomal structure between parental lines are presumably not great enough to cause preferential pairing in the induced tetraploid. Ae. caudata, thus, most probably is considered to be just on the way to speciation due to cryptic chromosomal rearrangements. [References: 27].

4594 Olteanu, L.D.; Paunescu, G. (Institutul de Cercetari pentru Cereale si Plante Tehnice Fundulea, Simnic (Romania). Statiunea de Cercetari Agricole Simnic Craiova) (1994) **[Deportment of some winter wheat varieties under the ecological conditions of Oltenia [Romania]]. Comportarea unor soiuri de grau de toamna in conditiile ecologice din sudul Olteniei.** *Lucrari stiintifice (Romania) v. 9 p. 103-108.* 1 table; 5 ref. Romanian. (AGRIS 95-111432).

The interaction genotype-cropping environment in winter wheat, a culture of great importance in the Oltenia zone was investigated. The variety became the most dynamic factor of the technology, and its comportment depends on climate conditions and on the frequency of pathogens. Among the 200 studied varieties, the paper stops at 12, 6 of which are noteworthy for their genetic value and adapting capacity, namely: Flamura 85, Simnic 30, Lovrin 34 and Fundulea 4. Due to the sensibility to diseases, the varieties Fundulea 133 and Flamura 80 will be excluded. The varieties noticed by their resistance to stress will be used as a source of germoplasma to improve winter wheat.

4595 Ordon, F.; Gotz, R.; Freidt, W. (1993) **Genetic stocks resistant to barley yellow mosaic viruses (BaMMv, BaYMV, BaYMV-2) in Germany.** *Barley genetics newsletter (USA) v. 22 p. 46-50.* references. English. (AGRIS 95-111029).

4596 Ordon, F.; Gotz, R.; Friedt, W. (1993) **Genetic stocks resistant to barley yellow mosaic viruses (BaMMV, BaYMV, BaYMV-2) in Germany.** *Barley genetics newsletter (USA) v. 23 p. 44-48.* references. English. (AGRIS 95-111030).

4597 Osorio Alcala, Leodegario (1992) **[Resistance to drought in some wheats (Triticum aestivum L.)]. Resistencia a sequia en trigos ventureros (Triticum aestivum L.).** Colegio de Postgraduados, Montecillo (Mexico). Centro de Genetica. 27 ilus.; 25 tablas; 108 ref. 130 p. Spanish. (AGRIS 95-098557).

4598 Pagnotta, MA.; Nevo, E.; Beiles, A.; Porceddu, E. (1995) **WHEAT STORAGE PROTEINS - GLUTENIN DIVERSITY IN WILD EMMER, TRITICUM DICOCCOIDES, IN ISRAEL AND TURKEY .2. DNA DIVERSITY DETECTED BY PCR.** *Theoretical & Applied Genetics. 91(3):409-414.* English. [UNIV HAIFA INST EVOLUT IL-31905 HAIFA ISRAEL].

Germplasm of Triticum dicoccoides collected from different environments in Israel was evaluated by using the PCR as a molecular marker. Two pairs of primers were used in the PCR in amplifying the DNA tracts coding the high- and low-molecular-weight glutenin subunits. Analyses reveal great variability within and between populations indicating the high values of this germplasm for future breeding programs to improve the protein quality in wheat. [References: 40].

4599 Paraschivu, M.; Paunescu, G.; Radu, A.; Olteanu, L.D. (Institutul de Cercetari pentru Cereale si Plante Tehnice Fundulea, Simnic (Romania). Statiunea de Cercetari Agricole Simnic Craiova) (1994) **[Deportment of an assortment of lines and varieties of barley towards disease Pyrenospora graminea (Rabh.) Ito et Kuris F.C. Helminthosporium gramineum (Rabh.) in the period 1987-1989]. Comportarea unui sortiment de linii si soiuri de orz fata de sfasierea frunzelor de orz Pyrenospora graminea (Rabh.) Ito et Kuris F.C. Helminthosporium gramineum (Rabh.) in perioada 1987-1989.** *Lucrari stiintifice (Romania) v. 9 p. 317-328.* 4 tables; 4 graphs; 7 ref. Romanian. (AGRIS 95-111033).

The experiments were carried out between 1987-1989 at the SCA Simnic on brown-reddish soil. The method of Latin square, with 20 variants in 5 repetitions was applied. The observations were done in metric frame, 0, 5 x 0, 5 m, and the attack of the pathogen Helminthosporium gramineum in each variant was determinated. The cultivars inculcated into production, Miraj and productive, proved to be sensible to the attack of this disease, the average attack degree being 12, 5 percent and respectively 10, 8 percent. A similar deportment showed the lines F 38-81 with the attack degree =11, 9 percent and F 115-83 with a.d.=9, 4 percent. A good deportment had the lines F 205-83 with a.d.=0, F 606-84 with a.d.=0, 8 percent and F 529-88 with a.d.=9, 4. the lines F 205-83, 74, 2 q/ha, F 74-82, 67, 0 q/ha and F 38-81 63, 5 q/ha were very productive.

4600 Paunescu, G.; Grigoriu, V.; Luca, E.; Oana, M. (Institutul de Cercetari pentru Cereale si Plante Tehnice Fundulea, Simnic (Romania). Statiunea de Cercetari Agricole Simnic Craiova) (1994) **[The relationship precocity - production of winter wheat varieties and lines, experimented at SCA Simnic in the period 1987-1991]. Relatia precocitate-productie la soiurile si liniile de grau de toamna experimentate la SCA Simnic in perioada 1987-1991.** *Lucrari stiintifice (Romania) v. 9 p. 21-33.* 1 table; 9 graphs; 4 ref. Romanian. (AGRIS 95-111431).

The complexity in the relationship between precocity and production has been assessed within the bounds of a lot of research carried out on world level. In the southern ecological zone, characterised by drought and intense heat, the early wheat varieties are preferred. The initiated study is aiming to show how much this character is correlated with the productivity in wheat varieties and lines of various provenance. The data came from 15 comparative competition crops experimented at SCA Simnic in the period 1987-1991. The influence of precocity upon the production was stated in 13 percent of cases, as well as the tendency in the lines created at ICCPT Fundulea towards the positive correlation tardivity-productivity, whereas the wheat lines created at Simnic show a positive correlation precocity-productivity.

4601 Paunescu, G.; Marinescu, M.; Oana, M.; Luca, E. (Institutul de Cercetari pentru Cereale si Plante Tehnice Fundulea, Simnic (Romania). Statiunea de Cercetari Agricole Simnic Craiova) (1994) **[Lines with high adaptability to drought conditions, assessed in an assortment of common wheat experimented in 1991-1992 at SCA Simnic]. Linii cu adaptabilitate ridicata la conditii de seceta, identificate intr-un asortiment de grau comun, experimentat in anii 1991-1992 la SCA Simnic-Craiova.** *Lucrari stiintifice (Romania) v. 9 p. 35-43.* 2 tables; 6 graphs; 6 ref. Romanian. (AGRIS 95-111012).

The drought occurred in 1992 at the SCA Simnic was considered to be an factor in the evaluation of stress resistance in a material derived from the collection of ICCPT Fundulea. The data obtained together with those of 1991, which was a particularly favourable year for cropping wheat, have been studied regarding statistical treatment and there were obtained variation coefficients regarding both the height and the mass of 1000 grains. Only 9 of 120 lines analyzed during 2 experimental years did obtain a variation coefficient <10 percent for two characters, therefore a rate of high reaction to drought conditions. The scarce variability of STW under various stress conditions was used as an index of appraisal of the adaptability. There were noticed 5 lines of reduced variability for STW and STW >40 g. From this point of view the Hungarian line GK Sagvari-RF Super was marked out, with STW=48 g. The results were obtained using an own working method, described in the paper.

4602 Penner, GA.; Clarke, J.; Bezte, LJ.; Leisle, D. (1995) **IDENTIFICATION OF RAPD MARKERS LINKED TO A GENE GOVERNING CADMIUM UPTAKE IN DURUM WHEAT.** *Genome. 38(3):543-547.* English. [AGR & AGRIFOOD CANADA WINNIPEG RES CTR 195 DAFOE RD WINNIPEG MB R3T 2M9 CANADA].

Temperature sweep gel electrophoresis in combination with random amplified polymorphic DNA analysis was employed to detect two markers for a single gene governing low cadmium uptake in western Canadian durum wheat (Triticum turgidum L, . var. durum). Analysis of progeny derived from a cross of the high cadmium accumulating cultivar Kyle by the low cadmium accumulating cultivar Nile resulted in linkage estimates of 4.6 (OPC-20) and 21.2 (UBC-180) cM. The closest marker (OPC-20) was shown to be useful for making low cadmium uptake selections from two other sources of low cadmium, 'Biodur' and 'Hercules'. The marker was further used to determine the genetic basis of resistance in 20 introduced durum wheat lines. Within this diverse range of germplasm the marker was correlated with cadmium contents as expected in all but two cases. Plant breeding selection for low cadmium genotypes is hindered by the high cost of chemical determination of cadmium content. Marker assisted selection for a low cadmium uptake gene offers an effective alternative. [References: 20].

4603 Petrovic, J.; Cermin, L. (Vysoka Skola Polnohospodarska, Nitra (Slovak Republic). Katedra Genetiky a Slachtenia); Brezinova Polakova, B. (1994) **[Genetic determination of quantitative characters in wheat]. Geneticka podmienenost kvantitativnych znakov psenice.** *Polnohospodarstvo (Slovak Republic) v. 40(8) p. 572-581.* 1 ill., 1 table; 14 ref. Slovak. (AGRIS 95-098591).

Using a graphic analysis of the complete diallel crossing of wheat during 2 years, the following wheat quantitative characters are evaluated: plant height, number of spikes per plant, grain weight per spike, a number of spikelets per spike, a number of grains per spike, a number of grains in spikelet, and the weight of 1000 grains. 4 genotypes (Slavia, Tiszataj, Maris Marksman and SO-78-4415) were used for crossing. An explicitely additive genetic system of polygenes was determined in grain weight per spike, number of spikelets per spike, number of grains per spike, number of grains per spikelet and weight of 1000 grains. Superdominance of the polygene influence was observed in plant height and 1000 grains weight. The number of grains per spike and the number of grains per spikelet indicated an incomplete dominance. Inactive polygenes prevailed in the Tiszataj and SO-78-4415 genotypes. Based on genetic determination of the evaluated quantitative characters of parents, their realization in the hybrid progeny can be expected.

4604 Petrovic, J.; Cermin, L. (Vysoka Skola Polnohospodarska, Nitra (Slovak Republic). Katedra Genetiky a Slachtenia Rastlin); Brezinova Polakova, B. (1994) **[The heterosis effect and phenotype correlations of the quantitative characters of wheat]. Heterozny efekt a fenotypove korelacie kvantitativnych znakov psenice.** *Polnohospodarstvo (Slovak Republic) v. 40(9) p. 660-671.* 7 ill.; 36 ref. Slovak. (AGRIS 95-098592).

The heterosis effect and phenotype correlations between the quantitative characters of wheat (plant height, number of spikes per plant, grain weight per spike, number of spikelets per spike, number of grains per spikelets, and the weight of 1 000 grains) were evaluated at the complete diallel crossing of 4 genotypes (Slavia, Tiszataj, Maris Marksman and SO-78-4415) under field conditions. A method of testing the mean values by the Student t-test compared to the Slavia variety has been used to evaluate the heterosis effect. The extent of this effect was influenced by parental genotypes, direction of crossing and the complex of soil and climatic factors. In both experimental years the heterosis effect was the highest in number of spikes per plant (31.16-43.14 % in comparison to the Slavia variety.) Tiszataj x Maris Marksman was found to be best hybrid combination as to grain weight per spike. In all genotypes, significant correlation coefficients have been determined between the grain weight per spike and the number of grains per spikelet, the number of spikelets per spike and number of grains per spike, and number of grains per spike and the number of grains per spikelet.

4605 Petrovic, S.; Momcilovic, V. (Poljoprivredni fakultet, Novi Sad (Yugoslavia)) (1994) **[Combining ability of nitrogen harvest index in wheat]. Analiza kombinacionih sposobnosti zetvenog indeksa azota psenice.** *Savremena poljoprivreda (Yugoslavia) v. 42(5) p. 89-92.* 4 tables; 8 ref. Serbian. (AGRIS 95-111013).

Combining ability of nitrogen harvest index in wheat is analyzed in this paper. Four wheat varieties, Jugoslavija, Zitnica, Osjecanka and NSR-2, were diallely crossed. The results indicate that the inheritance of nitrogen harvest index is under the control of additive and non-additive genes, as well.

4606 Pixley, K.; Jewell, D.C.; Waddington, S.R. (Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Harare (Zimbabwe). Regional Maize Program) (1994) **Research on maize for midaltitude regions.** *The subtropical, midaltitude, and highland maize subprogram. Bjarnason, M. (ed.) (Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). Maize Program) p. 45-62.* CIMMYT. 11 tables; 9 ref. English. (AGRIS 95-098516).

4607 Pogna, N.E.; Redaelli, R.; Biancardi, A.; Bianchi, A. (Istituto Sperimentale Cerealicoltura, Rome (Italy)); Peruffo, A.D.B. (Dipartimento Biotecnologie Agrarie, Padova (Italy)) (1992) **Genetic and biochemical aspects of technological quality in wheat.** Instituto Nacional de Investigacao Agraria, Elvas (Portugal). Estacao Nacional de Melhoramento de Plantas. *Melhoramento (Portugal) v. 33(2) p. 405-421.* issued 1994; 4 ill. table; 24 ref. English. (AGRIS 95-111422).

4608 Porter, DR.; Nguyen, HT.; Burke, JJ. (1995) **GENETIC CONTROL OF ACQUIRED HIGH TEMPERATURE TOLERANCE IN WINTER**

WHEAT. *Euphytica. 83(2):153-157.* English. [USDA ARS PLANT SCI & WATER CONSERVAT RES LAB 1301 N WESTERN STILLWATER, OK 74075 USA].

The development of high temperature-tolerant wheat (Triticum aestivum L.) germplasm is necessary to improve plant productivity under high-temperature stress environments. The quantification of high temperature tolerance and the characterization of its genetic control are necessary for germplasm enhancement efforts. This study was conducted to determine the genetic control of acquired high temperature tolerance in common bread wheat cultivars. Reduction of 2, 3, 5-triphenyltetrazolium chloride (TTC) by heat-stressed seedling leaves was used as a quantitative measure to characterize acquired high temperature tolerance. Eleven-day-old seedlings of 20 F-1 progeny produced through a complete 5 x 5 ('Payne', 'Siouxland', 'Sturdy', 'TAM W-101', and 'TAM 108') diallel mating design were acclimated at 37 degrees C for 24 hours, followed by a 2-hour incubation at 50 degrees C. Under these test conditions, acquired high temperature tolerance ranged from a high of 75.7% for the genotype TAM W-101 x TAM 108, to a low of 37.3% for the genotype Payne x Siouxland. Partitioning of genotypic variance revealed that only the general combining ability component effect was statistically highly significant, accounting for 67% of the total genotypic variation, These results suggest that enhancing the level of high temperature tolerance in wheat germplasm is feasible utilizing existing levels of genetic variability and exploiting additive genetic effects associated with high temperature tolerance. [References: 12].

4609 Robinson, J. (Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). Wheat Program) (1994) **Identification and characteristics of resistance to the Russian wheat aphid in small-grain cereals: Investigations at CIMMYT, 1990-92.** CIMMYT. 1 map; 20 tables; 3 graphs., 11 illus., 154 ref. 44 p. English. (AGRIS 95-098466).

The Russian wheat aphid (Diuraphis noxia) appears to have the ability to colonize environments quite different from its center of origin, and by the early 1990s this pest of small-grain cereals had spread to North America, Chile, Argentina, most Mediterranean countries, Ethiopia, Pakistan, Afghanistan, and Northeastern China. This report describes the effort to identify and characterize resistance to D. noxia, beginning with the implementation of a field-based screening method using artificial aphid infestation to identify resistant germplasm. Eventually both functional and genetic mechanisms of resistance were identified. Predators and parasitoids in one area of Mexico were studied to assess potential for biocontrol. Diversity in D. noxia at the molecular level was researched by generating DNA fingerprints from clones of the aphid from seven countries (Africa, West Asia, Europe, and North and South America). The report concludes with a discussion of directions for future research on methods of controlling D. noxia.

4610 Romano, M.C.S.; Antunes, M.P.S.; Barradas, M.C. (Instituto Nacional de Investigacao Agraria, Elvas (Portugal). Estacao Nacional de Melhoramento de Plantas) (1992) **[Potentialities of branched wheats]. Potencialidades dos trigos ramificados.** *Melhoramento (Portugal) v. 33(2) p. 483-506.* issued 1994; 2 ill. 2 graphs. 2 tables; 6 ref. Portuguese. (AGRIS 95-111002).

4611 Romano, M.C.S.; Antunes, M.P.S.; Barradas, M.C. (Estacao Nacional de Melhoramento de Plantas, Elvas (Portugal)) (1992) **[The relationship between seed grade and germinability in branched wheat and its genotypes]. Relacao entre o calibre da semente e o poder germinativo em trigo ramificado e nos seus genitores.** [International Synposium on Plant Breeding]; Elvas (Portugal); 27-29 May 1992. *Melhoramento (Portugal) v. 33(1) p. 143-152.* issued 1994; 3 ill. graph. 2 tables; 10 ref. Portuguese. (AGRIS 95-111009).

4612 Sato, K.; Takeda, K. (1993) **Genetic analysis of large trichome on barley leaf blade.** *Barley genetics newsletter (USA) v. 22 p. 50-52.* references. English. (AGRIS 95-111069).

4613 Saulescu, N.N.; Ittu, G.; Mustatea, P. (Institutul de Cercetari pentru Cereale si Plante Tehnice, Fundulea (Romania)) (1994) **[Relationship between plant height, coleoptile length, GA [gibberellic acid] sensitivity and yield in progenies of a cross between semidwarf wheat with contrasting coleoptile length]. Relatia dintre talia plantelor, lungimea coleoptilului, sensibilitatea la acid giberelic si productie la descendentele unei incrucisari intre genotipuri de grau semipitice cu lungime diferita a coleoptilului.** *Cercetari de genetica vegetala si animala (Romania) v. 3 p. 9-17.* 4 graphs; 11 ref. Romanian. (AGRIS 95-111010).

Random F5 - F6 lines from a cross of Sincron, a semidwarf Rht 8 carrier, GA sensitive with long coleoptile and a semidwarf Rht 1, Ga insensitive line with short coleoptile, were characterized for plant heigth, coleoptile length, GA sensitivity and yield. All GAI progenies were semidwarf and had short coleoptile, while GA sensitive progenies were semidwarf or tall and had coleoptiles varying between medium long and long. GAI semidwarf progenies overyielded semidwarf GA sensitive progenies on an average of 4 - 6 percent, both in an environment which favoured tall vs. semidwarf lines and in an environment where semidwarfs yielded more than tall progenies. However there was much variation in each group resulting in overlapping between groups suggesting that competitive Rht 8 semidwarfs with long coleoptile might be selected. The linear relationship between plant height and spike lenght was much stronger, the slope higher and the intercept lower for GA sensitive than for GAI progenies resulting in smaller spikes for Rht 8 semidwarfs.

4614 Sayanova, O.; Pomortsev, A.; Ladogina, M.; Kadyrzhanova, D.; Ananiev, E.V. (1993) **Analysis of C-hordein deficient mutants of barley.** *Barley genetics newsletter (USA) v. 22 p. 53-56.* references. English. (AGRIS 95-111070).

4615 Schledzewski, K.; Mendel, R.R. (Botanical Institute, Technical University of Braunschweig, Humboldtstr. 1, 38106 Braunschweig (Germany)) (1994) **Quantitative transient gene expression: comparison of the promoters for maize polyubiquitin 1, rice actin 1, maize-derived Emu and CaMV 35S in cells of barley, maize and tobacco.** *Transgenic Research (United Kingdom) v. 3(4) p. 249-255.* 20 ref. English. (AGRIS 95-098505).

4616 Schondelmaier, J.; Fischbeck, G.; Jahoor, A. (1993) **Linkage studies between morphological and RFLP markers in the barley genome.** *Barley genetics newsletter (USA) v. 22 p. 57-62.* references. English. (AGRIS 95-111071).

4617 Schreiber, H. (1993) **High non-reciprocal recombination in a barley cross.** *Barley genetics newsletter (USA) v. 22 p. 63-64.* references. English. (AGRIS 95-111072).

4618 Segit, Z.; Szwed Urbas, K. (Akademia Rolnicza, Lublin (Poland). Inst. Genetyki i Hodowli Roslin) (1993) **[Variability and correlation of major utility properties of intervarietal hybrids of durum wheat]. Zmiennosc i wspolzaleznosc wazniejszych cech uzytkowych mieszancow wewnatrzgatunkowych pszenicy twardej.** 3. Symposium: Quantitative Genetics of Crops; Kudowa-Zdroj (Poland); 24-25 May 1993. *Zeszyty Naukowe Akademii Rolniczej we Wroclawiu. Rolnictwo (Poland) (no.223) p. 291-299.* 4 tables; 7 ref. Polish. (AGRIS 95-098593).

The object of the study were 2 hybrid combinations of Triticum durum. The length of the main shoot and the features of the ear were determinated. Considerable differences were noted between the hybrids. In the combination of Signadur x K-5/827 no significant relation was found between the plant height and such important elements as the number and weight of grains per ear and the weight of 1000 grains, while in the combination of Primadur x K-5/827 the correlations between the properties mentioned were positive. The coefficients of heritability calculated, and the projected value of breeding progress for properties of high agricultural significance were relatively high, with more favourable results obtained the combination of Primadur x K-5/827.

4619 Shakir, H.S.; Waines, J.G. (1993) **Drought resistance in bread wheat, rye, barley, and dasypyrum.** *Barley genetics newsletter (USA) v. 22 p. 65.* references. English. (AGRIS 95-111073).

4620 Sheppard, J.A. (Queensland Dept. of Primary Industries, Toowoomba (Australia). Div. of Crop Sciences) (1994) **Queensland wheat variety trials 1993: Queensland Wheat Research Institute, Toowoomba.** *Project Report Series - Queensland Department of Primary Industries (Australia); no. QO94018*

89 p. Department of Primary Industries. 1 map, 61 tables. English. (AGRIS 95-098452).

Wheat cultivar trials were carried out by Queensland Department of Primary Industries during 1993 winter growing season. Commercial and potential wheat, durum, triticale and barley cultivars were evaluated in the quick, intermediate, midseason and long maturing wheat series and feed grain series. Due to the low number of trials in general, and the lack of testing of certain trial series in some regions, the year was very poor with regards to predictability.

4621 Singh, K.P.; Singh, I. (1992) **The influence of photothermal environmental factors on the combining ability of wheat genotypes [in Bangladesh].** *Bangladesh Journal of Agricultural Research (Bangladesh) v. 17(2) p. 109-114.* 3 tables, 9 ref. English. (AGRIS 95-111373).

The impact of photothermal environmental factors on genetic variability and gene effects of 11 lines, 4 testers and their 44 hybrids was studied for eight quantitative traits under two natural photothermal environments created through alteration of date of sowing. The magnitude of variances and percent contribution of lines, testers and hybrids, and estimates of general combining ability (gca) effects were higher in October sowing compared to November sowing for days to heading, no. of tillers and spikelets/spike. For other traits viz. plant height, grains/spike, grain weight and spike productivity, the magnitudes of gca effect differed in two environments for different genotypes. The direction of gca effects also changed from positive to negative and vice-versa in different environments. The gca effects of K 68 for days to heading, of C 306 M 10 for grains/spike, 500-grain weight and spike productivity and of WH 147M for grains/spike were positive in October sowing and negative in November sowing. The change in the magnitude and direction of specific combining ability (sca) effects under two environments was noticed for days to heading, plant height, no. of tillers, grains/spike and grain weight in 2, 4, 10, 10 and 8 hybrids.

4622 Srinivasan, G. (Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). Maize Program) (1994) **International testing and the adoption of subtropical, midaltitude, and highland germplasm.** *The subtropical, midaltitude, and highland maize subprogram. Bjarnason, M. (ed.) (Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). Maize Program) p. 87-95.* CIMMYT. 5 graphs., 4 ref. English. (AGRIS 95-098519).

4623 Starczewski, J.; Bombik, A.; Klys, D.; Tretowski, J. (Wyzsza Szkola Rolniczo Pedagogiczna, Siedlce (Poland)) (1993) **[Variance component application for assessment of winter triticale variety reaction to nitrogen fertilization and retardants]. Zastosowanie komponentow wariancyjnych do oceny odmian pszenzyta ozimego na nawozenie azotowe i retardanty.** 3. Symposium: Quantitative Genetics of Crops; Kudowa-Zdroj (Poland); 24-25 May 1993. *Zeszyty Naukowe Akademii Rolniczej we Wroclawiu. Rolnictwo (Poland) (no.223) p. 175-181.* 1 fig., 2 tables; 8 ref. Polish. (AGRIS 95-098546).

The attempt of 3 winter triticale variety reaction (Grado, Presto and Ugo) to nitrogen fertilization and retardants was made by variance components using which were generally used at quantity genetics so far. It was found that variability of most tested characteristics is mainly genetically determined. Influence of cultivation treatment and retardants is smaller. Usefulness of the variance component analysis was confirmed.

4624 Starczewski, J.; Bombik, A.; Korsak, M.; Tretowski, J. (Wyzsza Szkola Rolniczo Pedagogiczna, Siedlce (Poland)) (1993) **[Modification of some quantity characteristics of spring triticale varieties which are caused by cultivation treatments]. Modyfikacyjny wplyw sposobow uprawy na zmiennosc cech ilosciowych wybranych odmian pszenzyta jarego.** 3. Symposium: Quantitative Genetics of Crops; Kudowa-Zdroj (Poland); 24-25 May 1993. *Zeszyty Naukowe Akademii Rolniczej we Wroclawiu. Rolnictwo (Poland) (no.223) p. 165-173.* 2 fig., 3 tables; 6 ref. Polish. (AGRIS 95-098545).

2 field experiments were performed using 2 spring triticale varieties (Jago, Mayo) in order to test cultivation treatment random model the variability structures of these characteristics were evaluated. It was found that quantity characteristic variabilities of those varieties was slightly genetically determinated (0-12.1 percent of total variability) and variety variance component was modified by cultivation.

4625 Strid, B.J. (1993) **Coordinator's report: anthocyanin genes.** *Barley genetics newsletter (USA) v. 22 p. 136-137.* references. English. (AGRIS 95-111084).

4626 Suh, H.S.; Hyun, J.N.; Kweon, S.J.; Kim, B.J.; Kim, J.T.; Park, H.S.; Suh, D.Y. (Rural Development Administration, Milyang (Korea Republic). National Yeongnam Agricultural Experiment Station); Cho, E.K. (Rural Development Administration, Suwon (Korea Republic). Research Management Bureau) (1995) **A new good quality, lodging resistant and high yielding malting barley variety "Samdobori".** *RDA Journal of Agricultural Science (Korea Republic) v. 37(1) p. 117-121.* 2 illus.; 9 tables; 14 ref. Korean. (AGRIS 95-111053).

4627 Suoniemi, A.; Arna, T.; Schulman, A.H. (1993) **Isolation and analysis of BARE-1, a barley retrotransposon.** *Barley genetics newsletter (USA) v. 23 p. 5-7.* references. English. (AGRIS 95-111088).

4628 Swanston, J.S. (1993) **The milling energy of inbred lines carrying the amo1 (high amylose) gene.** *Barley genetics newsletter (USA) v. 22 p. 66-67.* references. English. (AGRIS 95-111074).

4629 Szunics, L.; Szunics, L. (1995) **FIELD RESISTANCE OF WHEAT VARIETIES TO LEAF RUST.** *Novenytermeles. 44(2):109-120.* Hungarian. [HUNGARIAN ACAD SCI AGR RES INST BRUNSZVIK U 2 H-2462 MARTONVASAR HUNGARY].

Information is given on the 1994 leaf rust (Puccinia recondita Rob. ex. Desm. f. sp. tritici) epidemic in Hungary. The field resistance of various wheat varieties and of genotypes with known and unknown resistance genes was evaluated after artificial infection on the basis of scoring (0 = resistant, 9 = very susceptible), the area under the disease progress curve (AUDPC), the degree (%) and type (VR --> VS) of infection, and the average coefficient of infection (ACI) between 1991 and 1994. Out of the 25 varieties studed, six (24, 0%), namely Martonvasari 22, Fatima 2, Martonvasari 17, Martonvasari 19, Korona and GK Bakros, provide practically complete protection against this pathogen, while 4 (16, 0%) are only infected to a slight extent (Martonvasari 16, GK Kincso, GK Barna, Martonvasari 18). Provided there is no significant change in the race composition of the pathogen population, these cultivars can be successfully grown without chemical plant protection. This confirms that a wise choice of variety is the biological basis of environmental protection, plant protection and low-cost cultivation techniques. The pathogen was found to be avirulent to varieties bearing the resistance genes Lr 9, Lr 19, Lr 23, Lr 24, Lr 25, Lr 27, Lr 34 and Lr 37. Many cultivated varieties also contain resistance genes Lr 3 and Lr 26, but these have ceased to give protection against the local leaf rust population. In resistance breeding programmes, use can be made not only of varieties with effective known resistance genes, but also of resistant genotypes in which the resistance genes have not yet been identified (e. g. GT 251, GT 1518, Fr 815, Fr 848, Baranijka, Mv 17, Mv 22, Fatima 2, GK Zugoly, Fundulea 4, Fundulea 113, CH 62445, So 5255, Lut. 1595, Er. 5921, GA 841465, NSA 0964).

4630 Szwed Urbas, K.; Segit, Z. (Akademia Rolnicza, Lublin (Poland). Inst. Genetyki i Hodowli Roslin) (1993) **[Heritability of the major utility features of durum wheat (Triticum durum Desf.)]. Odziedziczalnosc wazniejszych cech uzytkowych pszenicy twardej (Triticum durum Desf.).** 3. Symposium: Quantitative Genetics of Crops; Kudowa-Zdroj (Poland); 24-25 May 1993. *Zeszyty Naukowe Akademii Rolniczej we Wroclawiu. Rolnictwo (Poland) (no.223) p. 301-307.* 3 tables; 6 ref. Polish. (AGRIS 95-098594).

The study was concerned with foreign variety lines of T. durum (Grandur, Primadur and Signadur) and their hybrids with a Polish line K-5/770. Generation F2 of the hybrids was sown in 10 x 20 cm grid. For each of the hybrid combinations the mean coefficients of phenotypal correlation, coefficients of variability, heritability in the broad sense, and the genetic progress were calculated. The values of the genetic progress were various for the different hybrids, relatively high values being obtained for such important elements as the plant height, number and weight of grains per ear, and TGW.

4631 Therrien, M.C. (1993) **Coordinator's report: the genetic male sterile barley collection.** *Barley genetics newsletter (USA) v. 23 p. 175.* English. (AGRIS 95-111117).

4632 Tinker, N.A.; Mather, D.E. (1993) **Main effects of quantitative trait loci in Harrington/TR306 two-row barley.** *Barley genetics newsletter (USA) v. 23 p. 72-78.* references. English. (AGRIS 95-111103).

4633 Tonet, GL.; Dasilva, RFP. (1995) **RESISTANCE OF WHEAT GENOTYPES TO THE GREENBUG SCHIZAPHIS GRAMINUM (RONDANI, 1852) (HOM, APHIDIDAE).** *Pesquisa Agropecuaria Brasileira. 30(3):299-306.* Spanish. [EMBRAPA CNPT CAIXA POSTAL 569 BR-99001970 PASSO FUNDO RS BRAZIL].

The reaction of wheat (Triticum aestivum L.) genotypes to the damages caused by Schizaphis graminum (Rondani, 1852) (Hom., Aphididae), when naturally infested in the field, was studied in 1988 and 1989. Trials were set up at the experimental area of EMBRAPA-CPAO, in Dourados, Mate Grosso do Sul, Brazil, using 14 lines and 25 cultivars of wheat. A randomized block design in factorial, with four replications, was used, being the plots with and without greenbugs and the wheat genotypes the subplots. Assessments were made by recording the damage level, number of spikes per meter, and grain yield. The line PF 86414 showed no reductions in grain yield evidencing its resistance to S. graminum. Sulino, PAT 7219, Ocepar 8. El Pato, Iapar 1, BR 18, and BR 1 were the most suscetible cultivars to the greenbug.

4634 Tyunin, V.A.; Vrazhnova, R.A. (1994) **[Ethiology of enzymatic-mycosous grain depletion in soft spring wheat from the standpoint of breeding]. Selektsionnyj aspekt ehtiologii ehnzimomikoznogo istoshcheniya zerna yarovoj myagkoj pshenitsy.** *Sel'skokhozyajstvennaya biologiya. Seriya Biologiya rastenij (Russian Federation) (no.3) p. 48-51.* 10 ref. Russian. (AGRIS 95-111433).

The relationship between the varietal resistance of the soft spring wheat to the enzymatic-mycosous grain depletion and the basic agronomic grain properties has been studied. The experiments showed that the wheat susceptibility to the depletion and the adequate disease harmfulness were related to the qualitative grain properties, the grain size especially, these correlations displaying the known contradiction between the disease-dependent yielding capacity of varieties and the technological properties of the grain. Problems of selection by the verietal resistance to the depletion have been shown to be connected to a more important problem to overcome the negative correlating wheat yielding capacity and the grain quality.

4635 Untila, I.P.; Postolachi, A.A.; Gaina, L.V.; Covalski, I.; Litovcenco, I.; Chisca, M.; Stavar, L. (1994) **[Results and future aspects of breeding of cereals in Republic of Moldova]. Unele totaluri si perspective ale ameliorarii cerealelor spicoase in Republic of Moldova.** 50 years of activities in ICCC; Beltsy (Republic of Moldova); 14-17 Jun 1995. *[Results and future aspects of scientific research at 50 years of activities 1944-1994. Anniversary volume]. Boincean, B.P. (ed.). Institutul de Cercetari pentru Culturile de Cimp, Beltsy (Republic of Moldova) p. 9-19.* Romanian. (AGRIS 95-111129).

4636 Varughese, G. (1992) **Wheat germplasm exchange: its impact and its future.** [International Symposium on Plant Breeding]; Elvas (Portugal); 27-29 May 1992. Instituto Nacional de Investigacao Agraria, Elvas (Portugal). Estacao Nacional de Melhoramento de Plantas. *Melhoramento (Portugal) v. 33(1) p. 61-72.* issued 1994; 5 graphs. 4 tables; 6 ref. English. (AGRIS 95-111006).

4637 Verzea, M. (Institutul de Cercetari pentru Cereale si Plante Tehnice, Fundulea (Romania)); Palada Nicolau, M. (Institutul de Cercetari si Amenajari Silvice, Bucuresti (Romania)) (1994) **[The response of triticale species to in vitro manipulation]. Pretabilitatea speciei triticale la manipularea in vitro.** *Cercetari de genetica vegetala si animala (Romania) v. 3 p.* 62-64. 4 tables; 22 ref. Romanian. (AGRIS 95-110961).

Results were presented obtained in the field of in vitro embryogenesis and androgenesis in different forms and hybrid combinations of triticale. The embryogenetic ability in four 6x, four 8x primary triticale forms and eight triticale 8x/triticale 6x hybrid combinations was tested. Plants from 13 genotypes were regenerated. Anthers from 14 hybrid populations were cultured. 12 hybrid combinations reacted by formation of pollen calli and proembryos, 187 haploid plants (49 green and 138 albino) from 7 hybrids were regenerated. It has been shown in the present study that under in vitro culture conditions, it is possible, via somatic embryogenesis, to increase the number of primary triticale plants derived from the cross of Triticum x Secale, and that the androgenesis could be of practical value in triticale breeding programmes.

4638 Verzea, M.; Moraru, I.; Raducanu, F. (Institutul de Cercetari pentru Cereale si Plante Tehnice, Fundulea (Romania)); Badea, E.M.; Lupusanschi, I.; Coman, I. (Institutul de Biologie, Bucuresti (Romania)) (1994) **[The effect of parental genotypes on androgenetic capacity in F1 hybrids of 6x Triticale]. Efectul genotipurilor parentale asupra capacitatii androgenetice la hibrizii F1 de Triticale 6x.** *Cercetari de genetica vegetala si animala (Romania) v. 3 p. 55-61.* 6 tables; 18 ref. Romanian. (AGRIS 95-110960).

Studies were made of the effect of parental genotypes on androgenetic capacity in F1 hybrids of hexaploid triticale. This involved the analysis of a complete 6 x 6 diallel cross. Anthers containing largely miduninucleate to late uninucleate microspores were cultured on N6 medium and calli were induced to regenerate plants. The differences between hybrids and parental lines were significant for anthers response, embryo production rate, plant regeneration rate and androgenetic plant yield. The per se performance of the parental genotypes is not reflected in a similar performance in the F1 hybrids. The selection of parental lines for crossing programme will be made by analysis of the general combining ability. Since reciprocal crosses give different results, cytoplasmatic effects on anther culture response seem to be involved.

4639 Vivar, H.E.; Delgado, F.; Rodriguez, M.T.; Del Toro, E.; Magana, R.I. (Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). Wheat Program) (1994) **[Results of the eighteenth international barley observation nursery (IBON)]. Resultados del 18avo vivero internacional de observacion de cebada (IBON).** ICARDA/CIMMYT Results of the Barley Nurseries (CIMMYT); ICARDA/CIMMYT Resultados de los Viveros de Cebada (CIMMYT) p. 45-72. CIMMYT. 11 tables. p. 45-72. (En, Es). (AGRIS 95-098489).

The eighteenth international barley observation nursery (IBON) was sent in September 1990 to be grown by cooperators in their spring season of 1991. Ninety-two nurseries went to cooperators in 49 countries. The 136 advanced lines and checks in the nursery had been chosen from among the best materials. All had been grown and observed by scientists in a high yield environment under pressure from major diseases at the CIANO Experiment Station in northwest Mexico. There, seed for this international nursery was multiplied, cleaned, and treated with fungicides before shipment. Thirty-eight of the cooperators receiving the nursery returned field books with performance data from their locations in time to be included in this report. The choice of variables measured and the data returned rest with the individual cooperator. We have included in this summary selected variables reported to us. The number of observations differs from variable to variable. The reader is urged to note the number of observations at the head of each variable column in the summary table; this may be an important indicator of the level of credibility at should be inferred. The reader should also bear in mind that the yield reported is from a single plot essentially grown for observation rather than as a rigorous, replicated yield trial.

4640 Vivar, H.E.; Rodriguez, M.T.; Del Toro, E.; Magana, R.I. (Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). Wheat Program) (1994) **[Results of the thirteenth international barley yield trial (IBYT)]. Resultados del 13avo ensayo internacional de rendimiento de cebada (IBYT).** ICARDA/CIMMYT Results of the Barley Nurseries (CIMMYT); ICARDA/CIMMYT Resultados de los Viveros de Cebada (CIMMYT) p. 1-44. CIMMYT. 38 tables. p. 1-44. (En, Es). (AGRIS 95-098488).

The thirteenth international barley yield trial (IBYT) was distributed in 1990 to be grown by cooperators in their spring season of 1991. 95 nurseries went to cooperators in 41 countries. The advanced lines and varieties included in the nursery had been chosen from among the best materials and nominations from plant breeders in different parts of the world. All had

been grown and observed in a high yielding environment in northwester Mexico with pressure from major diseases. The selected lines thus comprised a collection of the world's best lines or varieties that cooperators could compare under the specific conditions of their own sites. Seed for this international nursery was multiplied in plots on the CIANO Experiment Station; the seed was cleaned and treated with fungicides before shipment. 38 cooperators receiving the nursery returned field books reporting performance at their locations in time to be included in this report. In receiving and processing the data, we assume that instructions were carried out and that accurate results were reported. We cannot, however, attest to the rigor with which the trials were grown and results obtained. The choice of variables measured and the data returned rests with the individual cooperator. We have included in this summary selected variables reported to us. Some are presented for which a limited number of observations were made. The user of these tables should be aware of the importance of the number of locations and the number of observations in interpreting data on a given variable; the table for results specify the guidance of the reader.

4641 Warner, RL.; Kudrna, DA.; Kleinhofs, A. (1995) **ASSOCIATION OF THE NAD(P)H-BISPECIFIC NITRATE REDUCTASE STRUCTURAL GENE WITH THE NAR7 LOCUS IN BARLEY.** *Genome. 38(4):743-746.* English. [WASHINGTON STATE UNIV DEPT CROP & SOIL SCI PULLMAN, WA 99164 USA].

The NADH-specific and NAD(P)H-bispecific nitrate reductase genes from barley have been cloned and sequenced. To determine if the Nar7 locus encodes the NAD(P)H-bispecific nitrate reductase structural gene, a cross was made between a wild-type cultivar, Morex (Nar7 Nar7), and Az70 (nar7w nar7w), a mutant from the cultivar Steptoe that is deficient in NAD(P)H-bispecific nitrate reductase activity. A probe specific to the NAD(P)H-bispecific nitrate reductase structural gene detected restriction fragment length polymorphism between the parents. This probe was used to classify selected F-2 progeny for restriction fragment length genotype. All the NAD(P)H nitrate reductase deficient F-2 progeny (24/101) possessed the Az70 restriction fragment genotype. The absence of recombination between the NAD(P)H-bispecific nitrate reductase deficient genotype and the NAD(P)H-bispecific nitrate reductase restriction fragment length genotype indicates that the two traits are closely associated in inheritance and that Nar7 is probably the NAD(P)H-bispecific nitrate reductase structural gene. [References: 19].

4642 Wegrzyn, S.; Pochaba, L. (Instytut Hodowli i Aklimacji Roslin, Krakow (Poland)) (1993) **[Estimation of combining ability of parental forms on the basis of grain yield in winter wheat strains]. Ocena zdolnosci kombinacyjnej form rodzicielskich na podstawie plonowanie rodow hodowlanych pszenicy jarej.** 3. Symposium: Quantitative Genetics of Crops; Kudowa-Zdroj (Poland); 24-25 May 1993. *Zeszyty Naukowe Akademii Rolniczej we Wroclawiu. Rolnictwo (Poland) (no.223) p. 249-254.* 3 tables; 9 ref. Polish. (AGRIS 95-098573).

Genetic analysis were carried out on grain yield for 1077 strains of the F6 generation obtained from crosses of ten testers with twenty cultivars of winter wheat. The mean square for testers and cultivars within testers was highly significant for grain yield. For every tester, cultivar and combination of crossing were determined mean value of yield, its effect and variability coefficient. On the basis of the results, group of cultivars improving component were identificated. Some combinations of crosses with significant specific combining ability for yield were selected.

4643 Wettstein, D. von (1993) **Coordinator's report: nuclear genes affecting the chloroplast.** *Barley genetics newsletter (USA) v. 23 p. 182.* English. (AGRIS 95-111121).

4644 Wood, EA.; Sebesta, EE.; Webster, JA.; Porter, DR. (1995) **RESISTANCE TO WHEAT CURL MITE (ACARI, ERIOPHYIDAE) IN GREENBUG-RESISTANT GAUCHO TRITICALE AND GAUCHO X WHEAT CROSSES.** *Journal of Economic Entomology. 88(4):1032-1036.* English. [USDA ARS PLANT SCI & WATER CONSERVAT LAB 1301 N WESTERN STILLWATER, OK 74075 USA].

Greenbug-resistant 'Insave F.A.' rye, 'Gaucho' triticale, and crosses of Gaucho x wheat, Sel. 74G80-2 and Sel. 74G559-6, were compared with wheat cultivars for their reaction to the wheat curl mite, Eriophyes tulipae Keifer, the vector of wheat streak mosaic virus. It was previously observed that rye generally is more resistant to the mite than wheat. In our study, Gaucho, which is the product of an Insave F.A. rye x 'Chinese Spring' wheat cross, and wheat lines derived from Gaucho x wheat crosses, showed a high degree of resistance to the mite, whereas the susceptible entries exhibited severe mite damage symptoms including leaf curling and trapping and large numbers of mites. The wheat streak mosaic virus was transmitted to all test entries by heavy initial infestations of viruliferous mites. Light infestations of 5 mites per plant did not result in disease symptoms, except in mite-susceptible entries. The results also indicate that the source of wheat curl mite resistance in 'TAM 107' wheat, widely planted in wheat streak virus-prone areas of the Great Plains, traces back to Gaucho triticale. [References: 17].

4645 Wos, H. (Zaklad Doswiadczalny Hodowli i Aklimatyzacji Roslin, Malyszyn (Poland)); Mackowiak, W.; Rutkowski, R. (1993) **[Simultaneous estimation of breeding strains of winter triticale in relation to stability and high yield]. Jednoczesna ocena rodow hodowlanych pszenzyta ozimego pod wzgledem stabilnosci i wysokosci plonowania.** 3. Symposium: Quantitative Genetics of Crops; Kudowa-Zdroj (Poland); 24-25 May 1993. *Zeszyty Naukowe Akademii Rolniczej we Wroclawiu. Rolnictwo (Poland) (no.223) p. 183-191.* 1 fig., 3 tables; 8 ref. Polish. (AGRIS 95-098547).

A set of winter triticale data (yield results from 16 trials of 25-30 strains each) was used to exemplify that high yielding strains were unstable in yielding and on the contrary low yielding strain were stable. However, there were deviations from the rule in both groups of strains. Nonparametric statistic S sub (i) 3 Huhn's was recognized as useful parameter of stability of performance but this statistic, just as S sub (i) 6, was not helpful for simultaneously selecting for yield and yield stability. On the base of S sub (i) 3, a H index was constructed which allowed for concurrently ranking for both stability and yielding. Certain influence of earliness of plant growth (heading) on better yield stability under drought conditions was observed.

4646 Xu, SJ.; Joppa, LR. (1995) **MECHANISMS AND INHERITANCE OF FIRST DIVISION RESTITUTION IN HYBRIDS OF WHEAT, RYE, AND AEGILOPS SQUARROSA.** *Genome. 38(3):607-615.* English. [UNIV ILLINOIS DEPT AGRON URBANA, IL 61801 USA].

First division restitution (FDR) in intergeneric Triticeae hybrids provides an important meiotic mechanism for the production of amphidiploids without the use of colchicine and similar chemicals. The genetic controls of FDR were investigated by examining microsporogenesis and fertility in F-1 hybrids of two- and three-way crosses of durum wheat (Triticum turgidum L val. durum) cultivars Langdon (LDN) and Golden Ball (GB), 'Gazelle' rye (Secale cereale L.), and one accession (RL5286) of Aegilops squarrosa L. The results from two-way crosses indicated that the first meiotic division varied, depending on the hybrid. GB crossed with Ae. squarrosa developed tripolar spindles and prevented congregation of chromosomes at the equatorial plate. The hybrid of GB with rye had a delayed first division. But, the hybrids of LDN with both Ae. squarrosa and rye had a high frequency of FDR. Analysis from the three-way crosses indicated that inheritance in rye crosses differed from those with Ae. squarrosa. FDR segregated in a 1:1 ratio in the rye cross, suggesting that the FDR is controlled by a single gene from LDN. However, FDR fit a 1:3 ratio in the three-way crosses with Ae. squarrosa. Cytological data suggested thar tripolar spindles are a major factor preventing FDR in Ae. squarrosa crosses. Some progenies from the three-way cross with rye had a high frequency of monads that resulted from second division failure of FDR cells. [References: 18].

4647 Xue, AG.; Burnett, PA.; Helm, J.; Rossnagel, BG. (1995) **VARIATION IN SEEDLING AND ADULT-PLANT RESISTANCE TO RHYNCHOSPORIUM SECALIS IN BARLEY.** *Canadian Journal of Plant Pathology-Revue Canadienne de Phytopathologie. 17(1):46-48.* English. [AGR & AGRIFOOD CANADA RES CTR UNIT 100-101 ROUTE 100 MORDEN MB R6M 1Y5 CANADA].

Sixty-six barley cultivars and advanced lines from western Canada were evaluated for resistance to scald caused by Rhynchosporium secalis in both greenhouse-grown seedlings and field-grown adult plants. Eleven of these genotypes had different reactions in the seedling and in the adult plant as

measured by percentage leaf area with symptoms (LAS). Of the 66 genotypes, 29 were resistant (LAS < 10) and 3 were moderately resistant (LAS greater than or equal to 10 but < 30) in both seedling and adult plant stages; and 8 were susceptible (LAS greater than or equal to 30) as seedlings but resistant or moderately resistant as adult-plants. The rational use of seedling and adult-plant screening for scald resistance and the desirable types of resistance for breeding programs are discussed.

4648 Yamae, G.; Konishi, T. (1993) **Distorted segregation of the lys3a mutant in barley kernels.** *Barley genetics newsletter (USA) v. 22 p. 68-70.* references. English. (AGRIS 95-111075).

4649 Yoshimi, R.; Konishi, T. (1993) **Linkage analysis of Pgd1 for phosphogluconate dehydrogenase in barley.** *Barley genetics newsletter (USA) v. 22 p. 70-72.* references. English. (AGRIS 95-111076).

4650 Yun, S.G. (Anseong National University, Anseong (Korea Republic)); Cho, C.W. (Dankook University, Cheonan (Korea Republic). College of Agriculture) (1995) **Segregation and heritability of ear/shoot dry weight ratio in f2 population of barley.** *Korean Journal of Breeding (Korea Republic) v. 27(1) p. 55-59.* 1 illus.; 4 tables; 12 ref. Korean. (AGRIS 95-111052).

4651 Zeuli, PLS.; Sergio, L.; Perrino, P. (1995) **CHANGES IN THE GENETIC STRUCTURE OF WHEAT GERMPLASM ACCESSIONS DURING SEED REJUVENATION.** *Plant Breeding-Zeitschrift fur Pflanzenzuchtung. 114(3):193-198.* English. [UNIV BASILICATA DIPARTIMENTO BIOL DIFESA & BIOTECNOL AGROFORESTAL VIA N SAURO 85 I-85100 POTENZA ITALY].

Changes in the genetic structure of wheat accessions caused by interspecific competition during periodic seed rejuvenation at a gene-bank were studied. Electrophoretic patterns (Acid-PAGE) of gliadin storage proteins were used to discriminate bread from durum wheat and to identify bread-wheat genotypes. Bread wheat shows high selective advantage over durum wheat and its frequency increased up to 100% after seven rejuvenation cycles. The number of bread-wheat genotypes identified in each entry varied from five to 13, but only a few prevailed and these were different in each accession. In most cases, bread wheal was already present in the field sample collected, but at low frequency. In one case, 'seed flow' was thought to have occurred at a very low rate among neighbouring plots. The implication of these findings for genetic resources conservation are: 1. Mixtures of wheat species within the same germplasm accession must be avoided; 2. Only in some cases are low planting densities effective in reducing competition; and 3. The genetic structure of accessions in the gene banks must be monitored. [References: 25].

4652 Zhang, J.; Tiwari, VK.; Golds, TJ.; Blackhall, NW.; Cocking, EC.; Mulligan, BJ.; Power, JB.; Davey, MR. (1995) **PARAMETERS INFLUENCING TRANSIENT AND STABLE TRANSFORMATION OF BARLEY (HORDEUM VULGARE L) PROTOPLASTS.** *Plant Cell Tissue & Organ Culture. 41(2):125-138.* English. [UNIV NOTTINGHAM DEPT LIFE SCI PLANT GENET MANIPULAT GRP UNIV PK NOTTINGHAM NG7 2RD ENGLAND].

Cat gene expression has been investigated following PEG-mediated plasmid uptake into barley protoplasts. The uptake conditions optimised for transient expression were employed for stable transformation. Transformed protoplast-derived calli of the cvs. Dissa and Igri, were selected on medium containing G418 at 40 mu g ml(-1) or kanamycin sulphate at 250 mu g ml(-1). Absolute transformation frequencies of 28.9 x 10(-5) and 21.3 x 10(-5) were recorded for Dissa with kanamycin sulphate and G418 selection, respectively. The frequency for Igri was 11.5 x 10(-5) with G418 selection. Antibiotic resistant protoplast-derived colonies expressed NPTII activity; Southern hybridisation confirmed integration of the *nptII* gene into barley genomic DNA. [References: 67].

F40 PLANT ECOLOGY

4653 El Refaie, M.M.A. (Ministry of Agriculture, Cairo (Egypt). Soils and Water Research Inst.); Hamada, A.A. (1994) **Effect of drought conditions on some wheat varieties.** *Menofiya Journal of Agricultural Research (Egypt) v. 19(6 part 2) p. 3359-3373.* 4 tables; 17 ref. English. (AGRIS 95-112233).

4654 Jaskulski, D.; Rudnicki, F. (Akademia Techniczno Rolnicza, Bydgoszcz (Poland). Katedra Ogolnej Uprawy Roli i Roslin) (1994) **[Mutual effects between species of cereals in the course of germination]. Wzajemne oddzialywania miedzy gatunkami zboz podczas kielkowania.** *Fragmenta Agronomica (Poland) v. 11(1) p. 89-94.* 1 fig., 1 table; 14 ref. Polish. (AGRIS 95-098835).

In the experiment the restraining effect of rye, triticale, wheat and barley germinating grains on germination and weight of sprouts of oats was stated. Rye and triticale inhibited growth of wheat and barley sprouts also. The growth of rye and barley sprouts was stimulated by oats.

4655 Kumakov, V.A.; Igoshin, A.P.; Evdokimova, O.E.; Igoshina, G.F. (1994) **[Yield-forming process in spring wheat stands as affected by drought]. Zasukha i produktsionnyj protsess v posevakh yarovoj pshenitsy.** *Sel'skokhozyajstvennaya biologiya. Seriya Biologiya rastenij (Russian Federation) (no.3) p. 105-114.* 14 ref. Russian. (AGRIS 95-112234).

4656 Rawson, HM.; Gifford, RM.; Condon, BN. (1995) **TEMPERATURE GRADIENT CHAMBERS FOR RESEARCH ON GLOBAL ENVIRONMENT CHANGE .1. PORTABLE CHAMBERS FOR RESEARCH ON SHORT-STATURE VEGETATION.** *Plant Cell & Environment. 18(9):1048-1054.* English. [CSIRO DIV PLANT IND GPO BOX 1600 CANBERRA ACT 2601 AUSTRALIA].

Field temperature gradient chambers designed for experiments on short-stature plants such as wheat are described, The chambers are portable, easily erected and dismantled, and are self-contained for control and measuring equipment. The design is modular, the modules being bolted together longitudinally although separated by slotted transparent septa which divide the chamber into zones of different temperature, Fresh air, which is blown in horizontally into one end of the chamber by two fans and extracted by a fan mounted vertically at the other end, passes sequentially through the modules The air stream progressively heats when the sun is shining, Fans are automatically speed-controlled in 100 steps between 20 and 100% of full output to keep the end-to-end temperature difference to within 5 degrees C. During darkness, when the fans are running at minimum speed, heaters mounted in the outlet module are turned on, The chambers in the configuration described enclose 6 x 8 m rows of crop, are 1.25 m high and have side walls which are entirely composed of rigid, vertically sliding doors for crop access. [References: 7].

F50 PLANT STRUCTURE

4657 Panteris, E.; Apostolakos, P.; Galatis, B. (1995) **TELOPHASE INTERPHASE TRANSITION IN TAXOL-TREATED TRITICUM ROOT CELLS - CORTICAL MICROTUBULES APPEAR WITHOUT THE PRIOR PRESENCE OF A RADIAL PERINUCLEAR ARRAY.** *Protoplasma. 188(1-2):78-84.* English. [UNIV ATHENS INST GEN BOT GR-15784 ATHENS GREECE].

Taxol stabilizes phragmoplast microtubules (Mrs) in cytokinetic root cells of Triticum, causing a delay in the rate of cytokinesis. As a result, the daughter nuclei acquire interphase appearance in mid- to late-cytokinetic taxol-affected cells much earlier than in control cells. Cortical Mts in such cells appear directly in the cell cortex, without the prior organization of a radial perinuclear Mt array as in control cells. These observations suggest that: (a) Whether perinuclear Mt assembly occurs or not in post-telophase cells is a matter of timing between the nuclear cycle and cytokinesis. (b) Mt organizing activity on the daughter nuclei surface is temporal. (c) Cortical Mts can be in situ assembled in the cortex of post-telophase cells of flowering plants without any participation of perinuclear Mts. [References: 32].

4658 Suspiro, J.L. (1994) **[Table of morphological characters used for the identification of spiked cereals]. Quadro de caracteres morfologicos utilizados para a identificacao de cereais praganosos.** *Divulgacao (Portugal); no. 20 51 p.* CNPPA. 7 tables. Portuguese. (AGRIS 95-112324).

F60 PLANT PHYSIOLOGY AND BIOCHEMISTRY

4659 Andrews, JR.; Fryer, MJ.; Baker, NR. (1995) **CONSEQUENCES OF LHC II DEFICIENCY FOR PHOTOSYNTHETIC REGULATION IN CHLORINA MUTANTS OF BARLEY.** *Photosynthesis Research. 44(1-2):81-*

91. English. [UNIV ESSEX DEPT BIOL WIVENHOE PK COLCHESTER CO4 3SQ ESSEX ENGLAND].

The light-harvesting chlorophyll a/b proteins associated with PS II (LHC II) are often considered to have a regulatory role in photosynthesis. The photosynthetic responses of four chlorina mutants of barley, which are deficient in LHC II to varying degrees, are examined to evaluate whether LHC II plays a regulatory role in photosynthesis. The efficiencies of light use for PS I and PS II photochemistry and for CO2 assimilation in leaves of the mutants were monitored simultaneously over a wide range of photon flux densities of white light in the presence and absence of supplementary red light. It is demonstrated that the depletions of LHC II in these mutants results in a severe imbalance in the relative rates of excitation of PS I and PS II in favour of PS I, which cannot be alleviated by preferential excitation of PS II. Analyses of xanthophyll cycle pigments and fluorescence quenching in leaves of the mutants indicated that the major LHC II components are not required to facilitate the light-induced quenching associated with zeaxanthin formation. It is concluded that LHC II is important to balance the distribution of excitation energy between PS I and PS II populations over a wide range of photon flux densities. It appears that LHC II may also be important in determining the quantum efficiency of PS II photochemistry by reducing the rate of quenching of excitation energy in the PS II primary antennae. [References: 41].

4660 Armstrong, GA.; Runge, S.; Frick, G.; Sperling, U.; Apel, K. (1995) **IDENTIFICATION OF NADPH-PROTOCHLOROPHYLLIDE OXIDOREDUCTASES A AND B - A BRANCHED PATHWAY FOR LIGHT-DEPENDENT CHLOROPHYLL BIOSYNTHESIS IN ARABIDOPSIS THALIANA.** *Plant Physiology. 108(4):1505-1517.* English. [ETH ZURICH INST PLANT SCI DEPT PLANT GENET CH-8092 ZURICH SWITZERLAND].

Illumination releases the arrest in chlorophyll (Chl) biosynthesis in etiolated angiosperm seedlings through the enzymatic photoreduction of protochlorophyllide (Pchlide) to chlorophyllide (Chlide), the first light-dependent step in chloroplast biogenesis. NADPH: Pchlide oxidoreductase (FOR, EC 1.3.1.33), a nuclear-encoded plastid-localized enzyme, mediates this unique photoreduction. Paradoxically, light also triggers a drastic decrease in the amounts of FOR activity and protein before the Chl accumulation rate reaches its maximum during greening. While investigating this seeming contradiction, we identified two distinct Arabidopsis thaliana genes encoding FOR, in contrast to previous reports of only one gene in angiosperms. The genes, designated PorA and PorB, by analogy to the principal members of the phytochrome photoreceptor gene family, display dramatically different patterns of light and developmental regulation. PorA mRNA disappears within the first 4 h of greening, whereas PorB mRNA persists even after 16 h of illumination, mirroring the behavior of two distinct FOR protein species. Experiments designed to help define the functions of FOR A and FOR B demonstrate exclusive expression of PorA in young seedlings and of PorB both in seedlings and in adult plants. Accordingly, we propose the existence of a branched light-dependent Chl biosynthesis pathway in which FOR A performs a specialized function restricted to the initial stages of greening and FOR B maintains Chl levels throughout angiosperm development. [References: 66].

4661 Bartels, D.; Alexander, R.; Schneider, K.; Elster, R.; Velasco, R.; Alamillo, J.; Bianchi, G.; Nelson, D.; Salamini, F. (1993) **Desiccation-related gene products analyzed in a resurrection plant and in barley embryos.** *Current topics in plant physiology (USA) v. 10 p. 119-127.* references. In the series analytic: Plant response to cellular dehydration during environmental stress / edited by T.J. Close and E.A. Bray. Proceedings of the 16th Annual Riverside Symposium in Plant Physiology held January 28-30, 1993, Riverside, California. English. (AGRIS 95-112680).

4662 Bartolome, B.; Faulds, CB.; Tuohy, M.; Hazlewood, GP.; Gilbert, HJ.; Williamson, G. (1995) **INFLUENCE OF DIFFERENT XYLANASES ON THE ACTIVITY OF FERULIC ACID ESTERASE ON WHEAT BRAN.** *Biotechnology & Applied Biochemistry. 22(Part 1):65-73.* English. [AFRC INST FOOD RES DEPT FOOD MOLEC BIOCHEM NORWICH RES PK NORWICH NR4 7UA NORFOLK ENGLAND].

The apparent specific activity of ferulic acid esterases on cell wall polysaccharide materials is enhanced by the presence of xylanases. In this paper we show that the extent of the synergy between an Aspergillus niger ferulic acid esterase (FAE-III) and various xylanases [beta-(1, 4)-D-xylan xylanohydrolases (EC 3.2.1.8)] in releasing ferulic acid from de-starched wheat bran is strongly dependent on the source of the xylanase. Differences among the xylanases are found to be due to (a) the rate of hydrolysis of wheat bran cell wall polysaccharides and (b) the size distribution and nature of the products solubilized in the hydrolysis. In addition, analysis of the low-molecular-mass carbohydrate products indicates that the initial rate of the hydrolysis by the xylanase is also enhanced by the addition of the esterase, showing a reciprocal co-operation between the enzymes. [References: 32].

4663 Berezin, B.B.; Samojlova, N.A.; Tikhonov, V.E.; Yamskov, I.A. (1993) **[Application of chromatographic methods to isolation of wheat germ agglutinin]. Khromatograficheskie metody vydeleniya lektina iz zarodyshej pshenitsy.** *Prikladnaya biokhimiya i mikrobiologiya (Russian Federation) v. 29(4) p. 632-638.* 16 ref. Russian. (AGRIS 95-099018).

Three sorbents are proposed for isolation of wheat germ agglutinin (WGA), namely the cross-linked hydrophilic gel-chitin and the glucosamine-containing copolymer of N-vinylpyrrolidone and maleic acid for affinity chromatography and the hydrophobic sorbent -polystyrene-coated silica gel for RF chromatography. The advantages and disadvantages of the sorbents are discussed in terms of the purity and yield of WGA preparations.

4664 Blake, T.; Tragoonrung, S.; Walton, M.; Wright, S.; Jones, B.; Chen, T.; Hayes, P. (1993) **Mapping the genes for cold tolerance in barley.** *Current topics in plant physiology (USA) v. 10 p. 202-210.* references. In the series analytic: Plant response to cellular dehydration during environmental stress / edited by T.J. Close and E.A. Bray. Proceedings of the 16th Annual Riverside Symposium in Plant Physiology held January 28-30, 1993, Riverside, California. English. (AGRIS 95-112681).

4665 Bush, DS.; Wang, T. (1995) **DIVERSITY OF CALCIUM-EFFLUX TRANSPORTERS IN WHEAT ALEURONE CELLS.** *Planta. 197(1):19-30.* English. [RUTGERS STATE UNIV DEPT BIOL SCI 101 WARREN ST NEWARK, NJ 07102 USA].

The ability of plant cells to regulate cellular calcium is dependent upon the action of calcium-transport proteins. Although significant progress has been made in identifying calcium-transporter activities (CaTs) in a number of plant tissues, very little is known about the diversity of CaTs in any single differentiated cell type. We have used isolated membrane vesicles from wheat (Triticum aestivum L.) aleurone cells to identify and characterize the principal CaTs that are responsible for efflux of Ca2+ from the cytosol of this highly differentiated cell. Based on the sensitivity of transport to protonophores and on their buoyant density in isopycnic sucrose density gradients, our data show that at least three prominent CaTs can be distinguished in membrane vesicles from aleurone cells. Two of these CaTs, which we have named Type I and Type III, were insensitive to protonophores and were inhibited by vanadate or erythrosin B (EB). Type I was associated with a membrane fraction enriched in endoplasmic reticulum whereas Type III was associated with the plasma membrane. The third prominent CaT, Type II, was inhibited by protonophores and by nitrate and was associated with a membrane fraction enriched in tonoplast. The three CaTs differed significantly in their intrinsic properties. Type I had the highest affinity for Ca2+ (K-m, 0.15 mu M), was stimulated by oxalate, inhibited by vanadate and erythrosin B, and was unaffected by exogenous calmodulin. Type II exhibited complex kinetics with regard to Ca2+ and was best described as a combination of a low-affinity (K-m, 21 mu M) and a high-affinity component (K-m, 0.2 mu M). Type II CaT was stimulated by calmodulin (1 mu M) and oxalate, and was inhibited by dicyclohexylcarbodiimide (500 mu M). Finally, Type III had an intermediate affinity for Ca2+ (K-m, 2.0 mu M), was *not* stimulated by calmodulin or by oxalate, and was inhibited by low concentrations of erythrosin B (0.1 mu M). These data provide one of the first comparative investigations of the Ca2+-transport activities in a single highly differentiated cell type. They indicate that at least three CaTs function to regulate cellular Ca2+ and we speculate that cytosolic Ca2+ may be buffered primarily by Type II and Type III CaTs which are associated with

an acidic intracellular compartment, probably the vacuole, and with the plasma membrane. [References: 36].

4666 Cabrera, HM.; Munoz, O.; Zuniga, GE.; Corcuera, LJ.; Argandona, VH. (1995) **CHANGES IN FERULIC ACID AND LIPID CONTENT IN APHID-INFESTED BARLEY.** *Phytochemistry. 39(5):1023-1026.* English. [UNIV SANTIAGO CHILE FAC QUIM & BIOL SANTIAGO CHILE].

Aphid infestation reduced the susceptibility of barley cultivars to new infestations. The intrinsic growth rate of aphids was lower in the populations reared on previously infested plants, than in populations reared on barley without previous infestation. Changes in the content of ferulic acid, and other aromatic compounds and lipids, were detected in barley seedlings infested by the aphid, Schizaphis graminum. Ferulic acid concentration increased from 4 to 14 mu mol kg(-1) fresh wt, as a function of infestation level by aphids. Survival of aphids reared with diets containing this compound was lower than the controls. Aphid survival at 24 hours was under 58% and 40% in diets with 10 and 20 mu M ferulic acid, respectively. In diets without the compound, survival was 84%. Analysis of alicyclic and aliphatic compounds in extracts of infested and non-infested barley plants showed differences in the relative concentrations of compounds. Our results suggest that the increase of ferulic acid induced by initial infestation may protect the plant against new infestations. Changes in lipid concentrations could be an acclimatization response of the plant to water-stress caused by the aphids. [References: 17].

4667 Callis, J. (1995) **REGULATION OF PROTEIN DEGRADATION [Review].** *Plant Cell. 7(7):845-857.* English. [UNIV CALIF DAVIS MOLEC & CELLULAR BIOL SECT DAVIS, CA 95616 USA].

4668 Canny, MJ. (1995) **APOPLASTIC WATER AND SOLUTE MOVEMENT - NEW RULES FOR AN OLD SPACE [Review].** *Annual Review of Plant Physiology & Plant Molecular Biology. 46:215-236.* English. [CARLETON UNIV DEPT BIOL OTTAWA ON K1S 5B6 CANADA].

The history of the apoplast, both the word and the concept, is traced from its invention by Munch (1930), through its adoption by the translocation physiologists as a gateway by which to feed pesticides, and the independent evolution of the free-space concept by ion-uptake physiologists. Both usages helped spread the idea that the cell walls were freely permeable to flowing solutions. Recent work has produced six contradictions to the prevailing notions of the rules that operate in the apoplast: (a) The flow of the apoplast is leaky, and the balance of the flow and leaks depends on vessel diameter. (b) Water leaves the vessels and enters the symplast faster than do some solutes, resulting in the accumulation of high concentrations of solutes at places called sumps. (c) Solutes diffuse away from sumps in the cell-wall apoplast at rates much slower than diffusion in water. (d) Ion concentrations in leaf vessels may be as high as 200 mM. (e) The intercellular-space apoplast of roots often contains solution with high concentrations of ions. (f) The threshold of cavitation of the flow-apoplast appears to be in the range of 1 to 2 bar below atmospheric, much less than the tensions required by the Cohesion Theory. [References: 92].

4669 Chaudri, AM.; Zhao, FJ.; Mcgrath, SP.; Crosland, AR. (1995) **THE CADMIUM CONTENT OF BRITISH WHEAT GRAIN.** *Journal of Environmental Quality. 24(5):850-855.* English. [IARC ROTHAMSTED DEPT SOIL SCI HARPENDEN AL5 2JQ HERTS ENGLAND].

The Cd content of wheat (Triticum aestivum L.) grain samples collected representatively from the major wheat growing regions of Britain in 1982, 1992, and 1993 was measured. Geographical distributions of grain Cd content were compared with the total Cd concentration in soils of England and Wales. The ranges and mean grain Cd concentrations for 1982, 1992, and 1993 were (mg kg(-1) dry weight, DW) 0.016 to 0.18, mean 0.052; 0.008 to 0.27, mean 0.042; and 0.004 to 0.31, mean 0.038, respectively. There was about a 20% decrease in mean grain Cd concentration from 1982 to 1992-1993. The proportion of samples above the World Health Organization's (WHO) limit of 0.12 mg Cd kg(-1) DW was 4% for 1982 and 1992 and 2% for 1993. The geographical distribution of these high Cd grain samples corresponded with areas where the total soil Cd concentrations were significantly above background concentrations. Differences between wheat varieties were small and significant ($P < 0.001$) only for 1992. The concentration of Cd in white flour was significantly correlated with that in wholemeal hour ($r = 0.95$), and bran Cd was significantly correlated with white hour Cd ($r = 0.87$). On average, the concentration of Cd in bran was twice that in wholemeal hour, and white flour contained about 31% less Cd than wholemeal flour. The estimated daily dietary Cd intake in the United Kingdom (UK) through the consumption of wheat-based products was about 8 mu g Cd per person or about 11% of the WHO's limit of 70 mu g Cd d(-1). The Cd content of the vast majority of British wheat grain would not constitute a health hazard to the population of the UK or elsewhere. [References: 30].

4670 Colmer, TD.; Epstein, E.; Dvorak, J. (1995) **DIFFERENTIAL SOLUTE REGULATION IN LEAF BLADES OF VARIOUS AGES IN SALT-SENSITIVE WHEAT AND A SALT-TOLERANT WHEAT X LOPHOPYRUM ELONGATUM (HOST) LOVE, A. AMPHIPLOID.** *Plant Physiology. 108(4):1715-1724.* English. [UNIV CALIF DAVIS DEPT LAND AIR & WATER RESOURCES DAVIS, CA 95616 USA].

Leaf blades of different ages from a salt-tolerant wheat x Lophopyrum elongatum (Host) A. Love (syn. Agropyron elongatum Host) amphiploid and its salt-sensitive wheat parent (Triticum aestivum L. cv Chinese Spring) were compared for their ionic relations, organic solute accumulation, and sap osmotic potential (pi(sap)). The plants were grown for 18 d in nonsaline (1.25 mM Na+) and salinized (200 mM NaCl) nutrient solutions. The response of leaf blades to NaCl salinity depended greatly on their age or position on the main stem. Na and proline levels were highest in the oldest leaf blade and progressively lower in younger ones. Glycine betaine and asparagine levels were highest in the youngest blade. The pi(sap) was similar for corresponding leaf blades of both genotypes, but contributions of various solutes to the difference in pi(sap) between blades from control and 200 mM NaCl treatments differed greatly. The NaCl-induced decline in pi(sap) of the youngest leaf blade of Chinese Spring was predominately due to the accumulation of Na and to a lesser extent asparagine; in the amphiploid, it was due to a combination of glycine betaine, K, Na, and asparagine. Proline contributed little in the youngest blade of either genotype. In the older blades Na was the major solute contributing to the decline in pi(sap). Thus, the maintenance of low Na and high K levels and the accumulation of glycine betaine in the young leaf tissues contributed to the NaCl tolerance of the amphiploid. No such role was evident for proline. [References: 43].

4671 Curry, J.; Walker Simmons, M.K. (1993) **Sequence analysis of wheat cDNAs for abscisic acid-responsive genes expressed in dehydrated wheat seedlings and the cyanobacterium, Anabaena.** *Current topics in plant physiology (USA) v. 10 p. 128-136.* references. In the series analytic: Plant response to cellular dehydration during environmental stress / edited by T.J. Close and E.A. Bray. Proceedings of the 16th Annual Riverside Symposium in Plant Physiology held January 28-30, 1993, Riverside, California. English. (AGRIS 95-112744).

4672 Flood, RG.; Martin, PJ.; Gardner, WK. (1995) **DRY MATTER ACCUMULATION AND PARTITIONING AND ITS RELATIONSHIP TO GRAIN YIELD IN WHEAT.** *Australian Journal of Experimental Agriculture. 35(4):495-502.* English. [BIOAG ENTERPRISES 22 MINTERN CRESCENT HORSHAM VIC 3400 AUSTRALIA].

Total crop dry matter (DM) production and its components, remobilisation of stem reserves, and the relation of these to grain yield were studied in 10 wheat cultivars sown at Walpeup, Boort, and Horsham in the north-western Victorian wheatbelt. Between sites, all DM components decreased in the order Horsham > Boort > Walpeup. Differences between Boort and Walpeup were not always significant. Total DM at anthesis for Walpeup and Boort was in a similar range, and less than that for Horsham. Yields increased in the order Walpeup < Boort < Horsham. When data from the 3 sites were combined, leaf stem (excluding cv. Argentine IX), and total DM were related to grain yield. Within sites, ear DM at anthesis was related to grain yield. Grain yield far all cultivars at Horsham and Walpeup and 5 cultivars at Boort was greater than the increases in crop DM from anthesis to maturity, indicating that pre-anthesis stored assimilates (stem reserves) were used for grain filling. Post-anthesis decrease in stem weight was inversely related to grain yield only at Horsham, which supports the view of utilisation of stem reserves for grain filling at this site. At Boort and Walpeup there was a similar negative trend, but values for 2 cultivars at each site were outliers, which weakened the

trend. The wide adaptability of the Australian cultivars used in this study may be related to the differential remobilisation of stem reserves at each site. A measure of yield stability, however, was not related to stem weight loss during the grain-filling period. [References: 37].

4673 Forster, B.P.; Macaulay, M. (1993) **Water-soluble proteins of mature barley grain.** *Barley genetics newsletter (USA) v. 23 p. 15.* references. English. (AGRIS 95-112678).

4674 Foyer, CH.; Parry, MAJ. (1995) **THE ABSENCE OF RUBISCO ACTIVASE ACTIVITY IN TOTAL WHEAT LEAF EXTRACTS IS RECOVERED IN THE PURIFIED PROTEIN.** *Journal of Experimental Botany. 46(289):1055-1060.* English. [IGER DEPT ENVIRONM BIOL ABERYSTWYTH SY23 3EB DYFED WALES].

When desalted extracts of soluble protein from dark-adapted wheat leaves were assayed for ribulose-1, 5-bisphosphate carboxylase/oxygenase (Rubisco) activase activity in the presence of 1 mM ATP and an ATP-regenerating system, very little ATP-dependent activation of RuBP-inactivated Rubisco was found. In extracts from light-adapted leaves a very similar pattern of Rubisco activation was observed except that the overall level of Rubisco activity was much lower than in the extracts from dark-adapted leaves, These features were apparent both at low (120 mu g per ml) and high (640 mu g per ml) protein concentrations. We were unable to demonstrate Rubisco activase activity in crude leaf extracts. Consequently, in order to establish that Rubisco activase was present in wheat leaf extracts the wheat leaf protein was purified to homogeneity. The identity of the protein was confirmed with antibodies to the spinach enzyme, ATPase activity and activase-mediated release of the inhibitor, carboxyarabinitol-1-phosphate (CA1P) from the tertiary Rubisco complex. The pure wheat Rubisco activase relieved the CA1P-induced inhibition of Rubisco activity. Rubisco activase had no significant effect on the affinity of wheat Rubisco for the substrate, ribulose-1, 5-bisphosphate (RuBP). [References: 29].

4675 Franchi, A.S. de; Gherbin, P.; Monteleone, M.; Pardo, A. (Basilicata Univ., Potenza (Italy). Dipartimento di Produzione Vegetale) (1995) **[Shoot and root growth and water uptake of barley genotypes (Hordeum spp.) with different vegetative habitus in a hilly area of Southern Italy [Basilicata]]. Dinamica dell'accrescimento ipogeo ed epigeo e dell'assorbimento idrico di genotipi di orzo (Hordeum spp.) a diverso habitus vegetativo nell'Appennino Lucano [Basilicata].** *Rivista di Agronomia (Italy) v. 29(1) p. 48-59.* 1 table; 11 graphs; 36 ref. Italian. (AGRIS 95-112671).

The results of a two-year trial, carried out in a hilly area of Southern Italy and regarding four barley genotypes with different vegetative habitus, are reported, in order to outline the growing dynamics, both of the shoot and of the root and the rate of the water uptake as well as the water use efficiency. The spring genotypes showed a higher shoot productive potential than the autumnal ones, despite their higher susceptibility to the late coolness, mainly at the root level. The rainfall pattern and the length of the crop cycle particularly influenced the water uptake and utilization of barley which, however, always showed an higher productivity than durum wheat.

4676 Gardner, HW. (1995) **BIOLOGICAL ROLES AND BIOCHEMISTRY OF THE LIPOXYGENASE PATHWAY.** *Hortscience. 30(2):197-205.* English. [USDA ARS NATL CTR AGR UTILIZAT RES 1815 N UNIV ST PEORIA, IL 61604 USA].

4677 Graybosch, RA.; Peterson, CJ.; Baenziger, PS.; Shelton, DR. (1995) **ENVIRONMENTAL MODIFICATION OF HARD RED WINTER WHEAT FLOUR PROTEIN COMPOSITION.** *Journal of Cereal Science. 22(1):45-51.* English. [UNIV NEBRASKA USDA ARS DEPT AGRON LINCOLN, NE 68583 USA].

The intrinsic processing quality of wheat (Triticum aestivum L.) cultivars is modified significantly by cultural conditions and climate. In an attempt to understand the biochemical basis of such variation, environmental modification of flour protein content and composition was measured. Thirty hard red winter wheat cultivars and experimental lines were gown at 17 Nebraska environments during 1990 and 1991. Environmental conditions, including grain filling duration, temperature and relative humidity during grain filling, were monitored. Grain yield and test weight also were determined as environmental indicators. Significant linear correlations between flour protein content, as measured by near-infrared spectroscopy, were observed only with the duration of grain filling. Protein quality, as measured by SDS sedimentation volumes and size-exclusion high-performance liquid chromatography, was highly influenced by the frequency of high temperatures during grain filling and by the relative humidity. Observed ranges in genotypic responses (variance) at locations also were altered by environmental factors. Optimal protein quality, as determined by SDS sedimentation volumes, was observed with exposure to less than 90 h of temperature greater than 32 degrees C during grain filling. Protein quality declined with exposure to a greater number of hours of elevated temperature. (C) 1995 Academic Press Limited [References: 21].

4678 Jamieson, PD.; Francis, GS.; Wilson, DR.; Martin, RJ. (1995) **EFFECTS OF WATER DEFICITS ON EVAPOTRANSPIRATION FROM BARLEY.** *Agricultural & Forest Meteorology. 76(1):41-58.* English. [NEW ZEALAND INST CROP & FOOD RES LTD PRIVATE BAG 4704 CHRISTCHURCH NEW ZEALAND].

A barley crop grown under an automatic rainout shelter was subjected to varying timings acid durations of water stress to develop a range of timings and severities of drought. Considerable variation in water use among treatments was induced. The control treatment was irrigated each week to replace the previous week's evapotranspiration (E(a)), Other treatments had irrigation withdrawn for varying periods either from emergence (early drought) or from 3 weeks before anthesis (middle drought), or from varying times from before anthesis to mid-grain fill until maturity (late drought). Maximum measured soil moisture deficits in the top metre varied from 105 to 208 mm, and seasonal E(a) from 434 to 210 mm, Reductions in E(a) below the control between 10 October to 10 January varied from 11 to 40%. Reductions in transpiration were generally larger than this because reduced ground cover in stressed treatments led to increases in soil evaporation. In contrast to other studies, a greater proportion of the decrease in transpiration was caused by increased stomatal resistance than by reduction of leaf area. A soil evaporation and transpiration model was used as an aid to data analysis. Data were fitted to a simple model that assumed transpiration was unlimited by water deficits until these exceeded 65% of the available water holding capacity of the root zone. This provided a good description of the transpiration process either when water was unlimiting or when deficits occurred late in crop development. However, when moderate to severe drought occurred before anthesis, reductions in transpiration were much larger than the model could account for, and persisted for up to 2 weeks after drought was relieved. The decline in transpiration was associated either with irreversible changes to leaves or with the time taken for the root system to recover. [References: 40].

4679 Jenner, CF.; Denyer, K.; Guerin, J. (1995) **THERMAL CHARACTERISTICS OF SOLUBLE STARCH SYNTHASE FROM WHEAT ENDOSPERM.** *Australian Journal of Plant Physiology. 22(4):703-709.* English. [UNIV ADELAIDE WAITE AGR RES INST DEPT PLANT SCI GLEN OSMOND SA 5064 AUSTRALIA].

The aim of the work reported in this paper was to characterise the thermal responses of soluble starch synthase (SSS) extracted from the endosperm of the developing wheat grain. Using partially purified preparations of SSS, the reaction obeyed Michaelis-Menten kinetics with both substrates amylopectin and ADPglucose. Both the V-max and the K-m varied with temperature. Values for V-max were higher at 45 degrees C compared with 25 degrees C. However, the K-m values for both substates wer also higher at 45 degrees C than at 25 degrees C indicating that the affinity of the enzyme for its substrates was reduced at the higher temperature. Over the temperature range 15-45 degrees C, the K-m for amylopectin was minimal at 20 degrees C, and rose exponentially between 25 and 45 degrees C. Kinetic analyses indicated that the reaction was sequential and that the substrates could bind to the enzyme in either order. At 25 degrees C the binding of one substrate to the enzyme increased the affinity of the complex for the second substrate but at 45 degrees C these effects were abolished. These thermal characteristics of SSS could explain certain important features of the temperature responses of starch deposition in the wheat grain in vivo. [References: 20].

4680 Jorgensen, HJL.; Lyshede, OB.; Allerup, S. (1995) **EPICUTICULAR WAX OF THE FIRST LEAVES OF TWO BARLEY CULTIVARS**

STUDIED BY CRYO SCANNING ELECTRON MICROSCOPY. *Journal of Agronomy & Crop Science-Zeitschrift fur Acker und Pflanzenbau. 174(4):217-224.* English. [ROYAL VET & AGR UNIV DEPT PLANT BIOL 40 THORVALDSENSVEJ DK-1871 FREDERIKSBERG DENMARK].

Chemical fixation and critical point drying of plant tissue prior to scanning electron microscopy often degrades the outermost layer of the specimen, i.e. the epicuticular wax. Knowledge of the unaltered wax, including its morphology, is important because the wax constitutes the interface between the plant and its surroundings. Having worked previously with barley leaves (anatomy, infection biology of pathogens), we found it of interest to examine and describe the wax morphology on barley leaves and to determine whether or not there were differences between cultivars. Hence, the morphology of the epicuticular wax on the first leaf of two spring barley cultivars has been studied by scanning electron microscopy following cryofixation. The wax on both cultivars consists chiefly of scales with a small proportion of rods and granules. There is little variation in wax morphology over each leaf side, and only minor differences between the abaxial and adaxial sides of the same leaf. Distinct differences are, however, observed between the two cultivars, especially regarding the thickness and the shape of the wax scales. The wax bodies cover the entire surface of a leaf except for pairs of trichomes and guard cells, and some scattered wax free areas. The morphology and distribution of wax are discussed in relation to studies made on barley leaves using different techniques. Also, the implications of wax morphology for disease resistance are briefly discussed. [References: 21].

4681 Karagiannidou, T.; Eleftheriou, EP.; Tsekos, I.; Galatis, B.; Apostolakos, P. (1995) **COLCHICINE-INDUCED PARACRYSTALS IN ROOT CELLS OF WHEAT (TRITICUM AESTIVUM L).** *Annals of Botany. 76(1):23-30.* English. [ARISTOTELIAN UNIV THESSALONIKI SCH BIOL DEPT BOT GR-54006 THESSALONIKI GREECE].

Tubulin conformations other than microtubules in the meristematic cells of wheat roots grown in the presence of 2 mM colchicine solution were investigated by immunofluorescence and electron microscopy. In the affected cells microtubules disappeared and were replaced by tubulin fluorescent strands that occurred in the cortical cytoplasm. With increasing time of exposure to colchicine the tubulin strands became better organized and occurred also in the subcortical cytoplasm and finally they were restricted to the area around the nucleus. In prophase and preprophase cells thick strands occupied the cortical cytoplasmic zone where in normal cells a preprophase microtubule band (PMB) was expected to be assembled. In the colchicine-treated cells electron microscopy revealed an accumulation of paracrystalline aggregates, which initially occurred along the cell wall and later deeper in the cytoplasm, in the perinuclear regions and the cytoplasmic invaginations of the nucleus. In transverse planes the paracrystalline strands appear to consist of hexagonal subunits in a 'honeycomb' arrangement, while in longitudinal and oblique sections they exhibit variable images. Since their distribution coincides with that of the tubulin strands visualized by immunofluorescence, they are considered to be the same structure. Therefore, the paracrystals consist of, or at least contain, tubulin. They are most likely to be polymers of tubulin-colchicine complexes. (C) 1995 Annals of Botany Company [References: 29].

4682 Karavaiko, NN.; Zemlyachenko, YV.; Selivankina, SY.; Kulaeva, ON. (1995) **ZEATIN-BINDING PROTEIN INVOLVED IN THE ACTIVATION OF IN VITRO RNA SYNTHESIS BY TRANS-ZEATIN - ISOLATION FROM BARLEY LEAF CYTOSOL.** *Russian Journal of Plant Physiology. 42(4):481-487.* English. [RUSSIAN ACAD SCI KA TIMIRYAZEV PLANT PHYSIOL INST BOT SKAYA 35 MOSCOW 127276 RUSSIA].

A procedure for isolating a protein with high affinity for the naturally occurring cytokinin trans-zeatin from the barley leaf cytosol was developed. Along with gel filtration and hydrophobic chromatography, this procedure involved affinity chromatography using trans-zeatin immobilized on Epoxy-activated Sepharose. The high affinity for zeatin in protein with mol wt of 67 +/- 2 kD was demonstrated by its competition with antibodies against trans-zeatin in the competitive-binding ELISA system when trans-zeatin was immobilized on polystyrene microtiter plates. When assayed in direct-binding ELISA and by Western-blot analysis, the protein cross-reacted with anti-idiotypic antibodies isolated from anti-zeatin serum. In the in vitro system containing barley chromatin and RNA polymerase I, the isolated protein enhanced RNA synthesis elongation in the presence of trans-zeatin. Data obtained permitted us to consider the isolated protein as a receptor for the naturally occurring cytokinin trans-zeatin, which mediated transcription activation with this phytohormone. [References: 18].

4683 Kim, K.T.; Seog, H.M.; Kim, S.S.; Lee, Y.T.; Hong, H.D. (Korea Food Research Institute, Sungnam (Korea Republic)) (1994) **Changes in physicochemical characteristics of barley leaves during growth.** *Korean Journal of Food Science and Technology (Korea Republic) v. 26(4) p. 471-474.* 4 tables; 16 ref. Korean. (AGRIS 95-112674).

4684 Kislyuk, IM.; Miroslavov, EA.; Paleeva, TV. (1995) **STIMULATION OF RESPIRATION IN WHEAT LEAVES AND PROLIFERATION OF MITOCHONDRIA IN LEAF CELLS UNDER CHILLING.** *Russian Journal of Plant Physiology. 42(4):534-537.* English. [RUSSIAN ACAD SCI KOMAROV BOT INST PROFESSORA POPOVA 2 ST PETERSBURG 197376 RUSSIA].

Ten to twelve-day-old wheat seedlings grown at 25/21 degrees C (day/night) temperatures were subjected to cold treatment (2-4 degrees C, illuminance 2 klx) for time periods ranging from 1 h to 6 days. Chilling of plants for 1 h depressed the respiration rate, measured at 30 degrees C, to 85% of the control level. During the subsequent 3 h of cold exposure, the stage of suppression was replaced by stimulation of respiration to 110% of the control level. Longer exposures of plants at the chilling temperature led to further stimulation of the respiration rate (to 170% after a 3-day chilling). Division of mitochondria was stimulated by low temperature only in the first few hours. On longer exposure to low temperature, the division of mitochondria ceased, although mitochondria continued to grow in size; after 3 days of cold treatment, mitochondria had larger dimensions than those organelles in the control plants. Our data suggest that changes in the rate of dark respiration under cooling are mediated by different controlling mechanisms. The proliferation of mitochondria represents a mechanism that compensates for the retardation of the energy metabolism at low temperature. [References: 22].

4685 Klasens, V. (Latvia University of Agriculture, Jelgava (Latvia)) (1994) **[What is gluten in reality?]. Kas tad isti ir lipeklis?** *Raziba (Latvia) (no.7) p. 18-19.* Latvian. (AGRIS 95-098945).

4686 Kobayashi, I.; Watanabe, H.; Kunoh, H. (1995) **INDUCED ACCESSIBILITY AND ENHANCED INACCESSIBILITY AT THE CELLULAR LEVEL IN BARLEY COLEOPTILES .14. EVIDENCE FOR ELICITOR(S) AND SUPPRESSOR(S) OF HOST INACCESSIBILITY FROM ERYSIPHE GRAMINIS.** *Physiological & Molecular Plant Pathology. 46(6):445-456.* English. [MIE UNIV FAC BIORESOURCES PLANT PATHOL LAB TSU MIE 514 JAPAN].

The release of elicitors and suppressors by Erysiphe graminis, the powdery mildew pathogen of barley, was investigated by microscopy in combination with micromanipulation. The elicitors enhance inaccessibility whereas the suppressors prevent the action of the elicitors. Conidia were deposited onto barley coleoptiles and incubated for intervals that varied from 1-8 h. These conidia were termed the inducer conidia since they determined whether their presence would induce the cells of the host to become inaccessible to subsequent inoculations with the fungus. At specified intervals after inoculation the conidial germlings were removed from cells with a micromanipulator. The coleoptiles were then incubated for an additional 8 h after which, a new germling of the fungus was transferred to the same cell from which the inducer germling had been removed. This new germling was called the challenge germling since it was used to determine if it could challenge the host cell to express either induced accessibility or enhanced inaccessibility. The ability of these challenge germlings to penetrate the barley host cell was then assessed after they had been incubated on the cell for an additional 19 h. This allowed the determination of whether inaccessibility had been enhanced in the host. Inaccessibility was enhanced in the host only when the inducer conidia were incubated on host cells for more than 7 h. Scanning electron microscopy revealed that these challenge germlings did not penetrate into the host cell. Thus, enhanced inaccessibility had occurred. The results indicate that the E. graminis germling released a material that enhanced the inaccessibility of the barley host cells. We refer to this material as an elicitor. The transfer of a challenge germling to a coleoptile was made at various

times after the removal of the inducer germling from the tissue. This allowed us to determine that more than 2 h is required for the enhancement of inaccessibility after the removal of the inducer germling From the tissue. If a germling, either the same or a different germling, was left on the host cell continuously, then enhanced inaccessibility did nor occur. Rather, susceptibility occurred. These results suggest that the E, graminis germling releases a material that suppresses inaccessibility. We refer to this material as a suppressor. Thus, the results indicate that E. graminis conidia release an elicitor that enhances inaccessibility of barley cells and that they also release a suppressor that prevents enhanced inaccessibility in the barley cell. [References: 24].

4687 Kochian, LV. (1995) **CELLULAR MECHANISMS OF ALUMINUM TOXICITY AND RESISTANCE IN PLANTS [Review].** *Annual Review of Plant Physiology & Plant Molecular Biology. 46:237-260.* English. [CORNELL UNIV USDA ARS US PLANT SOIL & NUTR LAB ITHACA, NY 14853 USA].

Aluminum (Al) toxicity is the major factor limiting crop productivity on acid soils, which comprise up to 40% of the world's arable lands. Also, many native and crop plants exhibit genetic-based variability in Al sensitivity that has allowed plant breeders to develop Al-resistant crops. Considerable research has been directed to elucidating the mechanisms of Al toxicity and resistance in recent years. However, these processes are still poorly understood. This review examines our current understanding of cellular mechanisms of Al toxicity and resistance. The major symptom of Al toxicity is a rapid inhibition of root growth, which has been proposed to be caused by a number of different mechanisms, including Al interactions within the cell wall, the plasma membrane, or the root symplasm. Al resistance has been speculated to be the result of either exclusion of Al from the root apex or the tolerance of symplasmic Al. This review focuses on those mechanisms for which some evidence exists as well as on some controversial aspects of Al phytotoxicity and resistance. [References: 120].

4688 Komarova, EN.; Vyskrebentseva, EI.; Trunova, TI. (1995) **LECTIN ACTIVITY IN WINTER WHEAT CROWNS DURING HARDENING.** *Russian Journal of Plant Physiology. 42(4):543-546.* English. [RUSSIAN ACAD SCI KA TIMIRYAZEV PLANT PHYSIOL INST BOT SKAYA 35 MOSCOW 127276 RUSSIA].

The activity and carbohydrate specificity of lectins were studied in the fractions of cell walls and total cell organelles from the crowns of winter wheat, cv. Mironovskaya 808, during plant cold acclimation for one to seven days at 2 degrees C. Using the technique of hemagglutination of trypsinized erythrocytes, lectin activity in the fraction of cell organelles from unhardened plants was shown to exceed threefold that of the fraction of cell walls. The carbohydrate specificity of lectins from two fractions differed. The cell wall lectins showed high affinity for uridine diphosphoglucose, whereas the organellar lectins did not interact with this carbohydrate. The cell wall lectins also showed higher affinity for N-acetylglucosamine, D-galactosamine, and glucose 6-phosphate, as compared to the organellar lectins. The temporal pattern of the lectin activity during hardening could be described by a single-peak curve. In the cell wall fraction, the highest activity manifested after one-day hardening, and in the fraction of organelles it peaked after five-day hardening. The carbohydrate specificity of lectins also changed during hardening: The cell wall lectins completely lost their capacity for interaction with uridine diphosphoglucose, glucose 6-phosphate, D-galactosamine, and N-acetylglucosamine and the lectins of organelles retained some affinity only for aminosugars. Lectin involvement in the frost resistance of winter cereal crops is discussed. [References: 16].

4689 Krezel, R. (Akademia Rolnicza, Wroclaw (Poland). Katedra Ogolnej Uprawy Roli i Roslin) (1994) **[Content of major chemical constituents in the plants grown in 2-, 3- and 4-field crop rotation on the medium soil]. Zawartosc wazniejszych skladnikow chemicznych w roslinach uprawianych w zmianowaniach 2-, 3- i 4-polowych na glebie sredniej.** *Zeszyty Naukowe Akademii Rolniczej we Wroclawiu. Rolnictwo (Poland) (no.238) p. 79-85.* 2 tables; 5 ref. Polish. (AGRIS 95-098991).

In the years 1986-89 the content of chemical macrocompounds was determined in the grain and straw material from winter wheat and spring barley grown in 10 crop succession systems differing with the structure of sowing and the length of rotation. The differences in examined macrocompounds were found to be relatively small. An increased content of proteins and decrease in ash amount was stated only in the wheat grain material originating from the plants grown in 4-course crop rotation after pea. The amounts of P2O5 and K2O found in grain were relatively higher in wheat grown in 2-course crop rotation with barley. The differentiation in examined compounds in the grain of spring barley was not significant and unequivocally dependent on performed crop successions.

4690 Kruse, E.; Mock, HP.; Grimm, B. (1995) **COPROPORPHYRINOGEN III OXIDASE FROM BARLEY AND TOBACCO - SEQUENCE ANALYSIS AND INITIAL EXPRESSION STUDIES.** *Planta. 196(4):796-803.* English. [INST PFLANZENGENET & KULTURPFLANZENFORSCH CORRENSSTR 3 D-06466 GATERSLEBEN GERMANY].

Coproporphyrinogen III oxidase (coprogen oxidase; EC 1.3.3.3) is part of the pathway from 5-aminolevulinate to protoporphyrin IX which is common in all organisms and catalyses oxidative decarboxylation at two tetrapyrrole side chains. We cloned and sequenced full-length cDNAs encoding coprogen oxidase from barley (Hordeum vulgare L.) and tobacco (Nicotiana tabacum L.). They code for precursor peptides of 43.6 kDa and 44.9 kDa, respectively. Import into pea plastids resulted in a processed tobacco protein of approx. 39 kDa, which accumulated in the stroma fraction. Induction of synthesis of recombinant putative tobacco mature coprogen oxidase consisting of 338 amino-acid residues in Escherichia coli at 20 degrees C result in a catalytically active protein of approx. 39 kDa, while induction of its formation at 37 degrees C immediately terminated bacterial growth, possibly due to toxic effects on the metabolic balance of tetrapyrrole biosynthesis. The plant coprogen oxidase gene was expressed to different extents in all tissues investigated. This is most likely due to the differing requirements for tetrapyrroles in different organs. The steady-state level of mRNA did not significantly differ in etiolated and greening barley leaves. The content of coprogen oxidase RNA reached its maximum in developing cells and decreased drastically when cells were completely differentiated. Functioning of the two photosystems apparatus requires the synthesis of all pigment and protein components during plant development. It is speculated that the enzymes involved in tetrapyrrole synthesis are developmentally rather than light-dependently regulated, Regulation of these enzymes also guarantees a constant flux of metabolic intermediates and avoids photodynamic damage by accumulating porphyrins. [References: 40].

4691 Lavie, B.; Stow, V.; Krugman, T.; Beiles, A.; Nevo, E. (1993) **Fitness in wild barley from two opposing slopes of a Mediterranean microsite at Mount Carmel, Israel.** *Barley genetics newsletter (USA) v. 23 p. 12-14.* references. English. (AGRIS 95-112517).

4692 Lehmann, J.; Atzorn, R.; Bruckner, C.; Reinbothe, S.; Leopold, J.; Wasternack, C.; Parthier, B. (1995) **ACCUMULATION OF JASMONATE, ABSCISIC ACID, SPECIFIC TRANSCRIPTS AND PROTEINS IN OSMOTICALLY STRESSED BARLEY LEAF SEGMENTS.** *Planta. 197(1):156-162.* English. [INST PLANT BIOCHEM POSTFACH 250 D-06018 HALLE GERMANY].

The accumulation of abundant proteins and their respective transcripts, induced by 10(-4) M cis-abscisic acid or 10(-5) M jasmonic acid methyl ester, was studied in barley (Hordeum vulgare L.) leaf segments and compared to that resulting from osmotic stress caused by floating the segments on solutions of sorbitol, glucose, polyethyleneglycol (PEG)-6000 or NaCl. Osmotic stress or treatment with abscisic acid led to the synthesis of novel proteins which were identical to jasmonate-induced proteins (JIPs) with respect to immunological properties and molecular masses. The most prominent polypeptides were characterized by molecular masses of 66, 37 and 23 kDa and were newly synthesized. Whereas sorbitol, mannitol, sucrose, glucose and PEG provoked the synthesis of JIPs, 2-deoxyglucose and NaCl did not. We provide evidence that the synthesis of JIPs induced by osmotic stress is directly correlated with a preceding rise in endogenous jasmonates. These jasmonates, quantified by an enzyme immunoassay specific for (-)-jasmonic acid and its amino-acid conjugates, increased remarkably in leaf segments treated with sorbitol, glucose or other sugars. In contrast, no increase in jasmonates could be observed in tissues exposed to salts (NaCl). The results strengthen the hypothesis that the accumulation of jasmonates, probably by de-novo synthesis, is an intermediate and essential step in a signalling pathway between (osmotic) stress and

activation of genes coding for polypeptides of high abundance. [References: 36].

4693 MacGregor, A.W.; Bhatty, R.S. (1993) **Barley: chemistry and technology.** *AACC monograph series (USA) 486 p.* American Association of Cereal Chemists. ill. bibliographical ref. and index. English. (AGRIS 95-098994).

4694 Malhotra, B.; Glass, ADM. (1995) **POTASSIUM FLUXES IN CHLAMYDOMONAS REINHARDTII .2. COMPARTMENTAL ANALYSIS.** *Plant Physiology. 108(4):1537-1545.* English. [UNIV BRITISH COLUMBIA DEPT BOT VANCOUVER BC V6T 1Z4 CANADA].

K-42(+) and Rb-86(+) were used to determine the subcellular distribution of potassium in Chlamydomonas reinhardtii by compartmental analysis. In both wild type and a mutant strain, three distinct compartments (referred to as I, II, and III) were apparent. Using K-42(+), we found that these had half-lives for K+ exchange of 1.07 min, 12.8 min, and 2.9 h, respectively, in wild-type cells and 0.93 min, 14.7 min, and 9.8 h, respectively, for the mutants. Half-lives were not significantly different when Rb-86(+) was used to trace K+ Compartments I and II probably correspond to the cell wall and cytoplasm, respectively. Based on the lack of a large central vacuole in Chlamydomonas, the effect of a dark pretreatment on the kinetic properties of compartment III and the similarity between the [KC] of compartment III and that of isolated chloroplasts, this slowly exchanging compartment was identified as the chloroplast. Growth of wild-type cells at 100 mu M (instead of 10 mM K+) caused no change of cytoplasmic [K+] but reduced chloroplast [K+] very substantially. The mutants failed to grow at 100 mu M K+. [References: 29].

4695 Manderscheid, R.; Bender, J.; Jager, HJ.; Weigel, HJ. (1995) **EFFECTS OF SEASON LONG CO2 ENRICHMENT ON CEREALS .2. NUTRIENT CONCENTRATIONS AND GRAIN QUALITY.** *Agriculture Ecosystems & Environment. 54(3):175-185.* English. [BUNDESFORSCH ANSTALT LANDWIRTSCHAFT INST PROD & OKOTOXIKOL D-38116 BRAUNSCHWEIG GERMANY].

Two cultivars each of spring wheat (Triticum aestivum L., cv. Star and cv. Turbo) and spring barley (Hordeum vulgare L., cv. Alexis and cv. Arena) were exposed season-long to ambient (384 p.p.m.) and above ambient CO2 concentrations (551, 718 p.p.m.) in open-top chambers. Plant samples were taken at the booting stage and at maturity. Concentrations (grams per gram dry weight) of macro (Ca, K, Mg, N, P, S) and micronutrients (Fe, Mn, Zn) were measured in stems, leaves, ears and grains, and the amino acid composition of the grain protein was determined. For most nutrients studied the sequence and size of the response of the four cereal plants to the CO, enrichment was cv. Arena < cv. Alexis < cv. Turbo < cv. Star. The CO2 enrichment usually produced a decrease in nutrient concentrations, which was already detectable at the booting stage and was further enhanced until plant maturity. Nutrient concentrations of straw were more affected than those of grains. The decrease in concentration was greatest for N followed by Mg, Ca and K, and the maximum decrease as compared with ambient CO2 amounted to 43%, 35%, 33% and 21% for straw, and 30%, 13%, 28% and - 6% for grains. Concentrations of micronutrients were also found to be partially decreased by about 10-30%. At 718 p.p.m. CO, grain protein concentrations were 96% (cv. Arena), 85% (cv. Alexis), 72% (cv. Turbo) and 70% (cv. Star) of the ambient CO2 value, however, the index of essential amino acids was increased. Overall, the CO2 enrichment did not decrease the nutrient harvest index of all nutrients except of sulphur. Nutrient use efficiency increased by high CO2 levels for cv. Star and cv. Turbo and decreased for cv. Arena. [References: 29].

4696 Montalbini, P. (1995) **EFFECT OF RUST INFECTION ON PURINE CATABOLISM ENZYME LEVELS IN WHEAT LEAVES.** *Physiological & Molecular Plant Pathology. 46(4):275-292.* English. [UNIV PERUGIA IST PATOL VEGETALE BORGO XX GIUGNO 74 I-06100 PERUGIA ITALY].

Variations in purine catabolism enzymes (xanthine oxidase, uricase and allantoinase) in wheat (Triticum aestivum) leaves were determined during compatible and incompatible interactions with a local isolate of Puccinia recondita f.sp. tritici. The cultivars Thatcher, Mentana and Leopardo as well as isolines with resistance (Lr) genes in a Thatcher background were employed. The level of xanthine oxidase enhancement was correlated with the three different infection stages: (i) from the beginning to the end of mesophyll colonization by intercellular mycelium (1-4 days postinoculation); (ii) subepidermal structure (flecks) differentiation (5-7 days post inoculation);and (iii) maturation of uredospore-producing uredinia (7-11 days post-inoculation). Early and consistent enhancement in xanthine oxidase was detected only during incompatible interactions whereas late enhancements were only detected in the highly compatible ones. In contrast to xanthine oxidase, uricase activity did not change early after infection, whether compatible or incompatible interactions were involved. Uricase was mostly stimulated in the compatible interactions during fungal structure differentiation (stromatic structure and uredinia) and during the same period in moderately incompatible interactions showing macroscopic necrotic symptoms but not in highly incompatible ones (pseudo-immune responses). According to previous results, allantoinase activity was absent in healthy wheal leaves. In rust-infected leaves allantoinase was evident starting from 7 days post-inoculation at the beginning of uredospore differentiation and the values reached corresponded to the level found in germinating uredospore suggesting that the fungal enzyme was being measured. Allantoinase was not detectable in rust-infected leaves 1-4 days post-inoculation with the assay method used and was hardly detectable 5-6 days postinoculation when the activity level in mycelium, calculated on the basis of chitin content, accounted for about one-third of that found during uredospore differentiation. The results obtained indicate that purine catabolism is involved during wheat leaf rust infection. Particular attention was given to the possible role of xanthine oxidase enhancement during the hypersensitive response in relation to the stage of the infection process it look place as well as the duration and intensity reached. The in vivo inhibition of host xanthine oxidase following application of allopurinol by root absorption in concentrations which did not inhibit fungal growth resulted in some inhibition of the hypersensitive response. Therefore, it was concluded that during wheat leaf rust infection, xanthine oxidase is probably responsible, at least in part, for host cell damage associated with hypersensitivity by mechanism/s possibly involving release of toxic amounts of superoxide. [References: 27].

4697 Morell, MK.; Rahman, S.; Abrahams, SL.; Appels, R. (1995) **THE BIOCHEMISTRY AND MOLECULAR BIOLOGY OF STARCH SYNTHESIS IN CEREALS.** *Australian Journal of Plant Physiology. 22(4):647-660.* English. [COOPERAT RES CTR PLANT SCI POB 475 CANBERRA ACT 0200 AUSTRALIA].

Starch is a key constituent of plant products finding utility as both a major component of a wide range of staple and processed foods, and as a feedstock for industrial processes. While there has traditionally been a focus on the quantity of starch production, starch quality is of increasing importance to the end-user as consumer demands become more sophisticated and as the range of industrial applications of starch broadens. Determinants of starch quality include the amylose to amylopectin ratio, the distribution of molecular structures within these fractions, and the packaging of the starch in granules. The biochemical processes involved in the transformation of the sucrose delivered to the endosperm cytosol to starch in the amyloplast are understood in broad outline. The importance of particular isoenzymes or processes to the production of starches of specific structures are, however, not well understood. This paper reviews aspects of the physiology, biochemistry and molecular biology of starch in plants, with an emphasis on the synthesis of starch in the cereal endosperm. Progress in understanding the linkages between the molecular events in starch synthesis and developing strategies for the manipulation of starch quantity and quality in cereals are discussed. [References: 138].

4698 Morishige, DT.; Preiss, S. (1995) **LIGHT-INDUCED BIOGENESIS OF THE LIGHT-HARVESTING COMPLEXES OF PHOTOSYSTEMS I AND II - GENE EXPRESSION AND PROTEIN ACCUMULATION.** *Photosynthesis Research. 44(1-2):183-190.* English. [TEXAS A&M UNIV DEPT BIOCHEM & BIOPHYS COLLEGE STN, TX 77843 USA].

The light-harvesting complexes of Photosystems I and II contain multiple chlorophyll-carotenoid-binding proteins. The stoichiometry and topology of the LHCs is precisely defined to optimally funnel captured light energy to the reaction center. The manner in which this exact arrangement is accomplished is not known. As an initial means to understand the mechanisms involved in establishing a functional LHC, the influence of light on LHC gene expression and protein accumulation was studied during the light-induced greening of etiolated wild type and chlorophyll b-

less mutant barley seedlings. Light, involving phytochrome, promotes the expression of all LHC genes with the same relative kinetics. LHC protein accumulation closely parallels the increases observed in transcript levels. Differential accumulation of LHC transcripts or protein was not evident in wild type seedlings. Post-translational factors are likely to be involved in fine tuning the position and stoichiometry of the individual LHCs around the reaction center. [References: 53].

4699 Narasimhalu, F.; Kong, D.; Choo, TM.; Ferguson, T.; Therrien, T.; Ho, KM.; May, KW. (1995) **EFFECTS OF ENVIRONMENT AND CULTIVAR ON TOTAL MIXED LINKAGE BETA-GLUCAN CONTENT IN EASTERN AND WESTERN CANADIAN BARLEYS (HORDEUM VULGARE L) (VOL 75, PG 371, 1995).** *Canadian Journal of Plant Science. 75(3):765.* English.

4700 Nevo, E.; Pagnotta, MA.; Beiles, A.; Porceddu, E. (1995) **WHEAT STORAGE PROTEINS - GLUTENIN DNA DIVERSITY IN WILD EMMER WHEAT, TRITICUM DICOCCOIDES, IN ISRAEL AND TURKEY .3. ENVIRONMENTAL CORRELATES AND ALLOZYMIC ASSOCIATIONS.** *Theoretical & Applied Genetics. 91(3):415-420.* English. [UNIV HAIFA INST EVOLUT MT CARMEL IL-31905 HAIFA ISRAEL].

The diversity of high-molecular-weight (HMW) and low-molecular-weight (LMW) glutenin subunits in the tetraploid wild progenitor of wheat, Triticum dicoccoides, was studied at the DNA level by the polymerase chain reaction (PCR). The DNA diversity of HMW and LMW glutenins was shown to be correlated to environmental physical and biotic factors (climate, soil and pathogen resistance) and to allozyme variation. We conclude that glutenin DNA diversity is nonrandomly distributed and could be more optimally sampled in nature for future breeding programmes to improve bread quality. [References: 52].

4701 Nomura, M.; Muramoto, Y.; Yasuda, S.; Takabe, T.; Kishitani, S. (1995) **THE ACCUMULATION OF GLYCINEBETAINE DURING COLD ACCLIMATION IN EARLY AND LATE CULTIVARS OF BARLEY.** *Euphytica. 83(3):247-250.* English. [TOHOKU UNIV FAC AGR PLANT BREEDING LAB AOBA KU SENDAI MIYAGI 981 JAPAN].

Barley plants are able to accumulate glycinebetaine (betaine) at high levels in their leaves in response not only to water and salt stress but also to cold stress. Such accumulation of betaine during acclimation to cold is associated to some extent with freezing tolerance in leaves of barley plants, as previously demonstrated with near-isogenic lines that differed only in a single gene for the spring type of growth habit (Plant, Cell and Environment 17:89-95, 1994). We now present evidence that the levels of betaine accumulated during cold acclimation might be associated with the earliness or lateness of the maturity of cultivars, namely, that late cultivars accumulate more betaine than early cultivars. Moreover, the grade of the vernalization requirement of the cultivars seemed unlikely to be associated with the level of betaine accumulated during cold acclimation. However, the trait that controlled accumulation of betaine during cold acclimation was not linked with the earliness or lateness of the maturity of cultivars. The higher levels of betaine in the late cultivars might have resulted from co-selection for lateness of maturity and freezing tolerance, which is generally a requirement in the areas of Japan where such late cultivars were originally cultivated. [References: 14].

4702 Nosov, AV. (1995) **THYMIDINE KINASE IN HIGHER PLANT CELLS .1. FUNCTIONAL TOPOGRAPHY OF THYMIDINE KINASE IN THE CELL CYCLE.** *Russian Journal of Plant Physiology. 42(4):473-480.* English. [RUSSIAN ACAD SCI KA TIMIRYAZEV PLANT PHYSIOL INST BOT SKAYA 35 MOSCOW 127276 RUSSIA].

Thymidine kinase (TK, EC 2.7.1.21) activity was studied in the nuclei of cultured sugar beet (Beta vulgaris L.) cells, in the chromatin from barley (Hordeum vulgare L.) seedlings, and in the cytosol and chromatin of cultured protoplasts from tobacco (Nicotiana tabacum L.) mesophyll. The cell cycle was synchronized by blocking sugar beet cell division in the S phase or by illuminating the etiolated barley seedlings. Protoplasts synchronously passed through their cell cycle, without any external agents. Evidence is presented that TK is active in the sugar beet cells during the S phase and that the increase in TK activity in the chromatin fraction from the greening barley seedlings correlates with DNA synthesis. The onset of S phase in the protoplasts was accompanied by enhanced TK activity, at first in the cytosol, and then in the chromatin; in the latter, TK activity was maintained until the G(2) phase was completed. Chromatin-associated RNA polymerase I was a creditable index of cell physiological state. The presumable cooperation between TK and proliferating-cell nuclear antigen in DNA synthesis and reparation is under discussion. [References: 44].

4703 Oliver, DP.; Gartrell, JW.; Tiller, KG.; Correll, R.; Cozens, GD.; Youngberg, BL. (1995) **DIFFERENTIAL RESPONSES OF AUSTRALIAN WHEAT CULTIVARS TO CADMIUM CONCENTRATION IN WHEAT GRAIN.** *Australian Journal of Agricultural Research. 46(5):873-886.* English. [CSIRO DIV SOILS PMB 2 GLEN OSMOND SA 5064 AUSTRALIA].

Cadmium concentration in grain was studied for wheat cultivars grown nationally in the Interstate Wheat Variety (IWV) experiments (1988 and 1989) and cultivars grown in the Western Australian (WA) experiments (1990-1992). These experiments covered a range of differing soil and environmental conditions. The adaptation of these cultivars to changes in cadmium potential at a site was determined. Significant cultivar effects were identified, but these were less significant than the site effects. The Cd concentrations in grain exceeded the current Australian maximum permitted concentration (MPC) of 0.05 mg kg-1 at one site in the IWV experiments while the concentration exceeded the MPC at a larger proportion of sites in the WA experiments. Several trends in cultivar accumulation of Cd in grain were evident. Reeves and Kulin were found to have the highest Cd concentration at a number of sites for several years in both the IWV and WA experiments. The similar pedigrees of these two cultivars suggest that while wheat breeders were selecting for certain traits during the breeding selection process, they were inadvertently selecting for the ability to accumulate Cd. In the 1992 WA cultivar experiments, generally Aroona had the highest Cd concentration in grain. Aroona has a different pedigree to Reeves and Kulin. Several of the cultivars that were low Cd accumulators also had similar pedigrees. This indicates that there is potential for selecting lines that are low Cd accumulators to be grown in areas where Cd accumulation in grain is a problem. [References: 15].

4704 Park, Y.I.; Hong, Y.N. (Seoul National University, Seoul (Korea Republic). Department of Biology); Park, M.C. (Songsim University, Puchon (Korea Republic). Department of Biology) (1994) **Correlative changes between photosynthetic activities and chlorophyll fluorescence in wheat chloroplasts exposed to high temperature.** *Journal of Plant Biology (Korea Republic) v. 37(1) p. 37-42.* 5 illus.; 24 ref. English. (AGRIS 95-112735).

4705 Pastori, GM.; Trippi, VS. (1995) **FATTY ACID COMPOSITION IN WATER- AND OXYGEN-STRESSED LEAVES OF MAIZE AND WHEAT STRAINS.** *Phytochemistry. 40(1):45-48.* English. [ESTAC EXPTL ZAIDIN DEPT BIOQUIM BIOL CELULAR & MOLEC PLANTAS APDO 419 E-18080 GRANADA SPAIN].

Leaves of maize and wheat strains with different sensitivity to water-stress were subjected to 0.5 M mannitol and 100% O-2 for 48 hr. A higher ratio of unsaturated to saturated fatty acids was found in the resistant strains. These results suggest a close relationship between fatty acid composition and plant stress-resistance. [References: 23].

4706 Pavlovic, M.; Kuburovic, M.; Zecevic, V.; Knezevic, D. (Institut za istrazivanja u poljoprivredi "Srbija", Kragujevac (Yugoslavia). Centar za strna zita "Kragujevac") (1994) **[Parameters of technological quality and components of yield of some winter wheat varieties]. Parametri tehnoloskog kvaliteta i komponente prinosa nekih sorti ozime psenice.** *Zito hleb (Yugoslavia) v. 21(4) p. 94-96.* 3 tables; 7 ref. Serbian. (AGRIS 95-112660).

The investigation was conducted on experiment field in 1987 and 1988 year. 5 Kragujevac (Yugoslav) winter wheat cultivars were used. Obtained results showed that grain yield, plant height and 1000 grain weight in all investigated wheat cultivars have been higher in 1988 year than in 1987. During 1988 year there were more favorable climate conditions (temperature and precipitate) than in 1987 year. The stability of percent of flour was established in years of testing, indicating less dependence of this parameter on environmental factor. Content of gluten and sedimentation volume varied in year of testing. The variation of this parameters in enhancer cultivars was lower than in bread cultivars.

4707 Proudlove, M.O.; Davies, N.L.; Dawe, C.J. (BRF International, Nutfield, Redhill, Surrey RH1 4HY (United Kingdom)) (1994) **The development of routine assays for water uptake in barley.** *HGCA Project Report (United Kingdom); no. 98 34 p.* Home Grown Cereals Authority. 11 ref. English. (AGRIS 95-099000).

4708 Ram, C.; Huebner, FR.; Bietz, JA. (1995) **IDENTIFICATION OF INDIAN WHEAT VARIETIES BY REVERSED-PHASE HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY.** *Seed Science & Technology. 23(1):259-262.* English. [CCS HARYANA AGR UNIV CTR SEED TECHNOL HISAR 125004 HARYANA INDIA].

Biochemical techniques such as electrophoresis and reversed-phase high-performance liquid chromatography (RP-HPLC) have inherent advantages over methods based on seed morphological characteristics for cereal varietal identification. In wheat, the major storage proteins, gliadins, are of special interest to breeders and geneticists because of their nearly invariant expression, making them accurate genotypic indicators. Similarly, protein analysis may be useful in marketing, or for seed certification. To assess the ability of one recently-developed biochemical method to identify Indian wheats, gliadins from 13 varieties (C 306, WH 423, WH 416, WH 291, WH 283, WH 147, Sonalika, Kalyan Sona, HD 2189, HD 2428, HD 2329, HD 2009 and HD 2285) were analyzed by RP-HPLC. All varieties could be distinguished by comparing the resulting gliadin profiles, showing that RP-HPLC has considerable potential as an analytical tool to identify wheat cultivars.

4709 Rodriguez Quijano, M.; Carrillo, J.M. (Universidad Politecnica de Madrid (Espana). Escuela Tecnica Superior de Ingenieros Agronomos) (1994) **[Relationship between high molecular weight glutenin subunits and gluten strength in Spanish landraces of Triticum aestivum ssp. vulgare]. Relacion entre subunidades de gluteninas de alto peso molecular y fuerza del gluten en cultivares indigenas espanoles de Triticum aestivum ssp. vulgare.** *Investigacion Agraria. Produccion y Proteccion Vegetales (Espana) v. 9(3) p. 327-339.* 2 fig., 4 tab.; 23 ref. Spanish. (AGRIS 95-099014).

4710 Shibasaka, M.; Tanaka, A.; Tsuji, H. (Department of Botany, Faculty of Science, Kyoto University, Kyoto 606 (Japan)) (1993) **Changes in spectral properties of chlorophyll during greening of barley leaves.** *Photochemistry and Photobiology (United Kingdom) v. 58(3) p. 432-437.* 21 ref. English. (AGRIS 95-098999).

4711 Stewart, D.; Robertson, G.W.; Morrison, I.M. (Scottish Crop Research Institute, Invergowrie, Dundee DD2 5DA (United Kingdom)) (1994) **Phenolic acids dimers in the cell walls of barley.** *Biological Mass Spectrometry (United Kingdom) v. 23(2) p. 71-74.* 19 ref. English. (AGRIS 95-098995).

4712 Tatham, AS.; Shewry, PR. (1995) **THE S-POOR PROLAMINS OF WHEAT, BARLEY AND RYE [Review].** *Journal of Cereal Science. 22(1):1-16.* English. [UNIV BRISTOL LONG ASHTON RES STN DEPT AGR SCI IACR BRISTOL BS18 9AF AVON ENGLAND].

4713 Ullrich, S.E. (1993) **Coordinator's report: molecular markers/probes: monoclonal antibodies.** *Barley genetics newsletter (USA) v. 23 p. 178-181.* references. English. (AGRIS 95-112679).

4714 Vensel, WH.; Tarr, GE.; Kasarda, DD. (1995) **C-TERMINAL AND INTERNAL SEQUENCES OF A LOW MOLECULAR WEIGHT (LMW-S) TYPE OF GLUTENIN SUBUNIT.** *Cereal Chemistry. 72(4):356-359.* English. [PERSEPT BIOSYST INC 500 OLD CONNECTICUT PATH FRAMINGHAM, MA 01701 USA].

Amino acid sequences have been determined for a 25-residue C-terminal peptide and for two 9-residue peptides, all derived from cyanogen bromide fragmentation of a low molecular weight glutenin subunit (LMW-GS) with the N-terminal sequence: serine-histidine-isoleucine-proline-glycine-(LMW-s type). Previously, only N-terminal amino acid sequences have been available for LMW-s types, which appear to be the predominant LMW-GS type in hexaploid and tetraploid wheats. N-terminal sequences and complete sequences based on DNA sequences have been available, however, for subunits of the LMW-m type. These have the N-terminal sequence: methionine-glutamic acid-threonine-serine-cysteine-. All three peptides prepared from the LMW-s type subunit showed strong sequence similarities to LMW-m type subunits from hexaploid and tetraploid bread wheats. The 25-residue C-terminal fragment was 80% identical to DNA-derived sequences of specific LMW-m types. Two of the peptides contained cysteine and showed homology around these cysteines with LMW-m type sequences. The results support the basic similarity between LMW-s and LMW-m glutenin subunits. [References: 16].

4715 Vinkx, CJA.; Stevens, I.; Gruppen, H.; Grobet, PJ.; Delcour, JA. (1995) **PHYSICOCHEMICAL AND FUNCTIONAL PROPERTIES OF RYE NONSTARCH POLYSACCHARIDES .6. VARIABILITY IN THE STRUCTURE OF WATER-UNEXTRACTABLE ARABINOXYLANS.** *Cereal Chemistry. 72(4):411-418.* English. [KATHOLIEKE UNIV LEUVEN RES UNIT FOOD CHEM KARDINAAL MERCIERLAAN 92 B-3001 HEVERLEE BELGIUM].

A fraction rich in water-unextractable arabinoxylans was isolated from rye wholemeal. Arabinoxylans were solubilized by a sequence of alkaline extractions. Structural features of these arabinoxylans were investigated by methylation analysis and nuclear magnetic resonance spectroscopy. Three groups of water-unextractable arabinoxylans could be recognized, differing in extractability, solubility, and structure. The first group had an intermediate arabinose-to-xylose ratio (A/X) of 0.55-0.79 and was extractable either with saturated Ba(OH)(2) containing 1% NaBH4 or with water after saturated Ba(OH)(2) extraction. The polymers were soluble in water after neutralization of the alkaline extract, but they precipitated in saturated ammonium sulfate solution. They contained terminal arabinose residues and unsubstituted, 3-mono-, 2-mono-, and disubstituted xylose residues. A second group had an A/X of similar to 1.1 and was partly extracted with alkali; more could be extracted after delignification. This group was soluble in water and in saturated ammonium sulfate solution. Typical structural features in this arabinoxylan were: substituted arabinose residues (40% of arabinoses), terminal xylose residues (26% of xyloses), and terminal galactose residues. A third group of arabinoxylans was extractable with 1M KOH, had low water solubility after neutralization of the alkaline extract, and had an A/X of similar to 0.2. Besides arabinoxylan, beta-glucan was present in large proportions in rye cell-wall material. Glucomannan and xyloglucan were also detected. [References: 61].

4716 Wang, XJ.; Douglas, LA.; Patti, AF. (1995) **DRY MATTER PRODUCTION AND N CONTENT OF WHEAT PLANTS IN RESPONSE TO APPLICATIONS OF NITROHUMIC ACIDS.** *Agrochimica. 39(2-3):73-77.* English. [UNIV MELBOURNE SCH AGR & FORESTRY PARKVILLE VIC 3052 AUSTRALIA].

The effects of nitrohumic acid (NHA) and its ammonium salt, ammonium nitrohumate (ANH) derived from Victorian brown coal on urea-N uptake and dry matter production by wheat plants were studied in pot experiments. Results indicated that when pellets made by incorporating NHA or ANH with urea were applied to plants grown on a Rhodoxeralf, no significant benefits occurred that could not be attributed to urea alone, When similar pellets were applied to plants growing on a Calciorthid, some increases in N uptake and dry weight of plants occurred due to the presence of NHA or ANH. Part of this effect was due to the N content of the humic acids. [References: 8].

4717 Weiss, A.; Budak, N.; Baenziger, PS. (1995) **USING TRANSPIRATION TO CHARACTERIZE PLANT HEIGHT IN WINTER WHEAT IN DIFFERENT ENVIRONMENTS - A SIMULATION STUDY.** *Canadian Journal of Plant Science. 75(3):583-587.* English. [UNIV NEBRASKA DEPT AGR METEOROL LINCOLN, NE 68583 USA].

Winter wheat (Triticum aestivum L.) plant height is an important trait for the diverse environmental conditions found in the Great Plains. It has been related to seedling emergence, lodging, soil erosion, ease of harvest, crop residue and weed control. The hypothesis that transpiration, which integrates atmosphere, soil, and plant processes, could be used to characterize environmental effects on wheat plant height was tested in this research. Data from four commercial winter wheat cultivars (Arapahoe, TAM107, Vista, and Siouxland) and nine environments in Nebraska in 1992 and 1993 were used. The climatic regions represented in this study ranged from sub-humid to semiarid. To test our hypothesis, a spring wheat

growth and yield model was modified to predict plant height development (modeled as a sigmoidal function of time) in winter wheat. Daily height increment was based on the ratio of actual to potential transpiration. The model was run for these four cultivars in eight environments. Data from the ninth environment was used to estimate maximum plant height for each cultivar; a necessary input into the model. Modeled plant height predictions were in good agreement with actual measurements for all environments (R(2) = 0.80). Based on these results, we conclude that transpiration was a good indicator of environment for plant height development in winter wheat. [References: 14].

4718 Yeo, UD.; Soh, WY.; Tasaka, H.; Sakurai, N.; Kuraishi, S.; Takeda, K. (1995) **CELL WALL POLYSACCHARIDES OF CALLUS AND SUSPENSION-CULTURED CELLS FROM THREE CELLULOSE-LESS MUTANTS OF BARLEY (HORDEUM VULGARE L).** *Plant & Cell Physiology. 36(5):931-936.* English. [CHONBUK NATL UNIV COLL NAT SCI DEPT BIOL CHONJU 560756 SOUTH KOREA].

Cellulose contents of fragile culms of field-grown barley mutants were about 20% of those of corresponding isogenic normal strains, while those of calluses and suspension-cultured cells of mutants were closer to those of corresponding normal strains. Apparently, normal barley strains did not develop secondary cell walls in culture. [References: 27].

4719 Yun, S.J. (Chonbuk National University, Chonju (Korea Republic). Institute for Molecular Biology and Genetics); Chung, I.M. (Konkuk University, Seoul (Korea Republic). Institute of Agricultural Resources Development) (1995) **Response of beta-glucanases to GA3 in barley aleurone layers.** *Korean Journal of Crop Science (Korea Republic) v. 40(2) p. 250-254.* 5 illus.; 12 ref. English. (AGRIS 95-112675).

4720 Zeyen, RJ.; Bushnell, WR.; Carver, TLW.; Robbins, MP.; Clark, TA.; Boyles, DA.; Vance, CP. (1995) **INHIBITING PHENYLALANINE AMMONIA LYASE AND CINNAMYL-ALCOHOL DEHYDROGENASE SUPPRESSES MLA1 (HR) BUT NOT MLO5 (NON-HR) BARLEY POWDERY MILDEW RESISTANCES.** *Physiological & Molecular Plant Pathology. 47(2):119-140.* English. [UNIV MINNESOTA DEPT PLANT PATHOL 495 BORLAUG HALL ST PAUL, MN 55108 USA].

The effects of AOPP, an inhibitor of phenylalanine ammonia lyase (PAL) and of OH-PAS, an inhibitor of cinnamyl-alcohol dehydrogenase (CAD) on the barley powdery mildew resistances conditioned by the dominant Mla1 (hypersensitive cell death based) and the recessive mlo5 (conditioning penetration resistance without cell death) major gene alleles were determined in leaf and coleoptile tissues. The inhibitors were applied either by uptake through cut ends of detached leaves or directly to monolayers of epidermal cells dissected from coleoptiles. In leaves, both inhibitors decreased localized autofluorescence in epidermal cell walls directly beneath primary germ tubes and appressoria. With the Mla1 resistance allele both inhibitors strongly suppressed race-specific hypersensitive epidermal cell death (as indicated by whole cell autofluorescence in leaves or by cell collapse in the coleoptile epidermis). AOPP was effective at 1 mM in tissues of both leaves and coleoptiles. OH-PAS was effective at 1 mM in leaves and at 1-11 mu M in coleoptile tissue. Concomitant with the reduction in hypersensitive cell death in the coleoptile epidermis was an increase in average haustorium size and percentage of germlings producing hyphae. OH-PAS was effective when applied to the coleoptile epidermis as late as 16 h after inoculation, approximately 2 h before the onset of hypersensitive cell death. Results strongly suggest that the products of CAD activity play a direct role in stimulating events (like peroxidase activity and free radical formation) leading to programmed hypersensitive epidermal cell death conditioned by Mla1. In contrast, the recessive mlo5 resistance, which is expressed by failure of the fungus to fully penetrate barley epidermal cells and form haustoria, was unaffected in either leaves or monolayers of coleoptile epidermis by OH-PAS or AOPP. With mlo5, localized autofluorescence was reduced at attack sites by inhibitor treatment, but treatment had no effect on rates of penetration based on observations of haustorium formation. These results indicate that mlo5 resistance does not require PAL or CAD activity for its effectiveness. Therefore barley resistances due to the major Mendelian resistance alleles Mla1 (HR resistance) and mlo5 (non-HR) differ in their respective mechanisms and in the physiological bases that underlie these mechanisms. (C) 1995 Academic Press Limited [References: 52].

4721 Zhao, FJ.; Mcgrath, SP.; Crosland, AR.; Salmon, SE. (1995) **CHANGES IN THE SULPHUR STATUS OF BRITISH WHEAT GRAIN IN THE LAST DECADE, AND ITS GEOGRAPHICAL DISTRIBUTION.** *Journal of the Science of Food & Agriculture. 68(4):507-514.* English. [ROTHAMSTED EXPTL STN INST ARABLE CROPS RES DEPT SOIL SCI HARPENDEN AL5 2JQ HERTS ENGLAND].

In 1992 and 1993, respectively, 400 and 393 wheat grain samples were collected representatively from the major wheat-growing areas in Britain. Concentrations of S in the grain and the N:S ratios were determined, and the variations due to variety and geographical distribution were analysed. Grain S concentration ranged from 0.54 to 2.09, with a mean of 1.43 mg g(-1) in 1992, and from 0.80 to 1.67, with a mean of 1.26 mg g(-1) in 1993. The ranges of grain N:S ratio were 13.3-29.6, with a mean of 15.8 in 1992, and 11.5-25.9, mean 15.6 in 1993. Breadmaking varieties contained significantly greater N and S concentrations in the grain than other varieties, but only small differences were found in the N:S ratio in grain. In 1992 and 1993, 7 and 26% of the samples had a S concentration below the critical value of 1.2 mg g(-1), respectively, whereas 10 and 7% of the samples had an N:S ratio greater than the critical value of 17. In both years 2.5% of the samples satisfied both criteria of S deficiency. Comparison of the results of 1992-1993 with those of 1981-1982 (Byers et al, J Sci Food Agric 38 (1987) 151-160) showed a significant decrease in the S status of British wheat grain during the 10-12 year period. The decrease can be attributed mainly to decreased S inputs, particularly from atmospheric deposition. The pattern of geographical distribution of grain S concentrations was not as strong as it was in the 1982 survey. However, it was still apparent that grain samples with small S concentrations were located mainly in Scotland, northern England, and the west and southwest of England, whereas the largest S concentrations occurred mainly in the areas near to or down-wind of the industrial conurbations of central England. [References: 31].

4722 Zito, F.; Gough, S.; Marcato, C.; Rascio, N.; Casadoro, G. (1995) **EXPRESSION OF CHLOROPLASTIC AND CYTOSOLIC GLUTAMINE SYNTHETASE IN BARLEY LEAVES AFTER COLD-SENSITIVE BLOCKING OF BETA-CAROTENE SYNTHESIS BY AMITROLE OR MUTATION.** *Physiologia Plantarum. 94(4):535-544.* English. [UNIV PADUA DIPARTIMENTO BIOL VIA TRIESTE 75 I-35121 PADUA ITALY].

d3-Amino-1, 2, 4-triazole (amitrole) provided to germinating barley at 20 degrees C in the light led to bleached seedling leaves and photodynamic destruction of chloroplast structure, whereas normal greening and chloroplast ultrastructure was obtained when the seedlings developed in the presence of amitrole in the light at 30 degrees C. Mass spectrometric analysis of the extractable herbicide demonstrated the same content of amitrole in leaves developed at 20 and 30 degrees C. A very similar temperature-sensitive syndrome is characteristic for the nuclear gene mutant tigrina-o(34) in barley. Amitrole and the mutation were shown to inhibit the cyclization of lycopene, leading to severe deficiencies in beta-carotene and its xanthophyll derivative lutein. Besides accumulation of lycopene, also its precursors phytoene, phytofluene and xi-carotene accumulated. Inhibition of carotenoid biosynthesis by amitrole and the mutation at 20 degrees C in the light led to a strong reduction of both transcript and protein levels for chloroplastic glutamine synthetase (GS(2)) while transcript amount and protein of the cytosolic isoenzyme (GS(1)) were unaffected. At 30 degrees C increased levels of mRNA for the chloroplastic isoform GS(2) were observed in wild type, mutant and amitrole-treated seedlings, but protein levels remained unchanged. Turnover rates of the GS(2) protein were the same at 20 and 30 degrees C. This extensive translational control of chloroplastic GS(2) synthesis was also observed in a hear shock experiment, which revealed transiently increased mRNA levels for chloroplastic GS(2) but unchanged protein levels. Permissive synthesis of beta-carotene and chloroplastic glutamine synthetase (GS(2)) at 30 degrees C in the presence of amitrole or the tigrina-o(34) mutation might be due to two alternative pathways of ionone ring formation using either lycopene or neurosporene as substrates for cyclization. [References: 46].

F61 PLANT PHYSIOLOGY-NUTRITION

4723 Barriga B, Patricio; Carrasco G, Basilio; Fuentes P, Ricardo; Manquian T, Nimia; Seemann F, Peter (Universidad Austral de Chile,

Valdivia (Chile). Fac. de Ciencias Agrarias) (1993) **[Evaluation of wheat genotypes in their efficiency for phosphorus utilization in nutrient solution]. Evaluacion de genotipos de trigo en su eficiencia de utilizacion del fosforo en solucion nutritiva.** *Agro Sur (Chile) v. 21(1) p. 19-25.* 25 ref. Spanish. (AGRIS 95-099253).

4724 Boddi, B.; Oravecz, AR.; Lehoczki, E. (1995) **EFFECT OF CADMIUM ON ORGANIZATION AND PHOTOREDUCTION OF PROTOCHLOROPHYLLIDE IN DARK-GROWN LEAVES AND ETIOPLAST INNER MEMBRANE PREPARATIONS OF WHEAT.** *Photosynthetica. 31(3):411-420.* English. [LORAND EOTVOS UNIV DEPT PLANT PHYSIOL MUZEUM KRT 4-A H-1088 BUDAPEST HUNGARY].

The cadmium treatment of dark-grown leaves and isolated etioplast inner membranes of wheat resulted in a decrease of the amount of the 657 nm emitting (77 K fluorescence) protochlorophyllide (PChlide) form, a simultaneous increase of the 633 mm form and the appearance of a 641.5 nm emitting form. This effect did not occur if excess NADPH was added to the isolated membranes: these samples showed spectral properties identical to those of non-treated (control) samples. Inhibition of the PChlide phototransformation was observed in the cadmium-treated leaves and membranes, the irradiation resulted in the appearance of a small amount of chlorophyllide (Chlide) with characteristic emission band at 678 nm. If excess NADPH was added, the inhibition did not occur and flash irradiation resulted in formation of the 694 nm Chlide form similarly as in control plants. [References: 20].

4725 Bolland, MDA. (1995) **VARIATION OF PLANT-TEST PHOSPHORUS FOR INDIVIDUAL LUPIN AND WHEAT TOPS.** *Communications in Soil Science & Plant Analysis. 26(15-16):2511-2517.* English. [WESTERN AUSTRALIA DEPT AGR PLANT IND 3 BARON HAY COURT S PERTH WA 6151 AUSTRALIA].

Two field experiments measured variation of phosphorus (P) concentration in dried tops (plant-test P) of individual lupin (Lupinus angustifolius cv. Merrit) and wheat (Triticum aestivum cv. Cadoux) plants collected from random locations in experimental plots treated with different levels of superphosphate. Plant-test P for the individual tops varied by between 4 to 65% of mean values. Coefficient of variation for the 10 individual plants per plot varied from 10 to 24%. For each plot, mean plant-test P for the 10 individual tops were similar to values for bulk samples of 30 plants collected at random within the plot. It is concluded that a bulk sample of 30 lupin or wheat plant tops need to be collected from uniform areas in farmer paddocks to provide a representative estimated of the current P status of the crop. [References: 4].

4726 Fabricio, A.C. (1994) **[Supply of boron and zinc for wheat cultivars: in nutritive solution and on two soil types]. Suprimento de boro e zinco para cultivares de trigo: em solucao nutritiva e em dois tipos de solo.** Escola Superior de Agricultura Luiz de Queiroz, Piracicaba, SP (Brazil). 16 graphs; 2 tables; 69 ref. 92 p. Portuguese. (AGRIS 95-099255).

4727 Feil, B.; Fossati, D. (1995) **MINERAL COMPOSITION OF TRITICALE GRAINS AS RELATED TO GRAIN YIELD AND GRAIN PROTEIN.** *Crop Science. 35(5):1426-1431.* English. [ETH ZURICH INST PLANT SCI UNIV STR 2 CH-8092 ZURICH SWITZERLAND].

Little has been published about the composition of mineral elements in triticale (x Triticoscale Wittm.) grains. Our study deals with the following questions: (i) How do increases in grain yield, resulting from growing triticale in more productive environments or growing more productive cultivars, affect the concentrations of minerals in the grains? (ii) Do genotypes exist whose grains are exceptionally high or low in minerals? (iii) To what extent are the concentrations of protein and minerals related? To answer these questions, 10 hexaploid winter triticale lines/cultivars were grown at three locations in western Switzerland for 2 yr. Whole grains were analyzed for protein (N x 5.7), P, K, Mg, Ca, Fe, Mn, Zn, and Cu. With the exception of Mn and Zn, the variation in mineral element concentrations among lines/cultivars was as great as or greater than the variation caused by environmental factors. Except for Mg, concentrations of mineral elements were significantly lower in the year in which the grain yield was higher. Except for Ca, high grain yields of cultivars were associated with low concentrations of minerals, indicating that one-sided selection for high grain yield tends to reduce the nutritional quality of triticale grain. Concentrations of protein and minerals were positively correlated, suggesting that breeding for elevated levels of protein is likely to increase the concentrations of minerals. [References: 24].

4728 Filella, I.; Serrano, L.; Serra, J.; Penuelas, J. (1995) **EVALUATING WHEAT NITROGEN STATUS WITH CANOPY REFLECTANCE INDICES AND DISCRIMINANT ANALYSIS.** *Crop Science.* 35(5):1400-*1405.* English. [UNIV AUTONOMA BARCELONA FAC CIENCIES CREAF E-08193 BARCELONA SPAIN].

Nitrogen deficiencies can seriously reduce yield and economic returns for farmers, Remote sensing could provide inexpensive, large-area estimates of N status and be used to monitor N status since leaf chlorophyll (Chl) A content is mainly determined by N availability. The objective was to determine if remote sensing of wheat (Triticum aestivum L.) Chi A content would provide a rapid estimation of wheat N status. We measured the reflectance of a wheat crop submitted to five different fertilization treatments throughout the growth cycle, We tested several empirical reflectance indices of pigment content: reflectance at 550 nm (R550), reflectance at 680 nn (R680), three parameters of the red edge [wavelength (lambda(re)), amplitude in the first derivative of the reflectance spectra (dR(re)), and sum of amplitudes between 680 and 780 nn in the first derivative of the reflectance spectra (Sigma dR(680-780nm))], and pigment simple ratio (PSR) and normalized pigment chlorophyll index (NPCI) (indices of carotenoid/Chl ratio). We also measured leaf CN A and N content, and leaf area index. There were significant correlations between canopy Chi A content and R550, R680, and all the red edge parameters. The NPCI and PSR followed phenological evolution of the carotenoids/Chl A ratio and separated the different treatments. BY discriminant analysis based on the pigment indices reflectance at 430 nn (R430), R550, R680, lambda(re), dR(re), and NPCI, each reflectance spectrum can be assigned to a different N status class. Thus, the use of these optical techniques offers a potential for assessing N status of wheat. [References: 28].

4729 Gouzou, L.; 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 N-15-LABELLED FERTILIZER.** *European Journal of Agronomy. 4(1):47-54.* English. [UNIV NANCY 1 CTR PEDOL BIOL CNRS UPR 6831 BP 5 F-54501 VANDOEUVRE LES NANCY FRANCE].

An experiment under glasshouse conditions with a sandy soil was conducted to evaluate the effect of the inoculation of wheat (Triticum aestivum L.) roots with Bacillus polymyxa on N uptake by plants and to investigate the effect of N fertilization on the dynamics of this strain. Different treatments were considered: (i) amended (100 kg N ha(-1)) or not with N-15 labelled ammonium nitrate; (ii) inoculated (2.5 10(7) spores per seed and 0.5 10(9) spores kg(-1) soil) or not with B. polymyxa CF43. No promoting effect on wheat growth (dry yield) or N uptake was observed after inoculation under these experimental conditions; 62 per cent of the N fertilizer was assimilated by plants during the first 33 days. Inoculation had no effect on the quantity of soil adhering to the roots. Soluble organic C and inorganic N concentrations were higher in the soil adhering to the roots than in bulk soil. However, the nitrate concentration in soil adhering to the roots was influenced by inoculation at the beginning of plant growth, nitrate supply to the root system being delayed by its probable retention in the rhizosphere. Furthermore, total bacteria in roots, soil adhering to the roots and bulk soil was not affected by N fertilization. The number of B. polymyxa cells measured by an AB-ELISA method increased first in the bulk soil and later in the soil adhering to the roots after inoculation. Fertilization with N decreased the B. polymyxa population in adhering soil, competitive suppression of diazotrophs by non-fixing bacteria probably being induced by the presence of large amounts of nutrients in the rhizosphere when N was added. [References: 35].

4730 Huang, BR.; Johnson, JW.; Nesmith, DS.; Bridges, DC. (1995) **NUTRIENT ACCUMULATION AND DISTRIBUTION OF WHEAT GENOTYPES IN RESPONSE TO WATERLOGGING AND NUTRIENT SUPPLY.** *Plant & Soil. 173(1):47-54.* English. [UNIV GEORGIA DEPT SOIL & CROP SCI GEORGIA STN GRIFFIN, GA 30223 USA].

The effect of soil waterlogging and nutrient supply on plant nutrient accumulation and distribution was investigated for two genotypes of winter wheat (Triticum aestivum L.) differing in waterlogging resistance,

'Bayles' and 'Savannah'. Plants were grown in waterlogged or drained sand and fertilized with half-strength or full-strength Hoagland's solution. Waterlogging reduced the concentrations of N, P K, Mg, and Zn in leaves and stems and increased the concentrations of those elements in the root system. The effects were greater for waterlogging-sensitive Bayles than for waterlogging-resistant Savannah. Higher concentrations of Fe and Mn were found in waterlogged plants compared to the control plants for sensitive Bayles. Waterlogging increased the proportion of N and Zn in the root system and decreased that of K in stems for Bayles. The proportion of Fe increased in leaves and stems for Bayles and Savannah under waterlogged conditions, but to a greater extent for Bayles. Doubling the concentrations of all major and minor nutrient elements supplied to the waterlogged rooting medium improved plant nutrient status and enhanced plant dry matter production. [References: 23].

4731 Igamberdiev, A.U.; Bykova, N.V. (1994) **[Effect on inhibitors of electronic transport and succinate on glycin decarboxylation in wheat and maize leaves]. Vliyanie ingibitorov ehlektronnogo transporta i suktsinata na dekarboksilirovanie glitsina v list'yakh pshenitsy i kukuruzy.** *Fiziologiya rastenij (Russian Federation) v. 41(3) p. 395-398.* 20 ref. Russian. (AGRIS 95-099258).

4732 Ilik, P.; Naus, J.; Cikanek, D.; Novotny, R. (1995) **CHLOROPHYLL FLUORESCENCE CHANGES AT HIGH TEMPERATURES INDUCED BY LINEAR HEATING OF GREENING BARLEY LEAVES.** *Photosynthesis Research. 44(3):271-275.* English. [PALACKY UNIV FAC SCI DEPT EXPTL PHYS CR-77146 OLOMOUC CZECH REPUBLIC].

A relative decrease of the high temperature part (above 60 degrees C) of the chlorophyll. fluorescence temperature curve during 3 h to 10 h greening period of barley (Hordeum vulgare L.) leaves was found to be concomitant to a decrease of Chl a/b ratio and to a gradual increase of LHCP/core ratio found by electrophoresis and the ratio of granal to total length of thylakoid membranes. It is suggested that the high temperature part of the fluorescence temperature curve depends inversely on the relative amount of LHC II in thylakoid membranes. [References: 22].

4733 Kromer, S. (1995) **RESPIRATION DURING PHOTOSYNTHESIS [Review].** *Annual Review of Plant Physiology & Plant Molecular Biology. 46:45-70.* English. [UNIV OSNABRUCK LEHRSTUHL PFLANZENPHYSIOL D-49069 OSNABRUCK GERMANY].

The respiratory activity of plants in the light, measured as CO:! release from the TCA cycle or O-2 consumption by the respiratory chain, varies between 25 and 100% of the dark respiratory activity. This has been interpreted as evidence for an inhibition of respiration during photosynthesis. However, studies with specific respiratory inhibitiors have shown that oxidative phosphorylation occurs in the Light and provides the cytosol with ATP, which is required for sucrose synthesis. Respiratory activity in the light might also be required to sustain a high photosynthetic capacity and might even prevent photoinhibition. Sources of redox equivalents for oxidative phosphorylation can be photosynthetically generated, externally oxidized NADPH; photorespiratory oxidation of glycine to serine; or a partial activity of the TCA cycle. Fifty to seventy-five percent of the redox equivalents produced in the mitochondria remain in the matrix and can function in ATP syntheses. The other 25-50% are exported via the mitochondrial malate-oxaloacetate shuttle and can function in nitrate reduction in the cytosol or hydroxypyruvate reduction in the peroxisomes. [References: 114].

4734 Laurie, SH.; Tancock, NP.; Mcgrath, SP.; Sanders, JR. (1995) **INFLUENCE OF EDTA COMPLEXATION ON PLANT UPTAKE OF MANGANESE (II).** *Plant Science. 109(2):231-235.* English. [DE MONTFORT UNIV DEPT CHEM THE GATEWAY LEICESTER LE1 9BH LEICS ENGLAND].

The effect of complexation has been variously described in the literature as causing both increased and decreased Mn uptakes by plants. This paper describes short-term experiments using the radiotracer Mn-54 to monitor Mn uptake by barley plants (cv. Georgie), The results show that when the amount of complexed Mn reached similar to 45% the concentration in roots substantially increased - in line with our previous findings from a multi-element uptake study. However, for greater than 90% Mn complexation the concentration in roots had decreased slightly compared to that of 45% and 0% complexation. This variation in uptake with complexation explains the apparent discrepancies in the literature and points to mutual metal antagonism occurring under conditions of metal (Fe or Zn) deficiency, [References: 14].

4735 Nie, GY.; Long, SP.; Garcia, RL.; Kimball, BA.; Lamorte, RL.; Pinter, PJ.; Wall, GW.; Webber, AN. (1995) **EFFECTS OF FREE-AIR CO2 ENRICHMENT ON THE DEVELOPMENT OF THE PHOTOSYNTHETIC APPARATUS IN WHEAT, AS INDICATED BY CHANGES IN LEAF PROTEINS.** *Plant Cell & Environment. 18(8):855-864.* English. [UNIV ESSEX DEPT BIOL WIVENHOE PK COLCHESTER CO4 3SQ ESSEX ENGLAND].

A spring wheat crop was grown at ambient and elevated (550 mu mol mol(-1)) CO2 concentrations under free-air CO2 enrichment (FACE) in the field, Four experimental blocks, each comprising 21-m-diameter FACE and control experimental areas, were used, CO2 elevation was maintained day and night from crop emergence to final grain harvest, This experiment provided a unique opportunity to examine the hypothesis that CO2 elevation in the field would lead to acclimatory changes within the photosynthetic apparatus under open field conditions and to assess whether acclimation was affected by crop developmental stage, leaf ontogeny and leaf age, Change in the photosynthetic apparatus was assessed by measuring changes in the composition of total leaf and thylakoid polypeptides separated by SDS-PAGE, For leaves at completion of emergence of the blade, growth at the elevated CO2 concentration had no apparent effect on the amount of any of the major proteins of the photosynthetic apparatus regardless of the leaf examined, Leaf 5 on the main stem was in full sunlight at emergence, but then became shaded progressively as 3-4 further leaves formed above with continued development of the crop, By 35 d following completion of blade emergence, leaf 5 was in shade, At this point, the chlorophyll alb ratio had declined by 26% both in plants grown at the control CO2 concentration and in those grown at the elevated CO2 concentration, which is indicative of shade acclimation. The ribulose-1, 5-bisphosphate carboxylase/oxygenase (Rubisco) content declined by 45% in the control leaves, but by 60% in the leaves grown at the elevated CO2 concentration, The light- harvesting complex of photosystem II (LHCII) and the chlorophyll content showed no decrease and no difference between treatments, indicating that the decrease in Rubisco was not an effect of earlier senescence in the leaves at the elevated CO2 concentration. Following completion of the emergence of the flag-leaf blade, the elevated-CO2 treatment inhibited the further accumulation of Rubisco which was apparent in control leaves over the subsequent 14 d, From this point onwards, the flag leaves from both treatments showed a loss of Rubisco, which was far more pronounced in the elevated-CO2 treatment, so that by 36 d the Rubisco content of these leaves was just 70% of that of the controls and by 52 d it was only 20%, At 36 d, there was no decline in chlorophyll, LHCII or the chloroplast ATPase coupling factor (CFI) in the elevated CO2 concentration treatment relative to the control, By 52 d, all of these proteins showed a significant decline relative to the control, This indicates that the decreased concentration of Rubisco at this final stage probably reflected earlier senescence in the elevated-CO2 treatment, but that this was preceded by a CO2-concentration-dependent decline in Rubisco. [References: 43].

4736 Olivetti, GP.; Cumming, JR.; Etherton, B. (1995) **MEMBRANE POTENTIAL DEPOLARIZATION OF ROOT CAP CELLS PRECEDES ALUMINUM TOLERANCE IN SNAPBEAN.** *Plant Physiology. 109(1):123-129.* English. [UNIV VERMONT DEPT BOT BURLINGTON, VT 05405 USA].

Two cultivars of snapbean (Phaseolus vulgaris L.) that differ in their sensitivity to aluminum (Al) exhibited significantly different electrical responses in root cap cells when exposed to Al. Membrane potentials of the Al-tolerant cultivar Dade rapidly and significantly depolarized upon exposure to increasing Al concentrations, to a maximum depolarization of 55 mV at 150 mu M AlCl3. In contrast, membrane potentials of the Al-sensitive cultivar Romano were only slightly depolarized by increasing Al concentrations, with none of the recorded depolarizations being statistically different from controls. Further experiments with 100 mu M AlCl3 suggested that Al significantly decreased passive potassium efflux in Dade root cap cells but not in those of Romano. The addition of the K+ channel blocker tetraethylammonium chloride depolarized the membrane potential of Dade by 69 mV, in 0.1 mM K+, but did not change the

membrane potential of Romano. At higher K+ concentrations, tetraethylammonium chloride-induced depolarizations were decreased in Dade and small hyperpolarizations were found in Romano. Experiments with cyanide suggested that the membrane potential in Romano is more electrogenic in origin than in Dade. These data are consistent with a model in which Al reduces K+ efflux channel conductance in Dade root cap cells, but does not affect K+ efflux channel conductance in Romano. [References: 39].

4737 Patrick, JW.; Offler, CE. (1995) **POST-SIEVE ELEMENT TRANSPORT OF SUCROSE IN DEVELOPING SEEDS.** *Australian Journal of Plant Physiology. 22(4):681-702.* English. [UNIV NEWCASTLE DEPT BIOL SCI NEWCASTLE NSW 2308 AUSTRALIA].

Developing seeds of cereals and grain legumes have proven to be useful experimental models to examine post-sieve element assimilate transport in sink tissues. Morphologically, these seeds offer well-defined sinks in which the processes of sucrose import plus efflux and influx plus metabolism may be examined independently. In all cases, sucrose is delivered through the phloem to the maternal seed tissues. Unloading from the sieve element-companion cell complexes is symplastic. Subsequently, sucrose moves through a symplastic route to cells responsible for sucrose efflux to the seed apoplast. The efflux cells are located at, or near, the maternal/filial interface. Sucrose is retrieved from the seed apoplast by the outermost cell layers of the filial tissues. Subsequent transfer of sucrose to the sites of storage in the filial tissues is confined principally to a symplastic route. Sucrose efflux from the maternal tissues appears to be passive in cereals and energy dependent in grain legumes, possibly through a sucrose/proton antiport system. Sucrose influx across the plasma membranes of the filial cells is energy dependent and, for grain legumes, is energy coupled through a sucrose/proton symporter. Studies on the control of post-sieve element transport of sucrose have focused largely on the membrane transport steps. The role of phytohormones as modulators of sucrose transport is uncertain. In grain legumes, efflux from the maternal cells could be regulated by rates of sucrose utilisation in the filial tissues through a turgor homeostat mechanism located in the efflux cells. [References: 150].

4738 Pavlov, A.N. (1994) **[Significance of basic elements of mineral nutrition in forming wheat grain with different composition of protein]. Znachenie osnovnykh ehlementov mineral'nogo pitaniya v formirovanii zerna pshenitsy s razlichnym sostavom belka.** *Agrokhimiya (Russian Federation) (no.5) p. 15-21.* 14 ref. Russian. (AGRIS 95-099257).

4739 Popova, TN.; Igamberdiev, AU.; Velichko, YI. (1995) **METABOLISM OF [5-C-14] GLUTAMATE IN PLANTS AFTER INHIBITING ELECTRON TRANSPORT IN MITOCHONDRIA.** *Russian Journal of Plant Physiology. 42(4):500-508.* English. [VORONEZH STATE UNIV FAC BIOL & SOIL SCI DEPT PLANT PHYSIOL & BIOCHEM UNIV SKAYA PL 1 VORONEZH 394693 RUSSIA].

Metabolic conversions of [5-C-14] glutamate in leaves of wheat (Triticum aestivum L.) and maize (Zea mays L.) were studied before and after inhibiting the electron transfer in cyanide-sensitive and cyanide-resistant electron transport chains. Analysis of radiochromatographic data showed that the electron transport inhibitors stimulated formation of gamma-aminobutyric acid, succinate, and fumarate; this effect was caused by accelerated operation of the gamma-aminobutyric route shunting the tricarboxylic acid cycle. Glutamate decarboxylase (EC 4.1.1.15) was activated, particularly, under conditions promoting the activity of extraglyoxysomal isocitrate lyase (EC 4.1.3.1); these findings suggest that the synthesis of isocitrate from succinate and glyoxylate is coordinated with operation of the gamma-aminobutyric shunting route. The isotopic label was also incorporated in proline, arginine, tyrosine, alanine, and glycolate, i.e., intermediates that are related to glutamate, succinate, and gamma-aminobutyric acid and are accumulated in plants under stress conditions. It is concluded that inhibition of mitochondrial electron transport accelerates metabolization of glutamate via compensatory pathways, gamma-aminobutyric shunting route, in particular. Redistribution of metabolic pathways permits accumulation of readily mobilized substrates of tricarboxylic acid cycle, when this cycle is inhibited by interrupted electron transport. [References: 26].

4740 Radyuk, M.S.; Fradkin, L.I. (1994) **[Effect of 5-aminolevulin acid in high concentration on plastid structure and spectrum properties of protochlorophyllid in barley leaves]. Vliyanie 5-aminolevulinovoj kisloty v vysokoj kontsentratsii na strukturu plastid i spektral'nye svojstva protokhlorofillida v list'yakh yachmenya.** *Fiziologiya rastenij (Russian Federation) v. 41(3) p. 404-408.* 15 ref. Russian. (AGRIS 95-099246).

4741 Savchenko, GE.; Klyuchareva, EA.; Abramchik, LM.; Serdyuchenko, EV.; Minkov, IN.; Chaika, MT. (1995) **PROTOCHLOROPHYLLIDE OXIDOREDUCTASE AND CHLOROPHYLL BIOSYNTHESIS IN GREENING BARLEY SEEDLINGS.** *Russian Journal of Plant Physiology. 42(4):492-499.* English. [BYELARUSSIAN ACAD SCI INST PHOTOBIOL SKORINY 27 MINSK 220733 BYELARUS].

The content and extent of photodestruction of NADPH:protochlorophyllide oxidoreductase (PCR) as well as chlorophyll accumulation after illumination in barley (Hordeum vulgare L.) seedlings were determined as dependent on the length of etiolation period. The PCR content was tested by immunoassay. In the etiolated seedlings, we observed an age-dependent increase in PCR content and the enrichment of the PCR photoactive complex with protochlorophyllide (PChlde) in the fraction of prolamellar bodies from the first leaf. Such an etiolated leaf also exhibited an age-dependent enhancement of enzyme photodestruction under illumination (3500 lx, 3.5 h) and a decrease in both the rate and level of chlorophyll accumulation. In the coleoptiles of etiolated seedlings, incapable of synthesizing the PChlde, a protein identical to PCR and nonresistant to photodestruction was found. At the same time, PCR was detected in the leaves and coleoptiles of plants greening under the light (16 h)/darkness (8 h) regime. Chlorophyll biosynthesis is suggested to be controlled only by PCR integrated into the multienzyme system participating in pigment biosynthesis; such a system is assembled under illumination and protects the PCR against photodestruction. Such a possibility of PCR integration into this system declines with etiolation time and depends on the type of plastid biogenesis. [References: 25].

4742 Spolidorio, E.S. (1994) **[Effects of boron on wheat (Triticum aestivum L.) production and on 45calcium uptake]. Efeito do boro na producao de trigo (Triticum aestivum L.) e na absorcao de 45calcio.** Escola Superior de Agricultura Luiz de Queiroz, Piracicaba, SP (Brazil). 10 tables; 73 ref. 63 p. Portuguese. (AGRIS 95-099254).

4743 Szmigiel, A. (Akademia Rolnicza, Krakow (Poland). Katedra Szczegolowej Uprawy Roslin) (1994) **[Utilization of nitrogen from the ammonium nitrate by winter wheat]. Wykorzystanie azotu z saletry amonowej przez pszenice ozima.** *Fragmenta Agronomica (Poland) v. 11(1) p. 38-44.* 3 fig., 2 tables; 8 ref. Polish. (AGRIS 95-099256).

The investigation was carried out on brown soil in a wheatland region, in a two-factorial field experiment. Nitrogen taken up with straw and grain yield amounted to 133-173 kg/ha and included 11-20 percent of N from ammonium nitrate. The level of nitrogen utilization depending on the wheat variety and fertilization level varied from 25 to 43 percent.

4744 Vonwiren, N.; Romheld, V.; Shioiri, T.; Marschner, H. (1995) **COMPETITION BETWEEN MICRO-ORGANISMS AND ROOTS OF BARLEY AND SORGHUM FOR IRON ACCUMULATED IN THE ROOT APOPLASM.** *New Phytologist. 130(4):511-521.* English. [INRA ENSA BIOCHIM & PHYSIOL VEGETALES LAB 1 PL VIALA F-34000 MONTPELLIER FRANCE].

Graminaceous plant species respond to iron (Fe)-deficiency stress by enhancing the release of phytosiderophores from the roots and the uptake of Fe-phytosiderophores. For studying the mobilization and uptake of apoplasmic root Fe by barley (inherently high phytosiderophore release) and sorghum (inherently low phytosiderophore release) in axenic and nonaxenic (inoculated) nutrient solution, Fe pools in the root apoplasm were loaded during plant preculture with 10(-4) M Fe(III)-EDTA. After 27 d growth in Fe-deficient nutrient solution, inoculated barley plants developed moderate Fe-deficiency chlorosis compared with the less chlorotic axenic plants. In inoculated plants, recovery of phytosiderophores and mobilization of apoplasmic root Fe tended to be slightly lower than in axenic plants, and in both treatments apoplasmic root Fe was completely depleted at harvest. As determined by the nonsoluble Fe fraction (> 0.2 mu m) in the nutrient solution and at the rhizoplane, the microbial uptake and

immobilization of apoplasmic root Fe was estimated at about 3% of the total amount of apoplasmic root Fe after preculture and at less than 10% of plant Fe uptake. Under axenic conditions, Fe-deficient sorghum also depleted apoplasmic root Fe and developed moderate Fe-deficiency chlorosis, although phytosiderophore recovery was 5-10-fold lower than in barley. By contrast, in inoculated sorghum plants, phytosiderophore recovery and Fe mobilization were extremely low. At harvest, in inoculated sorghum plants apoplasmic Fe pools were still considerably loaded and plant Fe uptake was c. 60% lower than that of axenic plants, resulting in severe Fe-deficiency chlorosis. Thus, in Fe-deficient sorghum plants, the lower rate of phytosiderophore release and its degradation restricted an efficient mobilization of apoplasmic root Fe in the presence of micro-organisms. In barley, however, the higher rate of phytosiderophore release allowed a complete mobilization of apoplasmic root Fe even in inoculated nutrient solution. Furthermore, the results show that the dominating effect of micro-organisms in their competition with barley and sorghum for apoplasmic root Fe is the degradation of phytosiderophores rather than the immobilization or uptake of Fe. [References: 31].

4745 Watanabe, N.; Naruse, J.; Austin, RB.; Morgan, CL. (1995) **VARIATION IN THYLAKOID PROTEINS AND PHOTOSYNTHESIS IN SYRIAN LANDRACES OF BARLEY.** *Euphytica. 82(3):213-220.* English. [GIFU UNIV FAC AGR GIFU 50111 JAPAN].

Barley breeders at ICARDA have observed that genotypes adapted to dry regions have leaves which are lighter in colour than those of unadapted ones. We measured photosynthesis, chlorophyll content and chlorophyll a:b ratios in two sets of genotypes which had previously been observed to have either light green or dark green leaves when grown in the field. Thylakoid membranes were also extracted and the proteins analysed on SDS-PAGE gels. The light leaf colour was associated with a higher chlorophyll a:b ratio. This was a measure of a reduction in the amount of antenna chlorophyll compared to that in the core complex of PSII. Genotypes with light green leaves had consistently less chlorophyll per unit leaf area and lower photosynthetic rates per unit area than those with dark green leaves. It is suggested that these features of light green leaves may confer the ability to adapt to high levels of irradiance under drought conditions. This ability may result from a high rate of photosynthetic electron transport through each PSII reaction centre, thus reducing the risk of damage from the overexcitation of these centres. [References: 25].

4746 Wieneke, J. (1995) **A CONTRIBUTION TO THE REPRESSING EFFECT OF AMMONIUM ON NITRATE UPTAKE.** *Zeitschrift fur Pflanzenernahrung und Bodenkunde. 158(4):407-409.* English. [KFA JULICH GMBH FORSCHUNGSZENTRUM INST RADIOAGRON POSTFACH 1913 D-52425 JULICH GERMANY].

The instantaneous impairing effect of 0.5 mM NH4+ on (NO3)-N-13 influx/net uptake and the early kinetics of (NH4+)-N-13 influx are demonstrated in experiments with barley and squash seedlings. Barley was found to have a high constitutive NH4+ uptake capacity in contrast to squash where NH4+ pretreatment appeared to accelerate the uptake after a certain lag phase. [References: 7].

4747 Xi, YX. (1995) **NACL-INDUCED AMOEBOID PLASTIDS AND MITOCHONDRIA IN MERISTEMATIC CELLS OF BARLEY ROOTS.** *Biologia Plantarum. 37(3):363-369.* English. [SHANDONG UNIV DEPT BOT SHANDONG PEOPLES REPUBLIC OF CHINA].

The barley (Hordeum vulgare L.) seeds were germinated in the non-saline conditions after 12 h imbibition in 2 % of NaCl solution. The results of treatment were: (I) the membrane system in meristematic cells of root tips developed well; (2) many profiles of endoplasmic reticulum and Golgi bodies appeared; and (3) the quantities of amoeboid plastids and amoeboid mitochondria increased. Thus the inhibitory effects of short-term NaCl stress on plants were reversible, and simultaneously NaCl treatment enhanced the metabolic activities in cells. The amoeboid form may be an adaptive form of plastids or mitochondria to an enhanced metabolic activity.

4748 Yamamori, M.; Nakamura, T.; Nagamine, T. (1995) **POLYMORPHISM OF TWO WAXY PROTEINS IN THE EMMER GROUP OF TETRAPLOID WHEAT, TRITICUM DICOCCOIDES, T-DICOCCUM, AND T-DURUM.** *Plant Breeding-Zeitschrift fur Pflanzenzuchtung. 114(3):215-218.* English. [JAPAN INT RES CTR AGR SCI OKINAWA SUBTROP STN ISHIGAKI OKINAWA 907 JAPAN].

Gel-electrophoretic analyses detected polymorphism of two waxy (Wx) proteins, Wx-A1 and Wx-B1, in 334 accessions of the emmer group of tetraploid wheat, Triticum dicoccoides, T. dicoccum and T. durum. The null allele for the Wx-A1 protein (Wx-A1b) was found in one accession of T. dicoccoides and seven of T. dicoccum, but it was not present in those T. durum accessions analysed. The null allele for the Wx-B1 protein (Wx-B1b) did not occur in three emmer-wheat species. Wx-A1 and Wx-B1 proteins showing alteration in mobility in SDS-PAGE gel or in isoelectric points were found in five accessions and considered to be the products of new alleles, Wx-A1d, Wx-A1e and/or Wx-B1d Densitometric analysis of Wx protein bands revealed that Wx-A1 was present in smaller amounts than Wx-B1 in almost all accessions. [References: 21].

4749 Zaborin, AV.; Nikitishen, VI. (1995) **SOIL WATER UTILIZATION BY WINTER WHEAT UNDER VARIOUS CONDITIONS OF MINERAL NUTRITION.** *Eurasian Soil Science. 27(2):84-92.* English. [RUSSIAN ACAD SCI INST SOIL SCI & PHOTOSYNTH PUSHCHINO 142292 RUSSIA].

The optimization of winter wheat mineral nutrition level by fertilizers application favors the development of plants, which are able to completely utilize soil moisture pool from 1 m layer. In this way, they get adapted to the stress impact of droughts and have minimum losses in yield. [References: 32].

F62 PLANT PHYSIOLOGY-GROWTH AND DEVELOPMENT

4750 Belimov, AA.; Kunakova, AM.; Vasilyeva, ND.; Gruzdeva, EV.; Vorobiev, NI.; Kojemiakov, AP.; Khamova, OF.; Postavskaya, SM. (1995) **RELATIONSHIP BETWEEN SURVIVAL RATES OF ASSOCIATIVE NITROGEN-FIXERS ON ROOTS AND YIELD RESPONSE OF PLANTS TO INOCULATION.** *FEMS Microbiology Ecology. 17(3):187-196.* English. [RES INST AGR MICROBIOL PODBELSKY SH 3 PUSHCHINO 189620 RUSSIA].

The population dynamics of associative nitrogen-fixers Azospirillum lipoferum 137, Arthrobacter mysorens 7, Flavobacterium sp. L30 and phosphate-solubilizing strain Agrobacterium radiobacter 10 in soil and the rhizoplane of inoculated plants was studied in pot and field experiments. All of the present strains were able to actively colonize the rhizoplane of barley, wheat, oat, tomatoes, rape, and alfalfa. For the most part the population size and dynamics of introduced bacteria depended only slightly on the plant genotype and soil conditions. The overall pictures of survival of the strains in soil and on plant roots were similar. The reliable effect of inoculation on plants was observed only in individual cases. No correlation was established between survival of introduced bacteria and their effect on plant development. It was concluded that the influence of plants on survival of bacteria was not specific. In contrast, the plant response to inoculation was conditioned to a greater extent by the plant genotype. [References: 33].

4751 BHARTI.; Rajam, MV. (1995) **EFFECTS OF THE POLYAMINE BIOSYNTHESIS INHIBITOR DIFLUOROMETHYLORNITHINE ON GROWTH, POLYAMINE LEVELS, CHROMOSOME BEHAVIOUR AND POLYGENIC TRAITS IN WHEAT (TRITICUM AESTIVUM L).** *Annals of Botany. 76(3):297-301.* English. [UNIV DELHI DEPT GENET S CAMPUS BENITO JUAREZ RD NEW DELHI 110021 INDIA].

Specific inhibition of fungal polyamine (PA) biosynthesis by DL-alpha-difluoromethylomithine (DFMO, an inhibitor of ornithine decarboxylase) has proved to be a novel and promising approach for the control of several fungal plant infections. However, the effects of application of DFMO on the physiology and cytogenetics of the host plant has not been studied in depth. We accordingly undertook these experiments on wheat (Triticum aestivum L. cv. Agra local) which show that up to 5 mM DFMO had no significant effect on growth, chlorophyll content, cellular PA levels, chromosome behaviour, pollen fertility and polygenic traits of wheat plants; in fact, it caused a significant increase in growth, chlorophyll content, PA levels and yield in some of the treatments. However, the highest concentration of DFMO (10 mM) reduced seedling growth and PA levels, and occasionally induced some chromosomal alterations such as unoriented chromosomes at metaphase and anaphase in root cells. Further,

other PA inhibitors, methylglyoxal bis (guanylhydrazone) (MGBG) and cyclohexylamine (CHA) even at 10 mM did nor affect the seedling growth, except DL-alpha-difluoromethylarginine (DFMA-5 and 10 mM) which induced significant reduction in growth of the seedlings. These observations suggest that DFMO could be safely used as a protectant against fungal plant diseases without affecting the host plant, since many fungal infections reported so far are controllable by 1 mM DFMO or lower concentrations. (C) 1995 Annals of Botany Company [References: 35].

4752 Bindi, M.; Porter, JR.; Miglietta, F. (1995) **COMPARISON OF MODELS TO SIMULATE LEAF APPEARANCE IN WHEAT.** *European Journal of Agronomy. 4(1):15-25.* English. [ACCAD GEORGOFILI CTR STUDIO APPLICAZ INFORMAT AGR PIAZZALE CASCINE 18 I-50144 FLORENCE ITALY].

Prediction on of leaf appearance in cereals is important for modelling canopy development and timing crop management practices. Four models which aim to predict leaf emergence on the basis of temperature and, in three cases, photoperiod are compared against independent data from a wide range of sites, sowing dates and cultivars of spring and winter wheat. Three of the models behaved bery similarly and had root mean square errors of the order of one leaf in their prediction of leaf appearance. The fourth model performed better in predicting differences in leaf appearance for different sowing dates than it did for latitudes. The prediction of the day of emergence of leaf number seven followed a similar response to that of leaf appearance. These results are discussed in terms of the hypothesised relationships between temperature, photoperiod and ontogeny within the models. [References: 39].

4753 Bounaix, C.; Doumas, P. (1995) **DEVELOPMENT OF A ONE-STEP ENZYME IMMUNOASSAY FOR THE QUANTITATION OF GIBBERELLIN A(3) IN BARLEY SEEDS.** *Plant Growth Regulation. 17(1):7-13.* English. [BIOTEC CTR 12 AVE CONCYR F-45160 ARDON FRANCE].

The development of a sensitive and specific enzyme immunoassay for GA(3) is reported. This method was based on the use of peroxidase labelled GA(3) and immobilized antibodies. In order to obtain a rapid immunoassay, several steps of purification were analyzed to show their necessity. Barley seed extracts were assayed at different steps of purification to exhibit the effect of extract components on the assay. It was demonstrated that HPLC had to be performed when a selective quantitation of GA(3) was required. This assay allowed GA(3) to be measured with reproducibility as its unmethylated form and the quantitation of GA(3) in barley seeds with this enzyme immunoassay was correlated to a GC-MS method. [References: 17].

4754 Christen, O.; Sieling, K.; Richterharder, H.; Hanus, H. (1995) **EFFECTS OF TEMPORARY WATER STRESS BEFORE ANTHESIS ON GROWTH, DEVELOPMENT AND GRAIN YIELD OF SPRING WHEAT.** *European Journal of Agronomy. 4(1):27-36.* English. [CHRISTIAN ALBRECHTS UNIV KIEL INST CROP SCI & PLANT BREEDING OLSHAUSENSTR 40 D-24118 KIEL GERMANY].

Soil water availability can limit grain yields of spring wheat in humid climates. The objective of this study was to quantify the effect of temporary water shortage at three stages during the development, i.e. stem elongation to flag leaf stage (WS1), flag leaf stage to ear emergence (WS2) and ear emergence to anthesis (WS3) on the growth, development and grain yield of spring wheat with special emphasis on the interaction between cultivars and nitrogen treatments. A pot experiment with controlled water supply and rain shelters was conducted in 1984 and 1985 in Kiel, NW Germany. The largest relative effect of a temporary water stress on crop development occurred after the first treatment period, EC 31 to 39 (Zadoks scale). Fresh weight, dry weight and the number of tillers per plant as well as the apex length of the second category tillers were reduced compared with the untreated control. After rewatering, the differences diminished and eventually plants which were subjected to the WS1 treatment produced more tillers than the control. The largest yield decrease, associated with a reduced number of kernels per ear, was observed after the WS3 treatment. The two other treatments caused a yield increase due to a compensatory increase in the number of kernels per ear in the second category tillers. Additional nitrogen partly compensated for the effect of a temporary water shortage at WS1 or WS2 by increasing the single ear yield of the second category shoots. [References: 37].

4755 Crook, MJ.; Ennos, AR. (1995) **THE EFFECT OF NITROGEN AND GROWTH REGULATORS ON STEM AND ROOT CHARACTERISTICS ASSOCIATED WITH LODGING IN TWO CULTIVARS OF WINTER WHEAT.** *Journal of Experimental Botany. 46(289):931-938.* English. [UNIV MANCHESTER SCH BIOL SCI STOPFORD BLDG OXFORD RD MANCHESTER M13 9PT LANCS ENGLAND].

The effects of nitrogen and plant growth regulators (stem shorteners) on root and shoot characteristics associated with lodging resistance were investigated in two winter wheat (Triticum aestivum L.) cultivars of contrasting lodging resistance: the susceptible Galahad and the resistant Hereward, The morphology and mechanical strength of the stems and anchorage systems grown at two levels of nitrogen and with or without growth regulators were measured and related to the incidence of lodging recorded in a field trial. In both cultivars high levels of nitrogen increased the height of the stem, thereby increasing the 'self-weight' moment transmitted into the ground and weakened both the stems and the anchorage coronal roots. As a result, the anchorage strength was also reduced, plants failing in the root system in simulated lodging tests. Growth regulators, in contrast, had little effect on the bending strength of the shoots and root systems, but reduced plant height so that the overturning moments generated by the weight of the shoot were less. There were also differences between cultivars: Galahad plants had weaker anchorage due to the smaller number and lower strength of the coronal roots. The morphological and mechanical measures were used to calculate a safety factor against both stem and root lodging. Five factors were found to influence the safety factors, these were: cultivar type, the type of lodging, the rate of nitrogen and growth regulator application, and time, being lowest in Galahad plants at high levels of nitrogen and without growth regulators and at grain filling when the ears were heaviest. This was consistent with the observed pattern of lodging: root lodging occurred at grain filling and only in Galahad which had been treated with high nitrogen rates, most strongly in plants without growth regulators. [References: 22].

4756 Daniels, A.; Papaikonomou, M.; Dyer, PS.; Lucas, JA. (1995) **INFECTION OF WHEAT SEEDLINGS BY ASCOSPORES OF TAPESIA YALLUNDAE - MORPHOLOGY OF THE INFECTION PROCESS AND EVIDENCE FOR RECOMBINATION.** *Phytopathology. 85(8):918-927.* English. [AGREVO UK LTD CHESTERFORD PK SAFFRON WALDEN CB10 1XL ESSEX ENGLAND].

The infectivity to wheat seedlings of ascospores from apothecia of Tapesia yallundae grown in vitro was demonstrated for the first time. The infection process from spore adhesion to lesion formation was monitored using low-temperature scanning electron microscopy and was similar to that observed for conidia of the anamorph, Pseudocercosporeila herpotrichoides. Mycelium isolated from lesions was characterized using randomly amplified polymorphic DNA (RAPD) markers and was compared to DNA amplification patterns obtained for parental isolates from which the teleomorph was induced. Recombination was demonstrated in all but one lesion from which mycelium was successfully reisolated. A high proportion of reisolates had unique RAPD profiles, indicative of novel genotypes. The implications for pathogenic variation and the development of fungicide resistance in the field are discussed. [References: 31].

4757 Dong, B.; Rengel, Z.; Graham, RD. (1995) **EFFECTS OF HERBICIDE CHLORSULFURON ON GROWTH AND NUTRIENT UPTAKE PARAMETERS OF WHEAT GENOTYPES DIFFERING IN ZN-EFFICIENCY.** *Plant & Soil. 173(2):275-282.* English. [UNIV ADELAIDE WAITE AGR RES INST DEPT PLANT SCI GLEN OSMOND SA 5064 AUSTRALIA].

Chlorsulfuron has been reported to induce and aggravate Zn and Cu deficiency in wheat when applied to crops grown on soils with low availability of these micronutrients. In the present study, the effect of chlorsulfuron on the growth of three wheat genotypes (Triticum aestivum L., cvs Excalibur and Gatcher, and T. turgidum conv. durum (Desf.) McKay cv Durati) differing in zinc efficiency was examined in Zn-deficient sandy soil fertilised with 0 or 0.8 mg Zn kg(-1) soil. Excalibur has previously been identified as the Zn- efficient genotype which can take up more Zn and has higher yield in soils with low plant-available Zn, while catcher and especially Durati are Zn-inefficient genotypes. Chlorsulfuron reduced the

shoot dry weight but not root dry weight. Zn concentration and content in shoots and roots were reduced by chlorsulfuron when applied with 0.8 mg Zn kg(-1) soil. Copper concentration was reduced by Chlorsulfuron in roots but not in shoots. Chlorsulfuron reduced the growth rate of the third leaf, decreased the total length of roots (especially the length of fine roots with diameter less than or equal to 0.2 mm), and increased the average root diameter, more so in the Zn-inefficient genotype Durati than in the other two genotypes. Gatcher is the genotype most tolerant to chlorsulfuron among the three wheat genotypes judged by its root system being less affected by chlorsulfuron. Excalibur grew well at the three-leaf stage (growth rate of the third leaf was not significantly inhibited by chlorsulfuron) but not better than Gatcher later because of inhibition of root growth by chlorsulfuron. The results indicate that Zn-efficiency trait of plants may contribute to the tolerance to chlorsulfuron but still there are other mechanisms involved. The reduced content of Zn or Cu may be a consequence of reduced growth of plant roots and alteration of root geometry or morphology because the net uptake rates (based on root surface area) of these micronutrients were not reduced by chlorsulfuron. [References: 24].

4758 Eagles, HA.; Bedggood, AG.; Panozzo, JF.; Martin, PJ. (1995) **CULTIVAR AND ENVIRONMENTAL EFFECTS ON MALTING QUALITY IN BARLEY.** *Australian Journal of Agricultural Research. 46(5):831-844.* English. [VICTORIAN INST DRYLAND AGR DEPT AGR PB 260 HORSHAM VIC 3401 AUSTRALIA].

Improvements in malting quality are important if barley from south-eastern Australia is to remain competitive on export markets. Grain is desired that will produce high levels of malt extract and diastatic power but has moderate levels of grain protein. To examine cultivar and environmental effects, especially nitrogen (N) fertilizer, on levels of malting quality parameters and their correlations, seven cultivars of barley were grown in a fallow and pea stubble rotation with five levels of N fertilizer in the Wimmera region of Victoria in 1990 and 1991. The first season was relatively dry and warm, while the second was wetter and cooler. Grain yield and malt extract were markedly lower in 1990 than 1991, and grain protein concentration, grain screenings and diastatic power were significantly higher. Grain protein and diastatic power increased almost linearly with increasing N application, with a higher rate of increase in 1990 than in 1991. Malt extract declined almost linearly with increasing N application, but the change in rate of decline between seasons was less than the change of rate of increase of grain protein. Environmental correlations between protein concentration and malt extract, and between malt extract and diastatic power, were negative. They were close to -1.0 when the environmental factor varying was restricted to N fertilizer, but were of a smaller absolute magnitude when seasons and rotations were also allowed to vary. In contrast, genotypic correlations were of intermediate magnitude. Broad-sense heritabilities for malt extract and diastatic power were relatively high, even with such contrasting seasons. This indicates that it should be possible to develop cultivars for south-eastern Australia which have high malt extract and high diastatic power at low protein levels. However, applications of N fertilizer that raise grain protein concentration will reduce malt extract, with the effect much greater in drier, warmer seasons. [References: 37].

4759 Erwin, JE.; Heins, RD. (1995) **THERMOMORPHOGENIC RESPONSES IN STEM AND LEAF DEVELOPMENT.** *Hortscience. 30(5):940-949.* English. [UNIV MINNESOTA DEPT HORT SCI ST PAUL, MN 55108 USA].

4760 Hamada, AM.; Khulaef, EM. (1995) **EFFECTS OF SALINITY AND HEAT-SHOCK ON WHEAT SEEDLING GROWTH AND CONTENT OF CARBOHYDRATES, PROTEINS AND AMINO ACIDS.** *Biologia Plantarum. 37(3):399-404.* English. [ASSIUT UNIV FAC SCI DEPT BOT ASSIUT 71516 EGYPT].

The effects of salinity (0, 50, 100, 150, and 200 mM NaCl) and heat-shock (42 degrees C) and their interactions on germination, seedling growth, and some relevant metabolic changes of two cultivars (cv. Giza 155 and cv. Stork) of wheat (Triticum vulgaris L.) were studied. Germination studies indicate that plants tolerated salinity up to 100 mM NaCl. The lengths of roots and shoots and their water content, as well as fresh and dry matter yield of cv. Giza 155 seedlings remained more or less unchanged up to 100 mM NaCl and of cv. Stork up to 50 mM NaCl. Salinity induced progressive increase in soluble carbohydrates, soluble proteins and proline in cv. Giza 155 and in soluble proteins, proline and other free amino acids in cv. Stork. However, under the higher salinity levels, in cv. Giza 155 increase in soluble carbohydrates was accompanied by lose in other free amino acids, whereas in cv. Stork an opposite effect was obtained. Heat-shock treatment (42 degrees C for 24 h) induced a significant decrease in the final germination percentage, the shoot and root lengths, fresh matter yield and the water content. The dry matter yield of the two cultivars was considerably increased as compared with the corresponding treatments with NaCl only. Heat-shock treatment resulted in a significant increase in the amount of soluble carbohydrates and proline in salt treated seedlings of both cultivars. The pattern of changes in amino acids was opposite to that of soluble proteins, indicating that the increase in soluble proteins was at the expense of other amino acids in cv. Giza 155 and vice versa in cv. Stork.

4761 Hunt, LA.; Pararajasingham, S. (1995) **CROPSIM-WHEAT - A MODEL DESCRIBING THE GROWTH AND DEVELOPMENT OF WHEAT.** *Canadian Journal of Plant Science. 75(3):619-632.* English. [UNIV GUELPH DEPT CROP SCI GUELPH ON N1G 2W1 CANADA].

Crop simulation models consolidate mathematical representations of the various physiological processes underlying crop growth and development into an entity that can be used to predict the outcome of various crop, soil and weather scenarios. For wheat, a number of simulation models are already available, but most of these do not appear to be set-up to facilitate easy comparison of model outputs with experimental data, to allow easy modification for new cultivars, and to facilitate the addition of disease routines, an aspect necessary for models to be useful in the general field situation. Cropsim-wheat was developed to help overcome some of these deficiencies. The model assumes that a crop consists of a collection of uniform plants, and performs calculations on a daily basis. It is driven by daily weather data dealing with solar radiation receipt, maximum and minimum temperatures, and precipitation. Water and nitrogen balance subroutines are included, and the rate of various crop processes is modulated through the use of multipliers that reflect the water and nitrogen states of the crop. Developmental processes are simulated using the concept of "biological days", a time measure that equates to chronological days under optimum conditions. The phases into which the life-cycle is broken relate closely to those in the widely used "Zadoks" scale. Dry matter accumulation is calculated from intercepted radiation, and distributed largely on the basis of demand. A minimum fraction of daily assimilate, however, is reserved for root growth. Leaf area is computed on the basis of potential leaf size and available dry matter, whereas stem and spike areas are calculated from the stem and spike weights. Both leaf and stem area are used in calculating radiation interception. Critical stresses, water saturation during early seedling growth and low temperature during the winter period, can result in plant death. Low temperatures, when they occur around heading, can also result in sterility and reduced grain number. The model performance has been compared with datasets from North America and Europe, and results of these comparisons will be conveyed in companion publications. The model has been set-up, however, on the premise that model development should be a continuing process as new datasets become available and new applications are contemplated. With this in mind, it has been built to use file structures that facilitate the handling and storage of field data, and the easy comparison of field and simulated data. It should thus be useable by experimenters as a tool to help in the analysis of field studies. [References: 68].

4762 Husted, S.; Schjoerring, JK. (1995) **A COMPUTER-CONTROLLED SYSTEM FOR STUDYING AMMONIA EXCHANGE, PHOTOSYNTHESIS AND TRANSPIRATION OF PLANT CANOPIES GROWING UNDER CONTROLLED ENVIRONMENTAL CONDITIONS.** *Plant Cell & Environment. 18(9):1070-1077.* English. [ROYAL VET & AGR UNIV DEPT AGR SCI PLANT NUTR LAB THORVALDSENSVEJ 40 DK-1871 FREDERIKSBERG C DENMARK].

A fully automatic growth chamber system was built in order to study NH3 exchange and NH3 compensation points of plant canopies growing under controlled environmental conditions in which atmospheric NH3 concentrations corresponded to those naturally occurring over terrestrial ecosystems. The system included plant cuvettes with separate root and shoot compartments constructed of coated polycarbonate, This material

did not change the spectral composition of photosynthetically active light and had a low adsorption of NH3 and water vapour. Atmospheric NH3 concentrations in the inlet of the cuvettes were controlled by mass-flow controllers. Inlet and outlet NH3 concentrations were measured on-line with a modified chemiluminescent NH3 monitor. At airflow rates per unit leaf area of about 3 dm(3) m(-2) s(-1), the system allowed accurate determinations of NH3 exchange rates down to about 0.1 nmol NH3 m(-2) s(-1). The NH3 compensation points s at anthesis for barley cultivars Laevigatum and Golf were 4.2+/-2.8 and 4.6/-+2.9 nmol mol(-1) of NH3 in air (SE, n=4), respectively. NH3 absorption in both cultivars increased linearly with atmospheric NH3 concentration in the range 0-30 nmol mol(-1) of NH3 in air. NH3 absorption was much higher in the light than in the dark, indicating a strong stomatal and/or metabolic control of NH3 exchange. Photosynthesis and transpiration were not affected by exposure to NH3 concentrations in the range 0-30 nmol mol(-1) for 7 d. [References: 31].

4763 Kholodar, AV.; Shvetsov, SV.; Chekurov, VM. (1995) **IMMUNOENZYME ASSAY IN THE STUDY OF GIBBERELLIN LEVEL IN WHEAT ETIOPLASTS.** *Russian Journal of Plant Physiology. 42(4):575-578.* English. [RUSSIAN ACAD SCI INST CYTOL & GENET SIBERIAN DIV PR LAVRENTEVA 10 NOVOSIBIRSK 630090 RUSSIA].

Anti-rabbit serum was raised against a conjugate between gibberellin A(3) and human serum albumin. The conditions were specified for enzyme-linked immunosorbent assay of gibberellins in the etioplasts isolated from submilligram amounts of the etiolated leaves of bread wheat (Triticum aestivum L.). The technique allows estimation of 3 to 1000 pg of gibberellin A(3) methyl ester in a sample. The selectivity of immunoassay toward a range of gibberellins differing in their chemical structure was characterized. Using the technique described, the level of substances cross-reacting to antibodies was estimated in bread wheat etioplasts after red and far red light irradiation. Pulse illumination with red light resulted in a rapid increase in the level of extractable gibberellins, whereas far red light reversed this effect. [References: 6].

4764 Lee, I.C. (Taejon University, Taejon (Korea Republic). Department of Biology) (1994) **Role of cytochrome p450 in xenobiotic metabolism of cultured rose and wheat cells.** *Journal of Plant Biology (Korea Republic) v. 37(2) p. 223-229.* 1 illus.; 3 tables; 35 ref. Korean. (AGRIS 95-113546).

4765 Liljeroth, E. (1995) **COMPARISONS OF EARLY ROOT CORTICAL SENESCENCE BETWEEN BARLEY CULTIVARS, TRITICUM SPECIES AND OTHER CEREALS.** *New Phytologist. 130(4):495-501.* English. [SWEDISH UNIV AGR SCI DEPT PLANT BREEDING RES S-26831 SVALOV SWEDEN].

The natural rate of root cortical death (RCD) in seminal roots was investigated in different cereals by staining the roots with acridine orange. In all cereals investigated the part of the cortex having stainable nuclei gradually decreased with increased age of the root. Wheat differed from barley, oats and rye in having a much faster rate of RCD. In 15-d-old root regions of wheat grown in soil, only 10-20% of the radius of the root had stainable nuclei. In barley, oats and rye the amount of cortex with stainable nuclei varied between 65 and 80%. Minor differences in RCD were found between different barley cultivars or accessions. Large variation in RCD was found between different Triticum species: T. monococcum, T. dicoccum and different Aegilops species had much slower RCD than did hexaploid wheat. These results are discussed in relation to microbial colonization of roots and susceptibility to root pathogens. [References: 23].

4766 Matus, A.; Slinkard, AE.; Vankessel, C. (1995) **CARBON-13 ISOTOPE DISCRIMINATION AT SEVERAL GROWTH STAGES IN LENTIL, SPRING WHEAT AND CANOLA.** *Canadian Journal of Plant Science. 75(3):577-581.* English. [UNIV SASKATCHEWAN DEPT CROP SCI & PLANT ECOL SASKATOON SK S7N 0W0 CANADA].

CID has been proposed to indirectly select for transpiration efficiency and seed yield in C-3 plants. Before using CID as an indirect selection criterion it is important for plant breeders to determine the best growth stage at which to sample for CID. Consequently, to determine the most effective growth stage to select for CID we measured: (i) several growth stages to determine the one that provides the maximum differential for CID, (ii) the magnitude of die genotype by growth stage interaction for CID, and (iii) the variability for CID within and among genotypes of two divergent genotypes of lentil (Lens culinaris Medikus), spring wheat (Triticum aestivum L.) and canola (Brassica napus L.). Three plants per pot were grown hydroponically in a glasshouse using a RCBD replicated four times. Three samples were collected at four growth stages: early vegetative, late vegetative, flowering and maturity. The variability for CID among plants within genotypes was small. The two lentil genotypes differed significantly in CID; whereas, no significant differences were observed for the wheat or canola genotypes. In all three crops the genotype by growth stage interaction for CID was not significant, and the best differential for CID among lentil genotypes was mature seed. The ranking of genotypes remained constant across growth stages; therefore, sampling for CID may be done at any stage of plant development. [References: 28].

4767 Milroy, SP.; Goyne, PJ. (1995) **LEAF AREA DEVELOPMENT IN BARLEY-MODEL CONSTRUCTION AND RESPONSE TO SOIL MOISTURE STATUS.** *Australian Journal of Agricultural Research. 46(5):845-860.* English. [QUEENSLAND DEPT PRIMARY IND HERMITAGE RES STN WARWICK QLD 4370 AUSTRALIA].

A model to simulate leaf area development for barley at the whole plant level was constructed. Data for leaf area development in the absence of soil water stress were collected from irrigated field trials grown at Hermitage Research Station, near Warwick, Queensland, in 1990. The response of leaf area expansion to soil water status was measured in a glasshouse trial. In the model, green leaf area per plant (GPLA) is derived as the difference between total leaf area produced per plant (TPLA) and senesced leaf area (SPLA). TPLA and SPLA are described by logistic functions of thermal time. Two types of senescence are included: that due to ageing of the whole plant (ontogenetic senescence) and senescence associated with the development of large canopies (light-induced senescence). The onset of ontogenetic senescence is linked to anthesis, whereas light-induced senescence occurs if the leaf area index of the crop exceeds 55. Leaf expansion of plants in pots varying in the fraction of transpirable soil water available (FTSW) was compared with leaf expansion of those in well-watered pots three times per week. The relationship between relative leaf expansion (RLE) and FTSW was described by a logistic function (r(2) = 0.96). A 50% reduction in RLE occurred when FTSW = 0.34. Similarly, a logistic function described the relationship between relative transpiration (RT) and FTSW (r(2) = 0.96). A 50% reduction in RT occurred when FTSW = 0.17. Potential leaf expansion as predicted by the non-stressed model was reduced in response to moisture stress via a ramp function relating RLE to RT. The model gave an unbiased prediction of the leaf area dynamics for 21 rainfed and irrigated crops of barley grown in southern Queensland between 1986 and 1993 (RMSD = 1.09 m(2) m(-2) r(2) = 0.75, n = 76). Precision may have been reduced by the lack of information available on parameters for soil water balance when barley is grown on a range of soil types. [References: 35].

4768 Munns, R.; Schachtman, DP.; Condon, AG. (1995) **THE SIGNIFICANCE OF A TWO-PHASE GROWTH RESPONSE TO SALINITY IN WHEAT AND BARLEY.** *Australian Journal of Plant Physiology. 22(4):561-569.* English. [CSIRO DIV PLANT IND POB 1600 CANBERRA ACT 2601 AUSTRALIA].

Wheat and barley genotypes that differed in salt tolerance were used to test a hypothesis that the growth response to salinity has two phases. In the first phase there would be a large decrease in growth rate caused by the salt outside the roots, i.e. an 'osmotic' response. In the second phase there would be an additional decline in growth caused by salt having built up to toxic levels within plants, i.e. a 'salt-specific' response. If this two-phase model is correct, genotypes that differ in their ability to exclude salt or tolerate high internal salt concentrations would not differ in growth rate for some period of time in saline conditions. This hypothesis was tested using many genotypes that had previously been found to differ greatly in salt tolerance, as defined by differences in percent reduction in yield or biomass after prolonged exposure to NaCl. Leaf extension of 15 wheat and barley genotypes was measured daily while the NaCl in the nutrient solution was increased over 10 days to 250 mM. All 15 genotypes showed a similar percentage reduction in leaf extension rate. Dry matter production of four selected wheat genotypes that again differed greatly in salt tolerance was measured for up to 6 weeks in 150 mM NaCl. All genotypes showed the same growth reduction for 4 weeks. After this initial period the more salt-sensitive genotype showed a greater decline in growth. This occurred after 60% of the leaves were dead. These data strongly support the hypothesis

that the growth response to salinity has two phases, and indicate that most changes in metabolism or gene expression leading to growth reductions during the first phase relate to the osmotic effect of salinity, not to any salt-specific effect. They also indicate that the salt within the plant reduces growth by causing premature senescence of old leaves and hence a reduced supply of assimilates to the growing regions. [References: 41].

4769 Oscarson, P.; Lundborg, T.; Larsson, M.; Larsson, CM. (1995) **FATE AND EFFECTS ON YIELD COMPONENTS OF EXTRA APPLICATIONS OF NITROGEN ON SPRING WHEAT (TRITICUM AESTIVUM L) GROWN IN SOLUTION CULTURE.** *Plant & Soil. 175(2):179-188.* English. [SWEDISH UNIV AGR SCI DEPT PLANT BREEDING S-26800 SVALOV SWEDEN].

Spring wheat (Triticum aestivum L.) was grown with daily additions of nitrate-N. The relative addition rate of nitrate-N was decreased stepwise, and after 125 days of growth, 58 mg N plant(-1) had been introduced. The fate and effect of an extra addition of nitrate (20 mg N plant(-1)) at six different times during the ontogeny (37, 54, 66, 79, 94 and 108 days from sowing) on grain yield and grain protein concentration was investigated. The plants absorbed all or most of the extra nitrate at all stages of development evaluated. Dry matter production of both aerial vegetative parts and grains, but not roots, generally increased as a result of the extra nitrate addition. The increase in grain dry matter was mainly an effect of an increased number of grains per plant. Extra nitrate applications had large effects on grain nitrogen content at all stages, but the effect on main shoot and tiller ears varied depending on the time of application. Early applications, i.e. before anthesis, mainly led to increased yield with unchanged protein concentration whereas late applications also led to increased grain protein concentration. The largest effect on grain nitrogen concentration (25-30% increase) was obtained when the extra nitrate was applied late after sowing, i.e. less than four weeks before final harvest. As the extra dose of nitrate was labelled with N-15, it was possible to follow the movement of the extra nitrogen addition within the plant. Samples were taken at one and five days after N-15-addition and at final harvest. There were differences in the movement of N-15 depending on when it was introduced. Generally, net movement of the N-15-labelled N into the grain increased with age at application until 94 days after sowing when a maximum of 90% of the added N-15 ended up in the grain. [References: 19].

4770 Oury, FX.; Triboi, E.; Berard, P.; Ollier, JL.; Rousset, M. (1995) **CARBON AND NITROGEN FLOWS IN HYBRID WHEATS AND THEIR PARENTS DURING GRAIN FILLING.** *Agronomie. 15(3-4):193-204.* French. [INRA AMELIORAT PLANTES STN DOMAINE CROUELLE F-63039 CLERMONT FERRAND FRANCE].

Carbon and nitrogen flows were studied between anthesis and maturity on 29 hybrid wheats and their 23 parents examined in a complete block design, the basic plot measuring 7 m(2). Heterosis expressed not only for grain yield but also for nitrogen yield. With the same nitrogen filling rate per m(2), F1 had a greater duration of grain filling for nitrogen than inbred lines. For the hybrids and their parents, 65% of grain nitrogen was already in the plant at anthesis, when only 18% of grain glucides came from water-soluble carbohydrate remobilization. There was no difference between hybrids and inbred lines for remobilization, but post-anthesis assimilation of nitrogen was greater for the F1 hybrids than for their parents. Some assumptions regarding carbon-nitrogen relationships are proposed to explain the more favorable 'sink-source' relationship demonstrated for the hybrids.

4771 Park, Y.C. (Hannong Seed Corporation, Seoul (Korea Republic). Laboratory of Breeding); Yu, C.Y.; Cho, D.H.; Chang, B.H.; Ahn, S.D. (Kangwon National University, Chuncheon (Korea Republic). Department of Plant Resources); Chung, I.M. (Kunkuk University, Seoul (Korea Republic). College of Agriculture) (1994) **Effect of embryo age, growth regulators, and low temperature treatment on regeneration and plant growth in immature embryo culture of barley.** *Korean Journal of Crop Science (Korea Republic) v. 39(6) p. 571-576.* 1 illus.; 4 tables; 14 ref. Korean. (AGRIS 95-113447).

4772 Peltonensainio, P.; Peltonen, J. (1995) **FLORET SET AND ABORTION IN OAT AND WHEAT UNDER HIGH AND LOW NITROGEN REGIMES.** *European Journal of Agronomy. 4(2):253-262.* English. [HELSINKI UNIV DEPT PLANT PROD CROP HUSB SECT POB 27 SF-00014 HELSINKI FINLAND].

In regions where the growing season is short, reducing the pre-anthesis phase and thus increasing the duration of grain-filling could improve the productivity of small-grain cereals. Our objective was to compare floret set and abortion in two oat (Avena sativa L.) cultivars Ryhti and Puhti and two wheat (Triticum aestivum L.) cultivars Heta and Kadett that differ in length of the pre-anthesis phase and to monitor the effects of high and low nitrogen regimes on floret set and survival. Results of an experiment carried out in a glasshouse indicated that Ryhti oat had a two day shorter pre-anthesis phase and had 15-20 per cent fewer fertile florets per panicle than Puhti oat at pollination. However, Heta wheat had a five day shorter pre-anthesis phase, but had 25 per cent more fertile florets per head than Kadett wheat under low N. In oats, the number of fertile florets at pollination was 14-31 per cent of the maximum floret number, whereas in wheat half of the florets were fertile at pollination. Hence, breeding for a shorter pre-anthesis phase may result in decreased floret set, but not necessarily in reduced grain yield. Extra N applied at pre-anthesis increased floret set and survival. This resulted in more grains per head and greater head weight compared to low N treatments. [References: 24].

4773 Ray, N.; Khaddar, VK. (1995) **A STUDY ON THE EFFECTS OF SOIL SALINITY, SODICITY AND THEIR COMBINATIONS ON EARLY SEEDLING GROWTH IN WHEAT.** *Journal of Environmental Biology. 16(3):193-199.* English. [JAWAHARLAL NEHRU KRISHI VISHWAVIDYALAYA INDORE CAMPUS INDORE 452001 INDIA].

Early seedling growth in wheat (Var. Swati) was studied in normal black cotton soil (Vertisol) and artificially created graded saline, sodic soils and their combinations. When compared to that of normal soil, adverse effects of saline and sodic soils and their combinations, on early growth of shoot and root were marked. However there were certain exceptions to this general trend. On the 5th day after sowing, dry weights of both shoots and roots decreased more in sodicity levels than in salinity, while root weight at the highest level of salinity and sodicity (A(0)S(4) and A(5)S(0)) remained quite close to each other. Regarding initial growth of wheat, a balance of sodicity and salinity was more a deciding factor than the individual level of salinity and sodicity.

4774 Rengel, Z.; Graham, RD. (1995) **IMPORTANCE OF SEED ZN CONTENT FOR WHEAT GROWTH ON ZN-DEFICIENT SOIL .1. VEGETATIVE GROWTH.** *Plant & Soil. 173(2):259-266.* English. [UNIV ADELAIDE WAITE AGR RES INST DEPT PLANT SCI GLEN OSMOND SA 5064 AUSTRALIA].

Seed nutrient reserves may be important for an early Seed nutrient reserves may be important for an early establishment of crops on low-fertility soils. This glasshouse of Excalibur (Zn efficient) and Gatcher (Zn inefficient) wheats were sown in a Zn-deficient siliceous sand fertilised with 0, 0.05, 0.2, 0.8 or 3.2 mg Zn kg(-1) soil. After 3 weeks, plants derived from the high-Zn seed had better root and shoot growth; the cv. Excalibur accumulated more shoot dry matter than the cv. Gatcher. After 6 weeks, greater root and shoot growth of plants grown from the high-Zn seed compared to those from the low-Zn seed was obvious only at nil Zn fertilisation. A fertilisation rate of 0.2 mg Zn kg(-1) soil was required for achieving 90% of the maximum yield for plants grown from the high-Zn seed compared to 0.8 mg Zn kg(-1) soil for plants derived from the low-Zn seed. The critical Zn level in youngest expanded leaves for 90% maximum yield was 16 mg Zn kg(-1) dry matter for both genotypes. Zn-efficient Excalibur had greater net Zn uptake rates compared to Zn-inefficient Gatcher after 3 weeks but they were not different at the 6-week harvest. Zinc-deficient plants had greater net uptake rates of Cu, Mn, B, P, and K but a reduced uptake rate of Fe. It is concluded that higher seed Zn content acted similar to a starter-fertiliser effect by improving vegetative growth and dissipating differences in Zn efficiency of wheat genotypes. [References: 36].

4775 Rengel, Z.; Graham, RD. (1995) **IMPORTANCE OF SEED ZN CONTENT FOR WHEAT GROWTH ON ZN-DEFICIENT SOIL .2. GRAIN YIELD.** *Plant & Soil. 173(2):267-274.* English. [UNIV ADELAIDE WAITE AGR RES INST DEPT PLANT SCI GLEN OSMOND SA 5064 AUSTRALIA].

Two wheat (Triticum aestivum L.) genotypes (Zn-efficient Excalibur and Zn-inefficient Gatcher) were grown from low-Zn (around 250 ng Zn/seed) and high-Zn seed (around 700 ng Zn/seed) in a Zn-deficient siliceous sand fertilised with 0, 0.05, 0.2, 0.8 or 3.2 mg Zn kg(-1) soil. At maturity, plants derived from the high-Zn seed had bigger grains and produced more grains than plants grown from the low-Zn seed when fertilised with nil Zn. Plants grown from high-Zn seed produced more grain dry matter per unit of Zn absorbed by the above-ground parts, transported a larger proportion of absorbed Zn to the grain, and approached the maximum harvest index with the fertilisation rate of 0.05 mg Zn kg(-1) compared to 0.2 mg Zn kg(-1) soil required for plants derived from the low-Zn seed. The Zn-efficient cv. Excalibuir had greater fertiliser efficiency when fertilised with 0.05 mg Zn kg(-1) soil and a greater harvest index at nil Zn treatment compared to the Zn-inefficient cv. Gatcher. Zn-deficient plants produced seed with higher concentrations of all inorganic nutrients determined except Zn. There was a positive relationship between grain dry weight and Zn concentrations in youngest expanded blades sampled at 6 weeks of growth. It is concluded that crops grown from seed containing higher Zn content have a distinct advantage which culminates in greater yield when grown in soils of low Zn status. [References: 27].

4776 Scheeren, PL.; Decarvalho, FIF.; Federizzi, LC. (1995) **WHEAT RESPONSES TO STRESSES CAUSED BY LOW LIGHT INTENSITY AND WATER EXCESS IN THE SOIL .2. FIELD TESTING.** *Pesquisa Agropecuaria Brasileira. 30(5):605-619.* 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 Agronomic Experimental Station of the Federal University of Rio Grande do Sul, in Brazil. The objective of this work was to assess the effect of stresses caused by water excess in the soil and by light reduction on 12 wheat (Triticum aestivum L.) genotypes. It was observed that the stress caused by shading, with 40% light reduction, caused significant modifications in agronomically important characters, like plant stature, number of fertile tillers per plant, peduncle length, number of fertile spikelets per spike, maximum number of grains per spikelet, plant weight and grain weight per plant; moreover, it increased the number of sterile spikelets per spike. The reductions caused by water excess in the soil were less significant to wheat as compared to the ones caused by shading, mainly as a result of environment conditions over cropping period.

4777 Slafer, GA.; Rawson, HM. (1995) **INTRINSIC EARLINESS AND BASIC DEVELOPMENT RATE ASSESSED FOR THEIR RESPONSE TO TEMPERATURE IN WHEAT.** *Euphytica. 83(3):175-183.* English. [UNIV MELBOURNE DEPT AGR CTR CROP IMPROVEMENT PARKVILLE VIC 3052 AUSTRALIA].

The related concepts of basic vegetative period, intrinsic earliness and basic development rate in wheat are examined. These concepts have the common assumption that, if plants are vernalised fully and then grown at long daylength in order to remove any responses to vernalisation and photoperiod, the calendar or thermal time then taken to anthesis will be a characteristic of a genotype that will be heritable. Thus, regardless of temperature, early genotypes will always be earlier than late genotypes (providing there are no vernalisation and photoperiod responses). Using four genotypes, exposed to 50 days of vernalisation, and then grown at 18 h photoperiod under six temperature regimes ranging between 10 and 25 degrees C, it is shown that: (1) no genotype had an absolute basic period as, depending on temperature, durations to anthesis for any one genotype varied by more than 50 days; (2) no genotype had an absolute value for intrinsic earliness (to anthesis), ranging for any genotype by more than 300 degrees Cd depending on temperature; (3) basic development rate was not a single value for a genotype but varied with stage of development; (4) some genotypes changed their ranking for earliness depending on the temperature regime; and (5) genotypes were differentially sensitive to temperature for the subphases prior to anthesis. We conclude that the earliness descriptors should not be considered as static genotypic characteristics but as the result of the interaction between the genotype and temperature. Thus, the apparent earliness trait is likely to be related to temperature sensitivity. [References: 36].

4778 Speulman, E.; Salamini, F. (1995) **GA(3)-REGULATED CDNAS FROM HORDEUM VULGARE LEAVES.** *Plant Molecular Biology. 28(5):915-926.* English. [MAX PLANCK INST ZUCHTUNGSFORSCH CARL VON LINNE WEG 10 D-50829 COLOGNE GERMANY].

The barley mutant dbg 576 shows an extreme vegetative dwarf phenotype. This is reversed after the application of GA, which also induces the mutant florets to become partly fertile. cDNA clones ES1A and ES2A were isolated by differential screening with subtracted probes from a DNA library prepared from mutant leaf blades after GA(3) treatment. Both the ES1A and the ES2A mRNA level increases as early as 30 min after GA(3) treatment and decreases later. Accumulation of ES1A and ES2A mRNAs is leaf blade-specific and both are ca. 750 nucleotides long. ES1A encodes a protein of approximately 6 kD which shows a significant homology with mammalian epidermal growth fractors (EGFs). ES2A encodes a protein of 22 kDa with homology, in regions with potential amphiphilic helices, with the D7 family of late embryogenesis-abundant proteins (LEA). [References: 30].

4779 Tester, RF.; Morrison, WR.; Ellis, RH.; Piggott, JR.; Batts, GR.; Wheeler, TR.; Morison, JIL.; Hadley, P.; Ledward, DA. (1995) **EFFECTS OF ELEVATED GROWTH TEMPERATURE AND CARBON DIOXIDE LEVELS ON SOME PHYSICOCHEMICAL PROPERTIES OF WHEAT STARCH.** *Journal of Cereal Science. 22(1):63-71.* English. [GLASGOW CALEDONIAN UNIV DEPT BIOL SCI SOUTHBRAE CAMPUS GLASGOW G13 1PP LANARK SCOTLAND].

Crops of winter wheat (cv. Hereward) were grown in the field under double-skinned polyethylene tunnels in two consecutive seasons (1991-92 and 1992-93). Air containing ambient (350 ppm) or elevated (700 ppm) concentrations of carbon dioxide was circulated through the tunnels, and temperature gradients, typically from 1 degrees C below ambient to 4-7 degrees C above ambient, were maintained within each tunnel. Despite a shorter crop duration and warmer temperatures in the first season, most grain and starch properties showed a similar response to temperature between seasons. Thousand grain weight and grain starch content declined with increase in temperature (from 55 +/- 5 mg to 18 +/- 2 mg, and from 31 +/- 3 mg to 7 +/- 2 mg, respectively), the latter reflecting both decreases in granule sizes and fewer amyloplasts per endosperm. Contents of total amylose and lipid-free amylose increased with temperature (from 26 +/- 1% to 31 +/- 1%, and from 21 +/- 1% to 25 +/- 1%, respectively), but the contents of lipid-complexed amylose (5.2 +/- 1.5%) and lysophospholipids (0.9 +/- 0.2%) varied independently of temperature. Starch gelatinisation temperatures ranged from 57.5 to 64.5 degrees C in the first season, and from 58.0 to 61.9 degrees C in the second season, increasing with increase in temperature in both seasons, the data for the two seasons providing almost separate clusters. Gelatinisation enthalpy was constant in the first season (12.6 +/- 1 J/g amylopectin) and in the second season (15.5 +/- 0.5 J/g amylopectin) with no effect of temperature. The differences in carbon dioxide concentration had no consistent effects on the parameters measured, but small effects were discernible on thousand grain weight, starch content and lipid-free amylose content. There were also effects in certain treatment combinations, specifically at warmer temperatures in the first season and at cooler temperatures in the second season, on thousand grain weight, non-starch solids and lipid-complexed amylose contents. (C) 1995 Academic Press Limited [References: 50].

4780 Tuesca, D.; Puricelli, E.; Vitta, JI. (1995) **SEEDLING DYNAMICS OF SORGHUM HALEPENSE (L) PERS IN WHEAT - EFFECT OF CROP DENSITY.** *Pesquisa Agropecuaria Brasileira. 30(3):339-345.* Spanish. [UNIV NACL ROSARIO FAC CIENCIAS AGR CAMPO EXPTL JF VILLARINO CC 14 RA-2123 ZAVALLA SANTA FE ARGENTINA].

This study was undertaken in order to determine the influence of wheat crop on the dynamics of Johnsongrass seedlings and their production of rhizomes and seeds. Trials were conducted during 1988, 1990, and 1992 at Zavalla, Santa Fe, Argentina. Johnsongrass seeds were sown in plots with different wheat densities. Established plants were counted, and at crop harvest dry weight of surviving weed plants was determined. Correlation between weed germination and fluctuating temperatures was observed for all years. Seedling establishment began during late September and early October. The number of germinated seeds and seedling dynamics was not in agreement with rainfall. Water stress could instead account for differences in mortality within experiments. Although in wheat systems

water conditions are adequate for germination and establishment of the weed, because of the short growing season and the competition of the crop, it is unlikely that Johnsongrass seedlings could reproduce.

4781 Xu, JG.; Johnson, RL. (1995) **ROOT GROWTH, MICROBIAL ACTIVITY AND PHOSPHATASE ACTIVITY IN OIL-CONTAMINATED, REMEDIATED AND UNCONTAMINATED SOILS PLANTED TO BARLEY AND FIELD PEA.** *Plant & Soil. 173(1):3-10.* English. [ALBERTA ENVIRONM CTR DIV BIOL SCI BAG 4000 VEGREVILLE AB T9C 1T4 CANADA].

Biological properties of soil are not only essential for the maintenance of soil fertility and the sustainability of the plant-soil ecosystems, but also indicators of land reclamation of contaminated or disturbed soils. This experiment involves two plants (barley and field pea) growing in four soils with different hydrocarbon contents. The objective was to study the effect of hydrocarbons on plant growth and microbial activity, and to evaluate the acid phosphatase activity as an indicator of reclamation of hydrocarbon-contaminated soils. Barley root mass decreased with the increase of the hydrocarbon content but field pea roots were not sensitive to the hydrocarbon content in this experiment. The hydrocarbon contamination reduced the plant growth but increased the microbial activity. The acid phosphatase activity was controlled by both plant root production and microbial activity, therefore it was not a good indicator of the reclamation of oil-contaminated soils. [References: 29].

4782 Yagbasanlar, T.; Ozkan, H. (1995) **CORRELATION AND PATH COEFFICIENT ANALYSIS FOR EAR CHARACTERS IN TRITICALE UNDER MEDITERRANEAN CLIMATIC CONDITIONS.** *Journal of Agronomy & Crop Science-Zeitschrift fur Acker und Pflanzenbau. 174(5):297-300.* English. [UNIV CUKUROVA FAC AGR DEPT FIELD CROPS 01330 ADANA TURKEY].

In this study, the correlation and path coefficients between ear characters and grain yield per plant were determined in triticale under Mediterranean climatic conditions. Weight of grains per ear and number of ears per plant were the most important direct components of yield. Characters like ear length and the number of spikelets per ear were not found to be the important component characters of grain yield. It could be concluded that among ear characters in triticale, the number of ears per plant and the weight of grains per ear are the most important yield contributing characters and these characters should get due consideration in future triticale breeding programmes. [References: 5].

4783 Yassien, M.A.; Hassan, R.K. (Ain Shams Univ., Cairo (Egypt). Faculty of Agriculture) (1994) **Influence of wheat grains maturity of harvest on long term storability. 4.- meiotic behaviour of grain progeny.** *Annals of Agricultural Science, Moshtohor (Egypt) v. 32(1) p. 193-202.* 3 tables; 5 ref. English. (AGRIS 95-113444).

4784 Zwar, JA.; Chandler, PM. (1995) **ALPHA-AMYLASE PRODUCTION AND LEAF PROTEIN SYNTHESIS IN A GIBBERELLIN-RESPONSIVE DWARF MUTANT OF HIMALAYA BARLEY (HORDEUM VULGARE L).** *Planta. 197(1):39-48.* English. [CSIRO DIV PLANT IND GPO BOX 1600 CANBERRA ACT 2601 AUSTRALIA].

A dwarf mutant, M117, was isolated following sodium-azide mutagenesis of barley (Hordeum vulgare L. 'Himalaya'). Treatment of the mutant with gibberellic acid (GA(3)) restored growth to levels of the tall parent. alpha-Amylase production was examined in germinated grains of the dwarf mutant and in Himalaya plants treated with gibberellin (GA) biosynthesis inhibitors. The mutant showed reduced alpha-amylase activity relative to the parent when grains were germinated on water, but activities were equivalent to the parent following germination on GA(3) solution. Germination of normal or mutant grains in the presence of GA biosynthesis inhibitors led to reduced alpha-amylase activity levels, but normal levels were restored if GA(3) was included in the inhibitor solution. These data are consistent with a model in which alpha-amylase production in the germinated grain is regulated by the supply of active GAs. Treatment of M117 with GA(3) increased the length, fresh weight, dry weight, volume, cell number, and protein content of the first leaf. Proteins being synthesized in the first leaf were labelled with [S-35]methionine and fractionated by two-dimensional electrophoresis. No reproducible qualitative or quantitative differences in protein profiles were detected in response to GA(3) treatment. In contrast, first leaves from seedlings exposed to dehydration stress had profiles clearly distinguishable from those of control seedlings. Stem sections from dwarf plants maintained on 10 mu M GA(3) in the presence of sucrose elongated significantly more than controls without GA(3), but two-dimensional analysis of the [S-35]methionine-labelled radioactive polypeptides again revealed no GA(3)-induced differences. It was concluded that enhanced elongation rates of leaves or stem segments were not associated with major changes in gene expression. [References: 33].

F70 PLANT TAXONOMY AND GEOGRAPHY

4785 Uribe Echeverria, M.T. (Fundacion Ibercebadas, San Adrian, Navarra (Espana)); Molina Cano, J.L. (1995) **[Identification of barley cultivars by electrophoretic separation of leaf esterase isoenzymes]. Identificacion de cultivares de cebada mediante separacion electroforetica de isoenzimas de las esterasas de la hoja.** *Cerveza y Malta (Espana) (no.125) p. 10-14.* 2 fig., 1 tab.; 23 ref. Spanish. (AGRIS 95-099449).

H10 PESTS OF PLANTS

4786 Banita, E.; Luca, E. (SCA, Simnic (Romania)); Cojocaru, D. (SCCAN, Dabuleni (Romania)); Voicu, M. (SCA, Podul Iloaiei (Romania)); Kis, B. (Univ. B. Bolyai, Cluj (Romania)); Cantoreanu, M. (Stat. Cerc. Biolog., Sinaia (Romania)); Paulian, M. (ICPP, Bucuresti (Romania)); Aftene, M. (Muzeul St. Nat., Ploiesti (Romania)) (1994) **[Researches regarding the structure of the injurious and useful fauna in wheat growing in Oltenia [Romania]]. Cercetari privind structura faunei daunatoare si utile in culturile de grau din Oltenia.** *Analele Institutului de Cercetari pentru Cereale si Plante Tehnice Fundulea (Romania) v. 61 p. 169-182.* 5 tables; 2 graphs; 42 ref. Romanian. (AGRIS 95-114245).

The paper presents the original results regarding the favourable modifications of the structure and abundance of the injurious and useful entomofauna under climatic conditions during 1991-1992, in zones with different favourable conditions for wheat growing on brown-reddish soil and on sands, on large lots (great agriculture) >50 ha and individual agriculture (<2 ha). The populations of injurious insects were studied with regard to economic threshold of prejudice in the main phenological stages to potentially injurious populations and to vector-populations for virosis of cereals.

4787 Bartels, M. (Landwirtschaftskammer Hannover (Germany). Bezirksstelle Northeim) (1994) **[Fighting aphids on sugar beets, wheat and grains]. Haben Ihre Blaetter Laeuse?** *Agrar-Uebersicht (Germany) v. 45(6) p. 29-31.* 2 ill., 2 tables. German. (AGRIS 95-114579).

4788 Bernal, J.; Gonzalez, D. (1995) **THERMAL REQUIREMENTS OF DIAERETIELLA RAPAE (MINTOSH) ON RUSSIAN WHEAT APHID (DIURAPHIS NOXIA MORDWILKO, HOM, APHIDIDAE) HOSTS.** *Journal of Applied Entomology-Zeitschrift fur Angewandte Entomologie. 119(4):273-277.* English. [UNIV CALIF RIVERSIDE DEPT ENTOMOL RIVERSIDE, CA 92521 USA].

Studies were undertaken to assess the effect of temperature on development, and to estimate the thermal requirements (t and K) and upper developmental thresholds of three developmental periods (i.e. egg-mummy, mummy-adult, egg-adult) in Diaeretiella rapae (M'Intosh) (Hym., Aphidiidae) from China on Diuraphis noxia (Mordwilko) (Hem., Aphididae) hosts. Experiments were conducted at 5 constant temperatures: 10.0, 15.5, 21.1, 26.7, and 29.4 degrees C (+/-1.0 degrees C). Photoperiod and humidity conditions were maintained at 14L:10D and 50-70% R.H., respectively. In general, the developmental times and rates for the three developmental periods in D. rapae were influenced by the temperature to which they were exposed. Developmental times for the egg-mummy period increased from 7.3 days at 29.4 degrees C to 28.5 days at 10.0 degrees C; for the mummy-adult period from 4.6 days at 29.4 degrees C to 20.0 days at 10.0 degrees C; and for the egg-adult period from 11.3 days at 29.4 degrees C to 48.3 days at 10.0 degrees C. At all five temperatures, the developmental times for the egg-mummy period were longer than the developmental times for the mummy-adult period. There were no differences in developmental times between males and females at the

temperatures tested except at 15.5 degrees C where males developed slightly faster than females ($P < 0.011$), i.e. 23.2 and 24.0 days, respectively. The estimated t and K values were, respectively, 2.47 degrees C and 198.99 degree-days for the egg-mummy period; 3.89 degrees C and 106.45 degree-days for the mummy-adult period; and 3.56 degrees C and 292.29 degree-days for the egg-adult period. The upper developmental threshold for the three developmental periods is considered to be above, but near 29.4 degrees C since the developmental rate decelerated but did not cease at this temperature. [References: 26].

4789 Chongrattanameteekul, Wiboon (Kasetsart University, Nakom Pathom (Thailand). Dept. of Entomology); Araya, Jaime E. (1993) **[Evaluation of population growth models of laboratory colonies of Rhopalosiphum padi (L) and Sitobion avenae (F) (Homoptera: Aphididae) on wheat plants]. Evaluacion de modelos de crecimiento de colonias de laboratorio de Rhopalosiphum padi (L.) y Sitobion avenae (L.) (Homoptera: Aphididae) en plantas de trigo.** *Investigacion Agricola (Chile) v. 13(1-2) p. 23-37.* 36 ref. Spanish. (AGRIS 95-099824).

4790 Danielson, S.D.; Wright, R.J.; Witkowski, J.E.; Hein, G.L.; Campbell, J.B.; Jarvi, K.J.; Seymour, R.C.; Kalisch, J.A. (1993) **Insect management guide for Nebraska alfalfa, soybeans, wheat, range and pasture.** *E.C (USA); no. 93-1511-D 31 p.* English. (AGRIS 95-114638).

4791 Ester, A.; Nijenstein, JH. (1995) **CONTROL OF THE FIELD SLUG DEROCERAS RETICULATUM (MULLER) (PULMONATA, LIMACIDAE) BY PESTICIDES APPLIED TO WINTER WHEAT SEED.** *Crop Protection. 14(5):409-413.* English. [RES STN ARABLE FARMING & FIELD PROD VEGETABLES POB 430 8200 AK LELYSTAD NETHERLANDS].

A laboratory test was developed as a quick screening method for investigating the effectiveness of different pesticides as seed treatments against the slug Deroceras reticulatum in winter wheat. Seed treatments were applied with and without a coating agent. The most effective treatments in preventing damage by slugs to the seeds were: bromoxynil, carvone, ioxynil, thiocyclam hydrogen oxalate and methiocarb. Anthraquinone, thiodicarb, isazofos and Bacillus thuringiensis were less effective. The coating agent had some influence on the effectiveness of these treatments, but was not significant. Among the most effective pesticides, only methiocarb did not demonstrate any phytotoxic effects. Tsazofos showed moderate phytotoxicity. Coating significantly improved germination of seeds treated with carvone and thiocyclam hydrogen oxalate. Other treatments did not react to coating. [References: 25].

4792 Haagvar, E.B.; Trandem, N. (Norges Landbrukshoeyskole, Aas (Norway). Inst. for Biologi og Naturforvaltning); Hofsvang, T. (Planteforsk, Aas (Norway). Avd. Skadedyr) (1994) **The leafminer Chromatomyia fuscula (Diptera:Agromyzidae) and its parasitoid complex in Norwegian barley fields.** Norwegian Journal of Agricultural Sciences (Norway); no. 16(suppl.) p. 369-378. Norges Landbrukshoegskole - Fagtjenesten. 4 tables; 22 ref. p. 369-378. English. (AGRIS 95-099807).

4793 Hein, G.L. (University of Nebraska, Scottsbluff, NE) (1994) **Integrated management of the Russian wheat aphid in the Great Plains.** *Great Plains Agricultural Council (USA) p. 67-72.* ref. Meeting held June 7-9, 1994, Bismark, North Dakota. English. (AGRIS 95-114054).

4794 Jackson, GE. (1995) **THE EFFECT OF OZONE, NITROGEN DIOXIDE OR NITRIC OXIDE FUMIGATION OF CEREALS ON THE ROSE GRAIN APHID METOPOLOPHIUM DIRHODUM.** *Agriculture Ecosystems & Environment. 54(3):187-194.* English. [UNIV EDINBURGH INST ECOL & RESOURCE MANAGEMENT KINGS BLDG EDINBURGH EH9 3JU MIDLOTHIAN SCOTLAND].

The performance of the rose grain aphid (Metopolophium dirhodum) on cereals, polluted for different short durations, with either ozone or nitrogen oxides, was investigated using a small chamber fumigation system. The parameter used to measure aphid performance was the mean relative growth rate (MRGR) which was calculated following fumigation of the plant only. The intrinsic rate of natural increase (r(m)) was calculated where a significant difference in MRGR was found. No general aphid response was found for any pollutant following different fumigation durations, although significant increases in performance following certain fumigation regimes were observed. The direct effect of the pollutant gases on the aphid was investigated using artificial diets and was found to be unimportant. [References: 28].

4795 Legg, DE.; Brewer, MJ. (1995) **RELATING WITHIN-SEASON RUSSIAN WHEAT APHID (HOMOPTERA, APHIDIDAE) POPULATION GROWTH IN DRYLAND WINTER WHEAT TO HEAT UNITS AND RAINFALL.** *Journal of the Kansas Entomological Society. 68(2):149-158.* English. [UNIV WYOMING DEPT PLANT SOIL & INSECT SCI LARAMIE, WY 82071 USA].

Three measures of Russian wheat aphid, Diuraphis noxia (Kurdjumov), spring and summer population growth on dryland winter wheat, Triticum aestivum L., were related to heat units and rainfall in 1991 and 1992 using multiple linear regression. Specific measures of population growth used were the average number of Russian wheat aphids per tiller, percent Russian wheat aphid-infested tillers, and cumulated average Russian wheat aphid days. Of the developed regression models, those that related cumulated average Russian wheat aphid days to cumulated heat units and cumulated rainfall provided the best fit to the data, explaining 90% of the observed variance. Relations were also constructed between the proportion of Russian wheat aphid-infested tillers and cumulated average Russian wheat aphid days. The former is currently being used in Russian wheat aphid management programs for calculating economic injury levels, but aphid days are much easier to use for predicting Russian wheat aphid infestations. Validation studies conducted on data collected in 1989, 1991, and 1993 indicated that the model approximated the observed cumulated average Russian wheat aphid days and percent Russian wheat aphid-infested tillers during the increasing phase of Russian wheat aphid population growth. [References: 19].

4796 Luca, E.; Banita, E.; Oana, M.; Paunescu, G. (Institutul de Cercetari pentru Cereale si Plante Tehnice Fundulea, Simnic (Romania). Statiunea de Cercetari Agricole Simnic Craiova) (1994) **[Structure of pests in wheat crops and dynamics in the main wheat pests at the SCA Simnic (1987-1991)]. Structura faunei daunatoare din cultura graului si dinamica principalilor daunatori in zona de sud a Olteniei (1987-1991).** *Lucrari stiintifice (Romania) v. 9 p. 281-293.* 2 tables; 8 graphs; 7 ref. Romanian. (AGRIS 95-114246).

The paper presents the structure and the frequency of pest groups in wheat crops during 1987-1991 in the southern zone of Oltenia. These are: Thysanoptera 19, 34 percent, Heteroptera 1, 82 percent, Homoptera 25, 19 percent, Hymenoptera 3, 09 percent, Coleoptera 38, 14 percent, Epidoptera 0, 21 percent and Diptera 12, 21 percent. The evolution of average frequency in each group, by decades, is demonstrated between March-July, which shows that the maximum frequency in April includes Chrysomelidae (Halticinea) and Diptera, in May Heteroptera, Thysanoptera and Hymenoptera, whereas June includes Homoptera and Heteroptera (larvae) and Thysanoptera (chrysalides). Fly curves annually represent the evolution in dynamics of the main wheat pests, and dependent on them there has been worked up a scheme containing the moments of applying chemical measures for controlling pests in the zone. So, it is recommended: treatment of seed; autumn treatment at tilling (optional); spring treatment, during the first decade of May, when the hibernating bugs reach PED; summer treatment at the end of blossom in the phase "Q" of wheat.

4797 Moody, SA.; Briones, MJI.; Piearce, TG.; Dighton, J. (1995) **SELECTIVE CONSUMPTION OF DECOMPOSING WHEAT STRAW BY EARTHWORMS.** *Soil Biology & Biochemistry. 27(9):1209-1213.* English. [UNIV LANCASTER INST ENVIRONM & BIOL SCI DIV BIOL SCI LANCASTER LA1 4YQ ENGLAND].

Three species of earthworm, Lumbricus terrestris L., Aporrectodea longa (Ude) and Allolobophora chlorotica (Savigny), were offered a choice of mixtures of soil and small wheat straw fragments which had been inoculated individually with six saprotrophic fungi. All earthworm species showed preferences between the six fungal species offered. Early straw decomposers, capable of utilizing water-soluble sugars and cellulose, were preferred in most cases to the lignin-decomposing fungi characteristic of the later stages of decomposition. The removal of fungal-inoculated straw pieces from the soil surface by L. terrestris followed the same pattern. The

palatability of two wheat pathogens to L. terrestris was found to be similar to that of the preferred saprotroph. The implications of these findings for fungal abundance and dispersal in wheat fields are discussed. [References: 38].

4798 Riedell, WE.; Kieckhefer, RW. (1995) **FEEDING DAMAGE EFFECTS OF THREE APHID SPECIES ON WHEAT ROOT GROWTH.** *Journal of Plant Nutrition. 18(9):1881-1891.* English. [USDA ARS NO GRAIN INSECTS RES LAB RR 3 BROOKINGS, SD 57006 USA].

Cereal aphid infestations have considerable impact upon productivity and profitability of United States agriculture. A comparison study of the influence of different aphid species (Russian wheat aphid, Duraphis noxia Mordvilko: greenbug, Schizaphis graminum Rondani; and bird cherry oat aphid, Rhopalosiphum padi L.) upon shoot characteristics and root growth of hard red spring wheat (Triticum aestivum L.) was conducted in an attempt to better understand the mechanisms of yield loss in aphid damaged plants. Plants infested with aphids showed similar reductions in shoot growth regardless of aphid species. Shoot chlorophyll concentrations were lowest in greenbug-infested plants. Root length and dry weight were also equally reduced by feeding damage by the three aphid species. Upon removal of the aphids, shoot dry weights of plants damaged by each aphid species remained unchanged for 10 days. Shoot dry weights for aphid-damaged plants were about half the magnitude Been in the control plants after 15 days. Chlorophyll concentrations seen in greenbug and Russian wheat aphid-infested plants initially were lower than the concentrations seen in bird cherry oat aphid-infested and control plants. Within 10 days after aphid removal, however, chlorophyll concentrations across all treatments were essentially equal, Root lengths in plants previously infested with greenbugs or Russian wheat aphids were lower than control plants four days after aphid removal. Within 10 days after aphid removal, root lengths in plants previously infested with greenbugs or Russian wheat aphids did not differ from control plants. Root lengths in plants previously damaged by bird cherry oat aphids did not reach the same magnitude as that of the other treatments until 27 days after aphid removal. These results indicate that aphid feeding damage to wheat plants can have significant effects on root growth, suggesting that crop management practices that promote root growth could play important roles in improving plant tolerance to aphid damage. [References: 18].

4799 Risha, E.M.; Othman, K.S.A.; Hashem, M.Y. (Cairo Univ. (Egypt). Faculty of Agriculture) (1994) **Effectiveness of corn oil as surface protectant of wheat and maize against infestation by the rice weevil, Sitophilus oryzae (L.).** *Journal of Agricultural Sciences, Mansoura Univ. (Egypt) v. 19(4) p. 1533-1538.* 2 tables; 13 ref. English. (AGRIS 95-114268).

4800 Ruszkowska, M. (Instytut Ochrony Roslin, Poznan (Poland)) (1994) **[Importance of the terms of treatment chemical control on the winter wheat before aphids]. Rola terminow zabiegow chemicznych w zwalczaniu mszyc zbozowych.** 33 Research Session of Institute of Plant Protection; Poznan (Poland); 1993. *Materials of the 33rd Research Session of Institute of Plant Protection. Pt. 2. Posters. Pruszynski, S.; Lipa, J.J. (eds.). Instytut Ochrony Roslin, Poznan (Poland) p. 62-65.* Panstwowe Wydawnictwo Rolnicze i Lesne. 2 tables; 3 ref. Polish. (AGRIS 95-114340).

It was found that not always chemical control of cereal aphids is effective therefore the control is recommended only in a very specific situation - when the aphids appear during the time just after earing. If the pesticides were applied after that time it was no effect on the yield and weight of one thousand of seeds. The most effective were two pyrethroids insecticides: Decis and Karate.

4801 Schreiber, L. (1995) **A MECHANISTIC APPROACH TOWARDS SURFACTANT/WAX INTERACTIONS - EFFECTS OF OCTAETHYLENEGLYCOLMONODODECYLETHER ON SORPTION AND DIFFUSION OF ORGANIC CHEMICALS IN RECONSTITUTED CUTICULAR WAX OF BARLEY LEAVES.** *Pesticide Science. 45(1):1-11.* English. [UNIV WURZBURG JULIUS SACHS INST BIOWISSENSCH LEHRSTUHL BOT 2 MITTLERER DALLENBERGWEG 64 D-97082 WURZBURG GERMANY].

Mechanisms of surfactant/wax interactions which contribute significantly to the acceleration of rates of cuticular uptake of agrochemicals have been investigated. Experiments were carried out using isolated and subsequently reconstituted barley wax. As C-14-labelled model compounds, the monodisperse alcohol ethoxylate octaethyleneglycolmonododecylether (C(12)E(8)), the aromatic compound, pentachlorophenol (PCP), and the aliphatic tetracosanoic acid (C(24)AC; representing a typical wax constituent) were used. Each of the three compounds represented one part of the complete interacting system: surfactant, pesticide and wax. Partitioning of PCP was independent of simultaneously present C(12)E(8) below its critical micelle concentration (CMC), but decreased linearly above the CMC. The maximum increase in the mobility of PCP was by a factor of about four by C(12)E(8), whereas the maximum increase of the mobility of C(24)AC was about forty-fold. Effects on the mobility of PCP and C(24)AC were independent of C(12)E(8) concentrations above the CMC, but they decreased significantly with decreasing C(12)E(8) concentrations below the CMC. A common model usually applied in life sciences for the analysis for dose-response curves, relating the observed effects to the logarithms of the applied concentrations, was successfully fitted to the results obtained here. This indicated that the observed effects were a function of the relative, rather than absolute, concentrations of the surfactant within the wax. Furthermore, it was discovered that surfactant-induced acceleration of the diffusion of PCP and C(24)AC was completely reversible if C(12)E(8) was removed from the system. Thus, accelerating effects on diffusion only occurred if distinct amounts of surfactant were present within the wax. This, finally, led to a tentative model, explaining the effect of C(12)E(8) on wax structure as an unspecific plasticising interaction between surfactant and wax. Rapid induction and complete reversibility of the effects indicated that the assumption of irreversible alterations of the wax structure (e.g. solubilisation of wax or destruction of crystalline wax domains) was not necessary in order to explain the surfactant-induced acceleration of rates of cuticular permeation of pesticides, when studying absorption/desorption from non-evaporating aqueous solutions. However, such changes may still occur when evaporation of the water in spray deposits concentrates surfactants sufficiently for them to become wax solvents. [References: 34].

4802 Stary, Petr (Czech Academy of Sciences, Ceske Budejovice (Czech Republic). Inst. of Entomology); Rodriguez A, Fernando; Gerding P, Marcos (1993) **[Natural enemies released against the Russian wheat aphid, Diuraphis noxia (Kurdjumov), in Chile]. Liberaciones de enemigos naturales del pulgon ruso del trigo, Diuraphis noxia (Kurdjumov), en Chile.** *Agricultura Tecnica (Chile) v. 53(4) p. 359-361.* 7 ref. Spanish. (AGRIS 95-099798).

4803 Zerene A, Mireya (Instituto de Investigaciones Agropecuarias, Santiago (Chile). Estacion Experimental La Platina); Quiroz E, Carlos (1993) **[Presence and deleterious effect of the Russian wheat aphid, Diuraphis noxia (Mordvilko) and other cereal aphids, in the central-northern region of Chile during 1990 - 91 and 1991 - 92 seasons]. Presencia y dano del pulgon ruso del trigo, Diuraphis noxia (Mordvilko) y de otros afidos de los cereales en la zona centro norte de Chile durante las temporadas 1990-91 y 1991-92.** *Agricultura Tecnica (Chile) v. 53(4) p. 319-326.* 12 ref. Spanish. (AGRIS 95-099823).

H20 PLANT DISEASES

4804 **[Cereal fungicides cards: COLUMBIA (hexaconazole + fenpropidine), MATADOR 300 (tebuconazole + triadimenol), EMINENT PRO, VOLTOUR (tetraconazole + carbendazim)]. Fiches fongicides cereales: COLUMBIA (hexaconazole + fenpropidine), MATADOR 300 (tebuconazole + triadimenol), EMINENT PRO, VOLTOUR (tetraconazole + carbendazime)** (1995) Institut Technique des Cereales et des Fourrages, Paris (France). *Perspectives Agricoles (France) (no 201) p. 36-40.* 3 p. p. seulement. French. (AGRIS 95-100077).

4805 Banks, PM.; Davidson, JL.; Bariana, H.; Larkin, PJ. (1995) **EFFECTS OF BARLEY YELLOW DWARF VIRUS ON THE YIELD OF WINTER WHEAT.** *Australian Journal of Agricultural Research. 46(5):935-946.* English. [QUEENSLAND WHEAT RES INST POB 2282 TOOWOOMBA QLD 4350 AUSTRALIA].

Yield responses were measured of six winter wheats to field infections with Barley Yellow Dwarf Virus (BYDV). In addition to the natural incidence of virus, the range of infection levels was widened by aphicide

spraying of some plots and the addition of artificially propagated viruliferous aphids to others. Significant grain yield losses attributable to natural infections by BYDV were found for all wheats despite the main infection period being in the spring. The addition of viruliferous aphids only marginally decreased yields further. Spraying with aphicides did not exclude infection but did reduce the incidence of BYDV and increase yields. A significant negative linear correlation between grain yield and percentage infection applied to each wheat genotype. The slope of the yield response appears to be a more useful measurement for comparing tolerance to BYDV of differing cereal lines than do proportional yield losses. Of the six wheats tested, Lawson, Birch 41, Birch 75, Owlet and Isis had similar tolerances to BYDV, despite substantial differences in absolute yields, while W71 was considerably more vulnerable. The mean natural incidence of BYDV in the main trial was 67%, producing an expected grain yield loss of about 2.2 t ha(-1) for W71 and about 1.1 t ha(-1) for the other five wheats. Effects on grain protein and potential control measures are also discussed. [References: 28].

4806 Barrasa, JM.; Camarero, S.; Martinez, AT.; Ruel, K. (1995) **ULTRASTRUCTURAL ASPECTS OF WHEAT STRAW DEGRADATION BY PHANEROCHAETE CHRYSOSPORIUM AND TRAMETES VERSICOLOR.** *Applied Microbiology & Biotechnology. 43(4):766-770.* English. [UNIV ALCALA DE HENARES DEPT BIOL VEGETAL MADRID SPAIN].

The ultrastructural patterns characterizing wheat straw degradation by the ligninolytic fungi Phanerochaete chrysosporium and Trametes versicolor were studied. During fungal attack, the less lignified tissues were degraded first, whereas the xylematic and sclerenchymatic fibers underwent a delayed attack. In straw samples degraded by T. versicolor, partial delignification, defibrillation and swelling of cell walls, often causing separation between primary and secondary walls, were observed. By contrast, the formation of erosions and fissures, with minor lignin removal, characterized the attack to the cell wall by P. chrysosporium. At an advanced stage of decay, KMnO4 staining demonstrated abundant electron-dense material around hyphae and in the proximity of the cell-wall surface. In the case of P. chrysosporium, spherical black bodies were found in the erosions and fissures produced during fungal attack. [References: 14].

4807 Benada, J.; Polisenska, I. (Zemedelsky Vyzkumny Ustav, Kromeriz (Czech Republic)) (1995) **[Wheat dwarf virus in trials of the Agricultural Research Institute in Kromeriz in 1994 [Czech Republic]]. Vyskyt virove zakrslosti psenice v pokusech Zemedelskeho vyzkumneho ustavu Kromeriz v r. 1994.** *Obilnarske Listy (Czech Republic) v. 3(1) p. 2-3.* 1 table. Czech. (AGRIS 95-115017).

4808 Cano Hernandez, Roberto (1994) **[Evaluation of fungicides to control net blotch (Helminthosporium teres Sacc) in Apan, Hidalgo]. Evaluacion de fungicidas para el control de la mancha reticulada de la cebada (Helminthosporium teres Sacc) en Apan, Hidalgo. Mexico.** Universidad Autonoma Chapingo (Mexico). Departamento de Parasitologia Agricola. 76 p. Spanish. (AGRIS 95-100063).

4809 Colbach, N.; Huet, P. (1995) **MODELLING THE FREQUENCY AND SEVERITY OF ROOT AND FOOT DISEASES IN WINTER WHEAT MONOCULTURES.** *European Journal of Agronomy. 4(2):217-227.* English. [INRA AGRON CTR GRIGNON F-78850 THIVERVAL GRIGNON FRANCE].

From 1986 to 1993, wheat crops from plots which had been cultivated with cereals for various lengths of time were assessed for the major foot and root diseases: eyespot (Pseudocercosporella herpotrichoides), take-all (Gaeumannomyces graminis) and sharp eyespot (Rhizoctonia cerealis). For each disease, mean frequency and severity were modelled as a function of the number of years of continuous cereal cropping. Both take-all and eyespot increased during the first 3 to 5 years of monoculture before disease decline was observed. Decline was more important for take-all severity than frequency, whereas it was considerably stronger for eyespot frequency than severity. Take-all decline started sooner than eyespot decline. Model quality was highest for eyespot frequency and lowest for take-all frequency and severity. The incidence of sharp eyespot was too low to observe any influence of crop succession. We observed however an important year effect and a negative correlation with eyespot. [References: 43].

4810 Cromey, MG.; Viljanenrollinson, SLH. (1995) **VIRULENCE OF PUCCINIA HORDEI ON BARLEY IN NEW ZEALAND FROM 1990 TO 1993.** *New Zealand Journal of Crop & Horticultural Science. 23(2):115-119.* English. [NEW ZEALAND INST CROP & FOOD RES LTD PRIVATE BAG 4704 CHRISTCHURCH NEW ZEALAND].

Leaf rust of barley (Hordeum vulgare L.), caused by Puccinia hordei Otth. is common in New Zealand. It is particularly prevalent in the Canterbury region of the South Island. In a virulence survey carried out between 1990 and 1993 to determine the extent of pathogenic variation in the population of P. hordei in New Zealand, four virulence patterns were detected amongst 187 isolates from barley. All isolates were virulent on the genes Pa, Pa-2, Pa-4, Pa-6, Pa-9, and Pa-12, and avirulent on Pa-7. Eighteen, 10, and 99% of isolates were virulent on the genes Pa-3, Pa-5, and Pa-8 respectively. No isolates were virulent on the combination of Pa-3 and Pa-5. It is postulated that the barley cultivar 'Liberty' relies on the gene Pa-3 for its resistance to leaf rust. This is the first record of virulence on Pa-3 and Pa-12 in New Zealand. The cultivars 'Liberty' and 'Triumph' (which contains Pa-12) provided selection pressure for the spread of pathotypes with these two virulences respectively. [References: 17].

4811 Darmedru, J.Y. (Rhone Poulenc Agro France (France)); Duvert, P.; Lacombe, J.P.; Pepin, R. (1994) **[But, fungicide for winter and spring barley [bromuconazole + iprodione]]. But, fongicide des orges d'hiver et de printemps [bromuconazole + iprodione].** *Phytoma La Defense des Vegetaux (France) (no 465) p. 52-53.* French. (AGRIS 95-100062).

4812 de Pous, M. (Institut Technique des Cereales et des Fourrages, Paris (France)) (1995) **[Fungicides and wheat crops in Pays de la Loire area (France)]. Ble en Pays de la Loire: des protections fongicides a peine suffisantes.** *Perspectives Agricoles (France) (no 201) p. 74-78.* French. (AGRIS 95-100079).

4813 Duarte, J.P.; Pereira, A.M.N. (Tras os Montes e Alto Douro Univ., Vila Real (Portugal)); Gomes, M.C. (Estacao Nacional de Melhoramento de Plantas, Elvas (Portugal)) (1992) **[Epidemiological studies on BYDV (Barley Yellow Dwarf Virus) in the Alentejo [Portugal]]. Estudos epidemiologicos sobre BYDV [Barley Yellow Dwarf Virus] no Alentejo.** Instituto Nacional de Investigacao Agraria, Elvas (Portugal). Estacao Nacional de Melhoramento de Plantas. *Melhoramento (Portugal) v. 33(2) p. 559-576.* issued 1994; 6 graph. 4 tables; 11 ref. Portuguese. (AGRIS 95-114915).

4814 Duffy, BK.; Weller, DM. (1995) **USE OF GAEUMANNOMYCES GRAMINIS VAR GRAMINIS ALONE AND IN COMBINATION WITH FLUORESCENT PSEUDOMONAS SPP TO SUPPRESS TAKE-ALL OF WHEAT.** *Plant Disease. 79(9):907-911.* English. [ETH ZURICH INST PLANT SCI PHYTOMED ZURICH SWITZERLAND].

Gaeumannomyces graminis var. graminis, originally isolated from rice, suppressed take-all of wheat caused by Gaeumannomyces graminis var. tritici in growth chamber studies when applied to the soil. Furthermore, combination treatments consisting of G. g. var. graminis applied to the soil and fluorescent Pseudomonas strains applied to the seed, either 30-84, Q29z-80, Q69c-80, or a mixture of strains (Q2-87 plus Q1c-80 plus Q8d-80 plus Q69c-80), were significantly more suppressive of take-all than either treatment used alone. In a winter wheat field trial at Pullman, Wash., G. g. var. graminis applied to the seed furrow significantly reduced crown root infection by G. g. var. tritici and the strain mixture reduced seminal root infection suggesting differential protection at various stages of disease development. However, in contrast to growth chamber studies the combination of G. g. var. graminis and the strain mixture did not enhance take-all suppression in the field compared with the same treatments used alone. [References: 31].

4815 Duveiller, E. (Centro Internacional de Mejoramiento de Maiz y Trigo (Mexico)) (1994) **A study of Xanthomonas campestris pv. undulosa populations associated with symptomless wheat leaves.** *Parasitica (Belgium) v. 50(3-4) p. 109-117.* 3 ill.; 12 ref. English. (AGRIS 95-114886).

The importance of populations of Xanthomonas campestris pv. undulosa associated with symptomless wheat leaves was investigated. Leaves were sampled in non-inoculated plots of four genotypes at El Batan (Mexico) in

1991, and whole lamina were homogenized to be assayed on WBC agar medium with the dilution plate method. The pathogen was isolated from symptomless leaves. The Xanthomonas campestris pv. undulosa population reached 1000000 cfu per leaf in the susceptible cultivar Alondra about one month before symptoms could be observed. Temperatures were always favorable for multiplication of bacteria during the season. Population of phytopathogenic bacteria decreased after heavy rainfall, suggesting that epiphytic or latent populations of Xanthomonas were on the leaf surface. In the case of genotype Alondra, however, no reduction of the number of Xanthomonas campestris pv. undulosa could be observed after rainfall at the end of the season. This suggests that the pathogen could also been isolated from resistant genotypes, disease symptoms only became visible in susceptible genotypes. In a greenhouse experiment, multiplication of Xanthomonas campestris pv. undulosa on wheat seedlings was much more prominent under dry conditions than under wet conditions. The possible occurrence of latent populations of Xanthomonas campestris pv. undulosa in wheat under natural conditions provides a new hypothesis for the disposal of the pathogen in the field and its transport on long distance. Moreover, genetic resistance may result from differences in bacterium's ability for colonizing the leaf of resistant and susceptible genotypes. It may explain, in part, the sporadic character of the disease and the difficulty to appraise correctly the efficiency of bactericides based on the observation of disease incidence in a field sown with treated seed.

4816 Esnard, J.; Hepperly, PR. (1995) **FIRST REPORT OF SOUTHERN BLIGHT OF COMMON BARLEY IN PUERTO RICO.** *European Journal of Plant Pathology. 101(5):497-501.* English. [UNIV MASSACHUSETTS DEPT PLANT PATHOL AMHERST, MA 01003 USA].

In 1990-91, 96% of the test plants in a barley (Hordeum vulgare L.) winter nursery in Puerto Rico was lost to Sclerotium rolfsii. Small necrotic lesions (1-3 mm long) developed at the base of the stem, followed by wilting and general chlorosis as the lesions progressed and eventually girdled the base of the stem. Sclerotia then developed on the plants at the stem base. Two morphologically different strains of S, rolfsii that were mycelial incompatible were isolated. This is the first report of a destructive blight due to S. rolfsii on field barley in the Caribbean. The apparent rate of disease increase (r) was estimated to be 12.2% per day using the logistic model, with an initial disease incidence of 0.042% (R(2) = 0.89, p less than or equal to 0.001). [References: 19].

4817 Friedrich, S. (1995) **THE USE OF TRAP PLANTS FOR MONITORING INFECTION EVENTS OF POWDERY MILDEW.** *Zeitschrift fur Pflanzenkrankheiten und Pflanzenschutz-Journal of Plant Diseases & Protection. 102(3):267-274.* German. [ZENT AGRARMETEOROL FORSCH STELLE BUNDESALLEE 50 D-38116 BRAUNSCHWEIG GERMANY].

During periods of several weeks in 1990 and 1991 with high disease levels of powdery mildew in the winter wheat plots, two sets of trap plants were exposed daily at canopy height. The overlapping exposition period each time was 2 and 24 h. Simultaneously, spore dispersal by use of a volumetric spore trap as well as meteorological conditions were monitored. A close relation between the number of conidia adhering to the trap planes (Technicoll method) and the number of infections occurring subsequently within the climate chamber was detected. Very low correlations, however, were found comparing spore catches using trap plants and those using a volumetric spore trap. Though many times more spores were dispersed within the field during the [References: 21].

4818 Garburg, W. (Landwirtschaftskammer Hannover (Germany). Bezirksstelle Braunschweig, Sachgebiet Pflanzenschutz) (1994) **[The targeted application of fungicides in barley and wheat]. Gezielter Einsatz von Fungiziden in Gerste und Weizen.** *Agrar-Uebersicht (Germany) v. 45(4) p. 29-32.* 3 ill., 2 tables. German. (AGRIS 95-114930).

4819 Glazek, M.; Pietryga, J. (Instytut Ochrony Roslin, Sosnicowice (Poland)) (1994) **[Chemical control of eyespot of winter wheat and rapid membrane test form increase of the disease]. Chemiczne zwalczanie lamliwosci zdzbla na pszenicy ozimej i ocena szybkiego testu membranowego do okreslenia nasilenia choroby.** 33 Research Session of Institute of Plant Protection; Poznan (Poland); 1993. *Materials of the 33rd Research Session of Institute of Plant Protection. Pt. 2. Posters. Pruszynski, S.; Lipa, J.J. (eds.). Instytut Ochrony Roslin, Poznan (Poland) p. 124-129.* Panstwowe Wydawnictwo Rolnicze i Lesne. 3 fig., 3 tables; 4 ref. Polish. (AGRIS 95-115020).

Rapid membrane test were studied to early determination of eyespot. The test is very effective and useful. For this experiment 3 fields with different level of infection were chosen: low infection (2-4 percent of infected plants), medium (15-20 percent) and high infection (48-60 percent). The following fungicides were used: Tilt CB 37.5 WP, Alert 375 SC, Siarkol K 500 SC, Tilt 250 EC, Rider 400 EC and Planete R. All these fungicides gave good result in reducing infestation of wheat by eyespot, but the best result was obtained in the case of using Alert fungicide.

4820 Goncalves, M.J.; Gomes, M.C.; Nogueira, F.; Lopes, C. (Instituto Nacional de Investigacao Agraria, Elvas (Portugal). Estacao Nacional de Melhoramento de Plantas) (1992) **[Crop variability in isolations of Septoria tritici Rob. ex Desm.]. Variabilidade cultural em isolamentos de Septoria tritici Rob. ex Desm.** *Melhoramento (Portugal) v. 33(2) p. 537-543.* issued 1994; 9 ill. 2 tables; 5 ref. Portuguese. (AGRIS 95-114896).

4821 Harvey, TL.; Martin, TJ.; Seifers, DL.; Sloderbeck, PE. (1995) **ADAPTATION OF WHEAT CURL MITE (ACARI, ERIOPHYIDAE) TO RESISTANT WHEAT IN KANSAS.** *Journal of Agricultural Entomology. 12(2-3):119-125.* English. [KANSAS STATE UNIV AGR & APPL SCI EXPT STN HAYS, KS 67601 USA].

Wheat streak mosaic (WSM) was the most important disease of wheat, Triticum aestivum L., in Kansas from 1987 to 1991. The incidence of WSM is reduced in the wheat cultivar TAM 107, which has resistance to the wheat curl mite, Eriophyes tulipae Keifer, vector of the WSM virus. Our objectives were to determine whether E. tulipae could overcome the resistance of TAM 107 in the laboratory and to look for evidence of a resistance-breaking strain on TAM 107 in the field. E. tulipae was able to overcome resistance after being reared on TAM 107 for 2 mo. (ca. 8 generations) under laboratory conditions. One of 10 1992 field collections of E. tulipae from spikes of TAM 107 was adapted to that cultivar. Thus, E. tulipae can develop a resistance-breaking strain in both field and laboratory, but more information is needed on its prevalence and distribution in the field. [References: 17].

4822 Henriksson, M. (1995) **[Pathogenicity tests with Swedish isolates of Verticillium dahliae]. Pathogenitetstester med svenska isolat av Verticillium dahliae.** Henriksson, M. Sveriges Lantbruksuniv. 19 ref. 19 p. Swedish. (AGRIS 95-115117).

4823 Hernandez Ruiz, Rene (1992) **[Identification and quantification of pathogen associated to wheat seeds (Triticum aestivum L.) sprinkled with fungicides in Juchitepec, Mexico]. Identificacion y cuantificacion de patogenos asociados a la semilla de trigo (Triticum aestivum L.) asperjado con fungicidas en campo en Juchitepec, Mexico.** Universidad Autonoma Chapingo (Mexico). Departamento de Parasitologia Agricola. 42 p. Spanish. (AGRIS 95-100080).

4824 Huang, R.; Kranz, J.; Welz, HG. (1995) **INCREASE OF COMPLEX PATHOTYPES OF ERYSIPHE GRAMINIS F SP HORDEI IN TWO-COMPONENT MIXTURES OF SPRING BARLEY CULTIVARS.** *Journal of Phytopathology-Phytopathologische Zeitschrift. 143(5):281-286.* English. [UNIV GIESSEN WZ TROPENINST D-35390 GIESSEN GERMANY].

Pathotypes of Erysiphe graminis f. sp. hordei were monitored at fortnightly intervals in pure stands of cultivars Golf with Laevigatum resistance [gene Ml(La)], Steina with Arabische resistance (Mla12) and Harry with Monte Cristo resistance (Mla9), as well as in two two-component mixtures [Golf+Steina (G+S) and Golf+Harry (G+K)] during the course of mildew epidemics in replicated field trials. The number of colonies per main tiller was also recorded. Virulence complexity (i.e. the average number of Virulence genes per isolate with respect to the two matching resistance genes of the mixed cultivars) was always higher in mixtures than in pure stands. Linear regression of complexity on the number of elapsed mildew generations (based on actual temperature data) gave significant b-values (slopes) of 0.039, 0.034, 0.022 and 0.018 on Golf in G+S, Steina in G+S, Golf in G+H and Harry in G+H, respectively. In pure stands, there was no significant complexity increase on any cultivar. The fact that b-values were higher on either component in the G+S than in the

G+H mixture indicates stronger selection for the complex, i.e. two-virulence, pathotypes in G+S. Complex pathotypes had a higher relative fitness than simple (one-virulence) pathotypes in both mixtures but not in the pure stands. The absolute frequencies of complex pathotypes as measured by the area under the colony frequency curve (AUCFC) were higher on all cultivars in mixtures than in pure stands, except on Steina. [References: 19].

4825 Huang, R.; Kranz, J.; Welz, HG. (1995) **VIRULENCE GENE FREQUENCY CHANGE IN ERYSIPHE GRAMINIS F SP HORDEI DUE TO SELECTION BY NON-CORRESPONDING BARLEY MILDEW RESISTANCE GENES AND HITCHHIKING.** *Journal of Phytopathology-Phytopathologische Zeitschrift. 143(5):287-294.* English. [UNIV GIESSEN WZ TROPENINST D-35390 GIESSEN GERMANY].

Individual isolates (in total 4040) of Erysiphe graminis f. sp. hordei were collected between 1989 and 1991 in fields of spring barley varieties with resistance genes Mla9, Mla12 and Ml(La) in the local air spora, i.e. remote from barley fields, in Hesse, Germany. Their virulence pattern was determined on a 13-partite differential set. In the air spora, virulence complexity (the number of Virulence genes per isolate) increased by 30% (4.2 vs. 5.5) between 1989 and 1991. This was mainly due to an increase of pathotypes with virulence genes Va7, Va13, Vk and V(La). In each mildew field population, frequencies of several non-corresponding virulence genes, e.g. V(La) on Mla9 variety, greatly increased during the period. Such change can be caused by hitchhiking selection, i.e. indirect selection resulting from asexual reproduction, and direct selection by non-corresponding resistance genes. To separate the two effects, the aerial barley mildew population of 1991 was sampled on cv. Pallas and near-isogenic lines of Pallas. Frequencies of non-corresponding virulence genes as observed in samples from the near-isogenic lines were compared to expected non-corresponding virulence frequencies which were obtained by subdividing the sample on Pallas into 12 subsamples, comprising all isolates virulent to line 1 through 12, respectively. Among 90 resistance/virulence gene combinations selection for non-corresponding Virulence was significant in five cases (e.g. Va9 on Mla7 host) and against non-corresponding virulence in nine cases (e.g. Vk on Ml(La) host). Hitchhiking selection was significant in eight cases. In 11 cases the two types of selection were significant in combination but not individually. It is suggested to monitor the stability of selection against non-corresponding virulence genes in race surveys and utilize it in diversified barley crops such as variety mixtures in order to retard the evolution of complex races. [References: 49].

4826 Jackson, K.E.; Pratt, P.W. (1994) **Effect of foliar fungicides on foliar diseases of hard red winter wheat, eastern Oklahoma.** *Research report P (USA) (no. 936) p. 1-7.* English. (AGRIS 95-115006).

4827 Jaczewska, A. (Instytut Ochrony Roslin, Grodzisk Mazowiecki (Poland). Terenowa Stacja Doswiadczalna) (1994) **[Yield loss of winter wheat due to foliar and ear diseases]. Straty plonu pszenicy ozimej powodowane przez kompleks chorob lisci i klosa.** 33 Research Session of Institute of Plant Protection; Poznan (Poland); 1993. *Materials of the 33rd Research Session of Institute of Plant Protection. Pt. 2. Posters. Pruszynski, S.; Lipa, J.J. (eds.). Instytut Ochrony Roslin, Poznan (Poland) p. 147-150.* Panstwowe Wydawnictwo Rolnicze i Lesne. 5 fig., 1 table. Polish. (AGRIS 95-115021).

In the experiment 11 fungicides applied twice during a season were used to control fungus diseases occurred on winter wheat. In 1992 the intensity of fungus diseases was rather low due to very dry climatic conditions, therefore the effectiveness of cereal protection was not so evident. The winter wheat mean yield losses caused by fungus diseases were about 7.76 percent (0.309 t/ha). The most common diseases which occurred in the season of 1992 were: Erysiphe graminis, Puccinia recondita and Septoria nodorum.

4828 Kato, H.; Mayama, R.; Sekine, R.; Urashima, A.S. (Kobe Univ., Kobe 657 (Japan). Faculty of Agriculture) (1994) **Microconidium formation in Magnaporthe grisea.** *Rice blast disease. Zeigler, R.S.; Leong, S.A.; Teng, P.S. (eds.). International Rice Research Inst., Los Banos, Laguna (Philippines). Entomology and Plant Pathology Div.; CAB International, Wallingford, Oxon OX10 8DE (United Kingdom) p. 590-591.* IRRI. English. (AGRIS 95-114974).

Magnaporthe grisea produces pyriform conidium as an anamorph and spindle-shaped ascospore as a teleomorph. An additional conidium state was found. The nucleus staining with Giemsa solution was tried in the area of mycelium confluence of both mating types to detect the process of nucleus migration. Some isolates possessing mating ability in the strains of finger millet, rice and wheat produced phialides and microconidia. Microconidia are hyaline, cylindrical, rounded at the end first, then lunate with thin cell wall, no septum, 5-8 (average 6) micro m long, 0.5-0.8 (0.7) micro m wide, and with one nucleus. The first rod-shaped microconidium is formed blastically from the conidiogenous cell apex within the collarette. At least two successive rod-shaped microconidia are formed in blastic from alternate side of the conidiogenous cell. Each conidium continues the growth and secedes. Subsequent microconidia are produced from the same locus. Accumulated microconidia curved from a globose mass with slime in most at the tip of a phialide. The shape of microconidia changes to crescent. The phialide is darkly pigmented vase-shaped, spherical to obclavate, with a tapered apex, terminal collarette, basal septum, thick walled, 5.9-12.5 (average 8.9) micro m long, 3.3-7.2 (4.5) micro m thick in the broadest part, arising solitary or sympodially from aerial hyphae.

4829 Klem, K.; Tvaruzek, L. (Zemedelsky Vyzkumny Ustav, Kromeriz (Czech Republic)) (1995) **[Analysis of Erysiphe graminis population in wheat in the Czech Republic from the point of view of resistance to fungicides]. Analyza populace padli travniho na psenici v Ceske republice z pohledu rezistence k fungicidum.** *Obilnarske Listy (Czech Republic) v. 3(2) p. 21-22.* 1 map. Czech. (AGRIS 95-115018).

4830 Kristensen, H.J. (1994) **Activation of plant defense responses with emphasis on barley powdery mildew [Oligoglucoside elicitors, fungal elicitors, bacterial elicitors, Conidia, review, including 2 manuscripts].** Kongelige Veterinaer- og Landbohoejskole, Copenhagen (Denmark). KVL. 12 ill., 16 tables; 350 ref. 117 p. English. (AGRIS 95-100068).

4831 Lei, CH.; Lister, RM.; Vincent, JR.; Karanjkar, MN. (1995) **SGV SEROTYPE ISOLATES OF BARLEY YELLOW DWARF VIRUS DIFFERING IN VECTORS AND MOLECULAR RELATIONSHIPS.** *Phytopathology. 85(7):820-826.* English. [PURDUE UNIV DEPT BOT & PLANT PATHOL W LAFAYETTE, IN 47907 USA].

Two SGV serotype isolates of barley yellow dwarf virus (BYDV), NY-SGV from New York State and TX-SGV from Texas, exhibited differences in aphid transmissibility that could significantly influence their relative occurrence and epidemiology; i.e., TX-SGV was readily transmitted by a range of vector aphids, whereas NY-SGV showed a much greater vector specificity. In serological assays, TX-SGV differed from NY-SGV but resembled an SGV serotype isolate from Idaho that shares similar vector relationships with TX-SGV. Dot blot hybridization assays using cloned cDNA probes distinguished the SGV isolates from the P-PAV, MAV-PSI, NY-RPV, and NY-RMV isolates of BYDV and from each other. Nucleotide sequences were determined for the 22-kDa coat protein gene, the associated 17-kDa internal open reading frame, and a 50-kDa protein gene of the NY-SGV and TX-SGV isolates. The deduced amino acid sequences of these proteins shared approximately 96% similarity between isolates but had only about 71% similarity with comparable regions from the MAV-PSI and P-PAV serotype isolates and approximately 57% similarity with those of the NY-RPV isolate. These comparisons did not identify obvious differences in primary structure that might be related to differences in vector relationships of NY-SGV and TX-SGV. The results demonstrate that the SGV serotype is distinct from other BYDV serotypes and that it includes sequence-distinguishable variants that differ in epidemiologically significant properties, such as transmissibility by various vectors. [References: 31].

4832 Lekomtzeva, SN.; Volkova, VT.; Chaika, MN. (1994) **RACES OF WHEAT STEM RUST CAUSAL AGENT - PUCCINIA GRAMINIS PERS F SP TRITICI ERIKS ET P HENN IN MOSCOW REGION IN 1992.** *Mikologiya i Fitopatologiya. 28(5):52-59.* Russian. [MOSCOW MV LOMONOSOV STATE UNIV MOSCOW RUSSIA].

4833 Lochon, S. (Service Regional de Protection des Vegetaux Centre, Fleury les Aubrais (France)); Migeon, J.L.; Murer, F.; de La Rocque, B.; Pillon, O.; Vergnaud, A. (1994) **[What can be learnt from the 1993-94**

cereal crop campaign [France]]. **Rien n'est jamais acquis. Ce qui ressort de la campagne "cereales" 1993-94.** *Phytoma La Defense des Vegetaux (France) (no 467) p. 40-44.* 8 illus. French. (AGRIS 95-100076).

4834 Locke, T.; Phillips, AN. (1995) **THE OCCURRENCE OF CARBENDAZIM RESISTANCE IN RHYNCHOSPORIUM SECALIS ON WINTER BARLEY IN ENGLAND AND WALES IN 1992 AND 1993.** *Plant Pathology. 44(2):294-300.* English. [ADAS WORCESTER WHITTINGTON RD WORCESTER WR5 2LQ ENGLAND].

In 1992, samples of Rhynchosporium secalis from 19 winter barley crops in England and Wales were examined for carbendazim resistance. Of the 120 isolates obtained, 14.2% were resistant to carbendazim. A larger survey was carried out in England and Wales in 1993 when samples from 74 crops were examined. On this occasion 16.6% of the 639 isolates obtained were resistant to carbendazim, and resistant isolates were detected in 46% of crops. [References: 19].

4835 Luo, Y.; Zeng, SM. (1995) **SIMULATION STUDIES ON EPIDEMICS OF WHEAT STRIPE RUST (PUCCINIA STRIIFORMIS) ON SLOW-RUSTING CULTIVARS AND ANALYSIS OF EFFECTS OF RESISTANCE COMPONENTS.** *Plant Pathology. 44(2):340-349.* English. [UNIV ARKANSAS DEPT PLANT PATHOL FAYETTEVILLE, AR 72701 USA].

Simulation studies were conducted to analyse the effects of components of slow-rusting resistance to stripe rust (Puccinia striiformis) on wheat varieties using the Slow-Rusting Epidemic Simulation Model (SRESM). Five components, infection efficiency (IE), sporulation capacity (SC), lesion expansion rate (LE), latent period (LP) and infectious period (IF) were studied for their importance in epidemics under various weather and pathogen inoculum conditions. Simulation outputs were analysed statistically. The LE, IE and SC were found to be the most important components. However, final disease was more strongly influenced by weather and initial disease. The Integrated Resistance Index (IRI), which combines the effects of resistance components, was used to predict the effects of various combinations of components in different types of weather and at different levels of initial disease intensity. These predictions provide guidelines for plant breeders and are useful in selecting varieties for specific regions. [References: 19].

4836 Lupej, A.Yu.; Valuevich, A.A. (Akadehmiya Navuk Belarusi, Minsk (Belarus). Instytut Genetyki i Tsytalogii) (1994) **[Assessment of wheat germ resistance to the septoriosis in vitro: methodical approaches]. Atsehnka prarostkavaj ustojlivastsi pshanitsy da septaryezu in vitro: metadychnyya padykhody.** *Vestsi Akadehmii Navuk Belarusi. Seryya Biyalagichnykh Navuk (Belarus) (no.3) p. 36-41.* 1 table, 15 ref. Byelo Russian. (AGRIS 95-114887).

4837 Maffi, D.; Cozzi, F.; Violini, G.; Bassi, M.; Conti, GG. (1995) **ULTRASTRUCTURAL STUDIES OF THE EFFECTS OF TETRACONAZOLE ON THE BARLEY-POWDERY MILDEW HOST PATHOGEN COMPLEX.** *Mycological Research. 99(Part 7):799-805.* English. [UNIV MILAN IST PATOL VEGETALE CNR CTR STUDIO MIGLIORAMENTO SANITARIO COLTURE AGRARIE I-20133 MILAN ITALY].

The effects of tetraconazole (TC), a systemic triazole fungicide, were investigated on the fungal haustoria and the plant leaf cells. TC caused thickening of the haustorial wall, modifications of the extrahaustorial membrane and matrix, and deposition of polysaccharidic plant materials around the haustoria leading to their encapsulation. Appositions of similar polysaccharides were frequently observed also in the walls of non-penetrated surrounding epidermal cells and sometimes of some underlying mesophyll cells. No changes were found in uninoculated TC-treated leaves, and haustorial encapsulation occurred very rarely in untreated leaves when the haustoria were damaged by removing the hyphae from the leaf surface. In mechanically wounded, uninfected healthy leaves, TC treatment did not increase polysaccharide deposition around the wounds. [References: 23].

4838 Mantle, PG.; Swan, DJ. (1995) **EFFECT OF MALE STERILITY ON ERGOT DISEASE SPREAD IN WHEAT.** *Plant Pathology. 44(2):392-395.* English. [UNIV LONDON IMPERIAL COLL SCI TECHNOL & MED DEPT BIOCHEM LONDON SW7 2AY ENGLAND].

Cytoplasmic male-sterile winter wheat. grown in the field in England with a limited supply of pollen, set over 80% less seed than fertile wheat. Wheat ears precociously inoculated with ergot (Claviceps purpurea) initiated local natural epidemics of disease at flowering and, within 1.5 m of primary foci, sclerotial abundance at harvest was correlated inversely with seed set. Sclerotial mass in poorly pollinated male-sterile wheat comprised more than 20% of the threshed grain yield, in contrast to only 0.7% in fertile wheat. [References: 8].

4839 Mellado Z, Mario; Matus T, Ivan; Madariaga B, Ricardo (Instituto de Investigaciones Agropecuarias, Chillan (Chile). Estacion Experimental Quilamapu) (1994) **[Importance of foliar diseases over grain yield of wheat varieties in Cauquenes dryland area of Chile]. Importancia de las enfermedades foliares en el rendimiento de grano de variedades de trigo en el secano interior de Cauquenes.** *Agricultura Tecnica (Chile) v. 54(2) p. 106-111.* 7 ref. Spanish. (AGRIS 95-100073).

A field trial to evaluate the importance of foliar diseases over grain yield of wheat and triticale varieties was carried out at the dryland area of Cauquenes during three cropping season, 1989 to 1991. A split plot design with three replications was used: two treatments (fungicide), and subtreatments (varieties) with 15 genotypes of cereal. The conclusions were: Foliar diseases are secondary in importance to wheat and triticale production evaluated in dryland conditions as compared to other environmental limitations like water stress during grain filling. Diseases observed during the trials were: septoria leaf blotch (Mycosphaerella graminicola), powdery mildew (Erysiphe graminis, sp tritici) and stripe rust (Puccinia striiformis). Early varieties (135 to 145 days to heading) get a higher and more stable yield through years than late varieties (150 to 160 days to heading).

4840 Merida, C.L. (Cornell University, Ithaca, NY.); Loria, R. (1994) **Survival of Helminthosporium solani in soil and in vitro colonization of senescent plant tissue.** *American potato journal (USA) v. 71(9) p. 591-598.* references. English. (AGRIS 95-115091).

4841 Milus, E.A.; Penix, S.E.; Gbur, E.E. (1994) **Progress of Septoria nodorum infection on wheat cultivars.** *Arkansas farm research (USA) v. 43(1) p. 14-15.* English. (AGRIS 95-115027).

4842 Minarikova, V. (Vyzkumny Ustav Zemedelsky, Kromeriz (Czech Republic)) (1995) **An analysis of Pyrenophora teres population in the Czech Republic and its use for barley resistance breeding.** *Ochrana Rostlin - UVTIZ (Czech Republic) v. 31(1) p. 1-10.* 3 tables; 11 ref. English. (AGRIS 95-100067).

The virulence of populations of net blotch of barley, caused by Pyrenophora teres, from ten locations in the Czech Republic was analyzed, a set of 20 cultivars, each with at least one gene for specific resistance or with tolerance were studied. The lowest percentage of infection within the populations and in the evaluation was found on cv. CI 739, which has become an effective donor in the hybridization programme aimed at barley resistance breeding. The cvs. Tifang and K 25 234 were susceptible to fewer than 10 % of the isolates; they are, however, more difficult to use for crossing. The cultivars were used for partial cloning of pathogen populations from various agroclimatic regions.

4843 Oana, M.; Banita, E.; Paunescu, G. (Institutul de Cercetari pentru Cereale si Plante Tehnice Fundulea, Simnic (Romania). Statiunea de Cercetari Agricole Simnic Craiova) (1994) **[The virulence of some populations Tilletia caries in an assortment of wheat]. Virulenta unor populatii de Tilletia caries asupra unui sortiment de grau.** *Lucrari stiintifice (Romania) v. 9 p. 303-315.* 5 tables; 3 graphs; 7 ref. Romanian. (AGRIS 95-114899).

Under conditions of an artificial infection, using the same amount of inocula, applying the same technological links, the wheat cultivars of an assortment can display in various ways also due to the virulence of some populations of common brand (Tilletia caries) of different origin. Analysing the resistance of the assortment, expressed in the attack frequency, as well as in the relative resistance, the authors assess that 8 wheat cultivars exist and remain free of attack. The obtained results attest the superiority of the virulence in the brand population Simnic, compared to ones of other provenance. Beside that, the dependence of virulence in populations on the

climate conditions is obvious as well as the existence of some genes resistant to common brand (Tilletia caries) in each cultivar's genom.

4844 Oana, M.; Paunescu, G.; Luca, E. (Institutul de Cercetari pentru Cereale si Plante Tehnice Fundulea, Simnic (Romania). Statiunea de Cercetari Agricole Simnic Craiova) (1994) **[Evolution of the main pathogens in wheat crops in the southern zone of Oltenia (1990-1991) [Romania]]. Evolutia principalilor agenti patogeni din cultura graului in zona de sud a Olteniei (1990-1991).** *Lucrari stiintifice (Romania) v. 9 p. 295-302.* 4 tables; 2 graphs; 6 ref. Romanian. (AGRIS 95-114898).

The good deportment to the attack of leaves' diseases (Erysiphe graminis, Septoria spp.) in the early variety Simnic 30 compared to the late variety Fundulea 4 is a proof of interaction between the character of resistance of the genotype and the climate conditions. Notwithstanding the high degree of attack got in experimental plots in both of the studied foliar diseases (attack degree = 30 percent) and in production area (a.d.= 15 percent), the production capacity was not much diminished. This fact is due first of all to the precocity of the variety Simnic 30, which achieves its productive elements before the outbreak of the disease. The Fusarium attack on the level of the ear depends not only on climate conditions, but also on the applied cultivation technology. In this case too, the lowest frequency was stated in the variety Simnic 30 (F percent = 3, 6).

4845 Olteanu, L.D. (Institutul de Cercetari pentru Cereale si Plante Tehnice Fundulea, Simnic (Romania). Statiunea de Cercetari Agricole Simnic Craiova) (1994) **[A new species of Tilletia indica Mitra - a parasite of wheat]. O noua specie de malura (Tilletia indica Mitra) care paraziteaza graul.** *Lucrari stiintifice (Romania) v. 9 p. 109-114.* 40 ref. Romanian. (AGRIS 95-114897).

The smut karnal is caused by the fungus Tilletia indica Mitra (synonym Neovassia indica Mitra-Mundkur), which produces a partial infection of common wheat, durum and triticale. It was found for the first time in India before 1930, but soon it became noticed in Pakistan, Afghanistan, Nepal, Iraq and Mexico. The infection is characterized by the fact that it occurrs in flowers, the teleospores germinate on scales, penetrate into ovaries and produce grains, partially attacked, which will germinate as normal plants, but with scarce organs. Though the climate conditions of the zone of origin differ from those in Romania, we consider that due to the import of wheat it is necessary to know this quarantine disease.

4846 Parry, DW.; Jenkinson, P.; Mcleod, L. (1995) **FUSARIUM EAR BLIGHT (SCAB) IN SMALL GRAIN CEREALS - A REVIEW [Review].** *Plant Pathology. 44(2):207-238.* English. [HARPER ADAMS AGR COLL CROP & ENVIRONM RES CTR NEWPORT TF10 8NB SHROPS ENGLAND].

This review of Fusarium ear blight (scab) of small grain cereals has shown that up to 17 causal organisms have been associated with the disease, which occurs in most cereal-growing areas of the world. The most common species were Fursarium graminearum (Gibberella zeae), F. culmorum, F. avenaceum (G. avenacea), F. pone and Microdochium nivale (Monographella nivalis). The disease was recorded most frequently under hot, wet climatic conditions where significant yield losses and mycotoxin accumulation in grain were reported. Possible sources of inoculum were reported as crop debris, alternative hosts and Fusarium seedling blight and foot rot of cereals. The mode of dispersal of inoculum to ears remains unclear, but contaminated arthropod vectors, systemic fungal growth through plants, and wind and rain-splash dispersal of spores have been proposed. Infection of wheat ears was shown to occur mainly during anthesis, and it has been demonstrated that fungal growth stimulants may be present in anthers. Despite the importance of the disease, particularly during epidemic years, control methods are limited. Much effort has gone into breeding resistant wheat varieties and into improving our understanding of the possible mechanisms and genetic basis of resistance, with only moderate success. There are also surprisingly few reports of successful fungicidal or biological control of the disease in the field. [References: 211].

4847 Prestes, A.M.; Angra, D.C.; Barbosa, M.M.; Moraes Fernandes, M.I.B. de (1994) **[Sources of resistance to Stagonospora nodorum within Aegilops squarrosa, a wheat - related species]. Fontes de resistencia a Stagonospora nodorum em Aegilops squarrosa, especie afim ao trigo cultivado.** *Fitopatologia Brasileira (Brazil) v. 19(4) p. 510-513.* 16 ref. Portuguese. (AGRIS 95-114919).

4848 Sache, I.; Devallaviellepope, C. (1995) **CLASSIFICATION OF AIRBORNE PLANT PATHOGENS BASED ON SPORULATION AND INFECTION CHARACTERISTICS.** *Canadian Journal of Botany-Revue Canadienne de Botanique. 73(8):1186-1195.* English. [INRA.PATHOL VEGETALE LAB F-78850 THIVERVAL GRIGNON FRANCE].

The infection cycles of 26 airborne fungal plant pathogens were compared using six monocyclic variables: latent period, infectious period, sporulation capacity, relative date of sporulation peak, lesion size, and infection efficiency. All variables were measured at the seedling stage in conditions highly conducive to disease development. Multivariate analyses of literature and experimental data were used to describe epidemic strategies based on compensation, addition, and multiplication effects between the monocyclic variables. A typology of fungi according to these effects is proposed, the main divisions of which follow the pattern of lesion growth (semisystemic, local, or negligible). Further subdivisions were obtained based on the other sporulation and infection variables. With a few exceptions, pathogens belonging to the same taxonomic (powdery mildews, downy mildews, rusts) and ecological (biotrophs, necrotrophs) group were grouped together in the proposed typology. Among rusts and necrotrophs, the fungi adapted to temperate and warm climates were also distinguished. The wheat stripe rust was not grouped with the other rusts because of unique epidemiological characteristics, especially semisystemic growth of lesions. [References: 58].

4849 Schweizer, P.; Vallelianbindschedler, L.; Mosinger, E. (1995) **HEAT-INDUCED RESISTANCE IN BARLEY TO THE POWDERY MILDEW FUNGUS ERYSIPHE GRAMINIS F SP HORDEI.** *Physiological & Molecular Plant Pathology. 47(1):51-66.* English. [SANDOZ AGRO LTD AGROBIOL RES STN CH-4108 WITTERSWIL SWITZERLAND].

A hear-treatment (30-60 s at 50 degrees C) of young barley seedlings of the highly susceptible cultivar Golden Promise reduced subsequent infection by the powdery mildew fungus Erysiphe graminis f.sp. hordei. Shorter heat-treatments (30 or 40 s) caused transient protection, whereas protection after longer heat-treatments (50 or 60 s) was more persistent. On heat-treated leaves, the fungus was mainly stopped at the stage of first appressorial penetration, in the absence of papilla formation or hypersensitive cell death. Heat-treated leaves produced fewer protoplasts on treatment with cellulase and pectinase than controls thus indicating effects on cell-walls. Protection did not correlate with enhanced accumulation of extracellular, pathogenesis-related (PR) proteins, compared to the susceptible interaction on control leaves. Two-dimensional analysis of in vitro translation products revealed a pattern of accumulating transcripts 14 h after heat-treatment, that was different from the pattern induced during a 4 h heat-shock period at 38 degrees C, with partial overlap. A new mechanism of acquired resistance is proposed that is independent of papilla Formation, hypersensitive cell death or accumulation of extracellular PR proteins but may be based on cell-wall modification and the induction of new host genes. (C) 1995 Academic Press Limited. [References: 46].

4850 Seifers, DL.; Harvey, TL.; Bowden, RL. (1995) **OCCURRENCE AND SYMPTOM EXPRESSION OF AMERICAN WHEAT STRIATE MOSAIC VIRUS IN WHEAT IN KANSAS.** *Plant Disease. 79(8):853-858.* English. [KANSAS STATE UNIV AGR & APPL SCI AGR RES CTR HAYS HAYS, KS 67601 USA].

Extracts of winter wheat with viruslike symptoms from Comanche County, Kans., did not react with antisera to viruses previously found infecting wheat in the state, nor was the virus mechanically transmissible to wheat, maize, or sorghum. Leaves of infected wheat developed thin, chlorotic striations that were more severe on the abaxial than adaxial surface. The virus reacted with American wheat striate mosaic virus (AWSMV) antiserum and was vectored by the painted leafhopper (Endria inimica), confirming the virus as AWSMV. A protein of 59 kDa, consistently detected in extracts of infected leaves, reacted with antiserum to AWSMV in Western blots. This is the first report of AWSMV in the Southern Great Plains region. Experiments showed that, on some cultivars, AWSMV caused brown necrotic streaking of culms and glumes, a symptom not described previously for wheat infected by this virus. Hard

red winter wheat cultivars Ike, Karl, and TAM 107 had positive enzyme-linked immunosorbent assay values, but exhibited few or no symptoms. [References: 19].

4851 Seng, J.M. (Biotransfer, Montreuil (France)); Desmarais, S.; Barchietto, T. (1994) **[Septoria diseases on wheat: diseases for the future]. Les septorioses du ble: des maladies d'avenir.** *Phytoma La Defense des Vegetaux (France) (no 464) p. 21-23.* 9 ref. French. (AGRIS 95-100074).

4852 Shaner, G.; Buechley, G. (1995) **EPIDEMIOLOGY OF LEAF BLOTCH OF SOFT RED WINTER WHEAT CAUSED BY SEPTORIA TRITICI AND STAGONOSPORA NODORUM.** *Plant Disease. 79(9):928-938.* English. [PURDUE UNIV DEPT BOT & PLANT PATHOL 1155 LILLY HALL W LAFAYETTE, IN 47907 USA].

Septoria tritici and Stagonospora nodorum frequently cause leaf blotch of wheat in the soft red winter wheat region east of the Mississippi River. Since 1955, leaf blotch has been the most destructive disease of wheat in Indiana. Seproria tritici was initially the principal pathogen responsible for this disease. Since 1986, S. nodorum has also been a devastating pathogen, causing both leaf and glume blotch. In order to understand the dynamics of this disease, we have monitored disease development on wheat cultivar Monon in replicated wheat performance trials each year since 1973. Monon has served as a long-term check cultivar in these trials, and it is very susceptible to both Septoria tritici and S. nodorum. The percent leaf area showing symptoms of Septoria leaf blotch was used to quantify disease severity, using a scale that reflected the vertical gradient of symptoms. Plots were usually assessed weekly for disease from the time of flag leaf emergence until crop maturity. During the 19 years of disease observation reported here, we rarely saw symptoms of leaf blotch in the fall. Initial symptoms usually appeared early in the spring on leaves touching or near the soil surface, suggesting that primary infection takes place during autumn, before the onset of cold weather, and that Septoria tritici and S. nodorum overwinter as asymptomatic infections. In most years, disease incidence was 100% by the time of flag leaf emergence; there was considerable variation in severity, but symptoms usually progressed at least to the third leaf below the flag leaf. The time from spike emergence to harvest (average = 49 days) was the main period of disease increase on the upper four leaves of the culm. For many of the years, the increase in severity with time, as recorded on the assessment scale, was approximately linear. In every year but 1982, the model based on plotting severity scale values vs. days relative to spike emergence yielded a reasonably linear relationship between severity and time. [References: 33].

4853 Sukhacheva, E.A.; Novikov, V.K.; Ambrosova, S.M. (1994) **[Epitope analysis of barley stripe mosaic virus by means of monoclonal antibodies]. Izuchenie antigennoj struktury virusa shtrikhovatoj mozaiki yachmenya s pomoshch'yu monoklonal'nykh antitel.** *Bioorganicheskaya khimiya (Russian Federation) v. 20(10) p. 1060-1069.* 16 ref. Russian. (AGRIS 95-099998).

Six stable hydridoma lines, producing monoclonal antibodies (MA) to barley stripe mosaic virus (BSMV) were obtained. Subtypes of all the MA and their affinity constants were determined. Interaction of the MA with BSMV of various strains (V-1, Norwich, Myronovka) in sandwich-ELISA showed that the BSMV strains used in this work were serologically identical. Three independent methods - additive ELISA, competitive ELISA and inhibition of latex agglutination -revealed three antibody-binding sites on the surface of the native BSMV.

4854 Tada, S.; Hatano, M.; Nakayama, Y.; Volrath, S.; Guyer, D.; Ward, E.; Ohta, D. (1995) **INSECT CELL EXPRESSION OF RECOMBINANT IMIDAZOLEGLYCEROLPHOSPHATE DEHYDRATASE OF ARABIDOPSIS AND WHEAT AND INHIBITION BY TRIAZOLE HERBICIDES.** *Plant Physiology. 109(1):153-159.* English. [CIBA GEIGY CORP AGR BIOTECHNOL RES UNIT 3054 CORNWALLIS RD RES TRIANGLE PK, NC 27709 USA].

Imidazoleglycerolphosphate dehydratase (IGPD; EC 4.2.1.19), which is involved in the histidine biosynthetic pathway of Arabidopsis thaliana and wheat (Triticum aestivum), has been expressed in insect cells using the baculovirus expression vector system. N-terminal amino acid sequencing indicated that recombinant IGPDs (rIGPDs) were produced as mature forms via nonspecific proteolytic cleavages in the putative transit peptide region. The wheat rIGPD contained one Mn atom per subunit, and the Mn was involved in the assembly of the subunits to form active IGPDs. Protein-blotting analysis, using antibodies raised against the wheat rIGPD, indicated that IGPD was located in the chloroplasts of wheat. The rIGPDs of Arabidopsis and wheat, which were 86% identical in their primary structures deduced from the cDNAs, exhibited similar properties in terms of the molecular mass, pH optimum, and the K-m for the substrate, imidazoleglycerolphosphate. However, the nonselective herbicides 3-amino-1, 2, 4-triazole and a newly synthesized triazole [(1R*, 3R*)-[3-hydroxy-3-(2H-[1, 2, 4]triazole-3-yl)-cyclohexyl]-phosphonic acid], inhibited Arabidopsis and wheat IGPDs in a mixed-type and a competitive manner, respectively. [References: 28].

4855 Troshina, N.B. (1994) **[Influence of preinoculation of the wheat plants with causative agents of helminthosporiosis and septoriosis on development of secondary infection and on the protein content of leaves]. Vliyanie preinokulyatsii rastenij pshenitsy vozbuditelyami gel'mintosporioza i septorioza na razvitie vtorichnoj infektsii i soderzhanie belka v list'yakh.** *Izvestiya AN - Rossijskaya AN. Seriya biologicheskaya (Russian Federation) (no.6) p. 951-953.* 7 ref. Russian. (AGRIS 95-114901).

The intensity of symptoms of septoriosis and helminthosporiosis was estimated and the protein content was assayed in the 2nd leaf of wheat plants at different times after preinoculation of the ist leaf. At the interval of 1-5 days between inoculations the symptoms of diseases were weaker than in the control. At the same time the protein content of leaves increased. It remained at a high level during the subsequent four days of the experiment. The increased concentration of the pathogen spores uses for preinoculation did not affect the course of the disease.

4856 Troshina, N.B. (1994) **[Intensity of septoriosis symptoms in wheat plants preinoculated by the fusarial root rot]. Intensivnost' simptomov septorioza na rasteniyakh pshenitsy, predvaritel'no infitsirovannykh fuzarioznoj kornevoj gnil'yu.** *Izvestiya AN - Rossijskaya AN. Seriya biologicheskaya (Russian Federation) (no.6) p. 949-951.* 9 ref. Russian. (AGRIS 95-114900).

The intensity of septoriosis symptoms was estimated on the 2nd leaf of wheat plants preinoculated by Fusarium gramineum. Under the conditions of weak infection with F. gramineum the intensity of septoriosis decreased as compared with the control. In the case of strong infection with F. gramineum leading to the deep damage of cells of the cortex and parenchyma of the conducting system at the stem base, resistance of plants to the septoriosis causative agent was not induced.

4857 Tyuterev, S.L.; Tarlakovskij, S.A. (1994) **[Dynamics of free aminoacids in wheat plants under influence of resistance inducer]. Dinamika nakopleniya svobodnykh aminokislot v rasteniyakh pshenitsy pod dejstviem induktora bolezneustojchivosti.** *Sel'skokhozyajstvennaya biologiya. Seriya Biologiya rastenij (Russian Federation) (no.3) p. 120-127.* 7 ref. Russian. (AGRIS 95-115022).

The free aminoacids' dynamics in plants of the wheat variety Saratovskaya 29 (susceptible to the race 77 of Puccinia recondita f. sp. tritici) and its resistant isogenic line possessing the gene Lr 9 was studied after the spraying with 1% suspension of disintegrated mycelium of Fusarium oxysporum, strain No. 2021 of the VIZR collection (the resistance inducer) and the subsequent inoculation with pathogen's urediospores. The treatment with the inducer resulted in an increased accumulation of aminoacids and their changed ratio in the pool. This effect was most high within four days and disappeared at the 9th day. In plants of the resistant isogenic line, the free aminoacids' pool contained more hydroxi acids, tyrosine, alfa- and beta-alanine, ethanole amine, and urea. The changes were most rapid and significant in plants with genetically determined or induced resistance, on the one hand, and expressed at the least degree in Saratovskaya 29 plants, on the other. The changed pool and the involvement of free aminoacids in biological processes by the response type typical for resistant plants have been supposed to reduce the crown rust development in inoculated plants by 50-70%.

4858 Vechet, L. (Vyzkumny Ustav Rostlinne Vyroby, Prague Ruzyne (Czech Republic)) (1995) **[Analysis of yellow rust occurrence in the Czech and Slovak wheat varieties]. Analyza vyskytu rzi plevove na ceskych a**

slovenskych odrudach psenice. *Ochrana Rostlin - UVTIZ (Czech Republic) v. 31(1) p. 35-48.* 2 graphs, 2 table; 11 ref. Czech. (AGRIS 95-100082).

The occurrence of yellow rust on leaves of winter wheat cultivars was higher in the cooler year, than in the warmer one. The cultivars Mona, Agra, Solida, Samanta were resistant or very slightly affected by the race avirulent to resistance gene Yr9 but the race virulent to Yr9 affected these cultivars very strongly. The cultivars Sparta, Selekta, Briga were affected in a similar way but in a smaller intensity also. The cultivars Mona, Samanta, Iris, Senta which were affected by the race virulent to resistance gene Yr9 showed more susceptible infection type in the cooler year while in the warmer year they showed more resistant infection type. On the cultivars Klea, Sida, Stella it was on the contrary.

4859 Villareal, RL.; Mujeebkazi, A.; Gilchrist, LI.; Deltoro, E. (1995) **YIELD LOSS TO SPOT BLOTCH IN SPRING BREAD WHEAT IN WARM NONTRADITIONAL WHEAT PRODUCTION AREAS.** *Plant Disease. 79(9):893-897.* English. [CIMMYT INT MAIZE & WHEAT IMPROVEMENT CTR APARTADO POSTAL 6-641 DELEGAC CUAUHTEMOC MEXICO CITY 06600 DF MEXICO].

Twenty-five spring bread wheat (Triticum aestivum L.) cultivars were evaluated for 2 years at Poza Rica, Mexico, for grain yield, aboveground biomass at maturity, harvest index, yield components, and test weight under a natural epidemic of spot blotch (caused by Cochliobolus sativus) with and without fungicide protection. Diseased plot yields were 43.2% lower than fungicide-protected plot yields. Aboveground biomass yield at maturity and harvest index were reduced by 18 and 31.3%, respectively, on blotched plots. The average percent reduction on primary yield components due to the disease was highest for number of grains per m(2) (32.8%), followed by 1, 000-grain weight (30.5%), number of grains per spike (24.6%), and number of spikes per m(2) (12%). Test weight was reduced 8.4%. Resistance to Cochliobolus sativus present in cultivars with resistance from Thinopyrum curvifolium or materials derived from Chinese germ plasm increased grain yield. This germ plasm may be a valuable source of genes for spot blotch resistance in T. aestivum. [References: 21].

4860 Zhang, ZJ. (1995) **EVIDENCE OF DURABLE RESISTANCE IN NINE CHINESE LAND RACES AND ONE ITALIAN CULTIVAR OF TRITICUM AESTIVUM TO PUCCINIA STRIIFORMIS.** *European Journal of Plant Pathology. 101(4):405-409.* English. [BEIJING AGR UNIV DEPT PLANT PROTECT BEIJING 100094 PEOPLES REPUBLIC OF CHINA].

In this study carried out from 1987 to 1994, in a very conducive environment to stripe rust, nine Chinese land races and one Italian cultivar of wheat showed fair levels of quantitative resistance to rust disease. The nine old Chinese cultivars had a commercial planting history in this conducive environment ranging from 20 to 100 years, in a cultivation area of 20 to 467 thousand hectares p.a. with no apparent erosion of resistance. The Italian cultivar has been used commercially for 15 years in China without showing a decrease in the level of quantitative resistance. All these data warrant the conclusion that the ten cultivars have a form of durable resistance to stripe rust. [References: 21].

H50 MISCELLANEOUS PLANT DISORDERS

4861 Abawi, GY.; Smith, RJ.; Brady, DK. (1995) **ASSESSMENT OF THE VALUE OF LONG RANGE WEATHER FORECASTS IN WHEAT HARVEST MANAGEMENT.** *Journal of Agricultural Engineering Research. 62(1):39-48.* English. [UNIV SO QUEENSLAND NATL CTR ENGN AGR POB 2246 TOOWOOMBA QLD 4350 AUSTRALIA].

Quality losses from weather damaged wheat cost the Australian wheat industry on average around $A30 M annually. These losses are higher in the north-eastern region than in other regions of the Australian wheat belt because of spring and summer dominant rainfall coinciding with harvest. If a wet season can be predicted, growers could reduce grain losses by strategies such as early harvesting, contract harvesting, additional grain drying and harvesting at a faster rate. In north-eastern Australia, long-range rainfall forecasting is possible by the analysis of sea surface temperatures and air-pressure differences between Tahiti (17 degrees S 150 degrees W) and Darwin (12 degrees S 131 degrees E) as identified by the Southern Oscillation Index (SOI). Using monthly SOI and rainfall data since 1890, this paper examines the relationship between the SOI and rainfall during the harvest period in north-eastern Australia. A simulation model of wheat harvesting and drying developed earlier was used to investigate the value of seasonal forecasts as a decision aid in harvest management. The results show that in north-eastern Australia, the status of the SOI as early as May gives a reasonable indication of above- or below-average rainfall in the following spring and summer (October-December). This information could enable growers to minimize grain quality damage by altering their management practices according to seasonal variations in rainfall. This could involve harvesting of high-moisture grain and drying it or, the use of contract harvesting when the seasonal outlook for rainfall is high. The value of such information to the producer is predicted to be around $A12 ha(-1) per year through improvements in grain quality and reduced losses. (C) 1995 Silsoe Research Institute [References: 14].

4862 Akhtar, J.; Gorham, J.; Qureshi, RH. (1995) **COMBINED EFFECT OF SALINITY AND HYPOXIA IN WHEAT (TRITICUM AESTIVUM L) AND WHEAT-THINOPYRUM AMPHIPLOIDS (VOL 166, PG 47, 1994).** *Plant & Soil. 173(1):177 ff.* English.

The effects of sodium chloride salinity and hypoxia were studied in eight wheat lines and three wheat-Thinopyrum amphiploids in vermiculite-gravel culture. The lines were treated with either 100 or 150 mol m(-3) NaCl with and without hypoxia. Saline hypoxic conditions significantly reduced the vegetative growth, water use, grain and straw yields for all wheat varieties except the amphiploids, whereas NaCl or hypoxia alone had less pronounced effects. In addition, saline hypoxic stress reduced K+ concentration and increased significantly the Nat and Cl(-)concentrations in cell sap expressed from leaves. There was more Na+ and Cl- accumulation in wheats than the amphiploids in hypoxic conditions at 150 mol m(-3) NaCl. Of the wheats, Pato was the most sensitive at all stress levels while a Triticum aestivum cv. Chinese Spring x Thinopyrum elongatum amphiploid was the most tolerant of the three amphiploids. [References: 28].

4863 Akimova, T.V.; Titov, A.F.; Topchieva, L.V. (1994) **[Comparative study of plant [Triticum aestivum and Cucumis sativus] response on the action of high hardening and damaging temperatures]. Sravnitel'noe izuchenie reaktsii rastenij na dejstvie vysokikh zakalivayushchikh i povrezhdayushchikh temperatur.** *Fiziologiya rastenij (Russian Federation) v. 41(3) p. 381-385.* 19 ref. Russian. (AGRIS 95-100295).

4864 Crosson, P. (Institut Technique des Cereales et des Fourrages, Paris (France)) (1995) **[Plant growth regulators: an insurance against lodging]. Les substances de croissance, une assurance contre la verse.** *Perspectives Agricoles (France) (no 200) p. 110-113.* French. (AGRIS 95-100293).

4865 Ding, NC.; Musgrave, ME. (1995) **RELATIONSHIP BETWEEN MINERAL COATING ON ROOTS AND YIELD PERFORMANCE OF WHEAL UNDER WATERLOGGING STRESS.** *Journal of Experimental Botany. 46(289):939-945.* English. [LOUISIANA STATE UNIV CTR AGR LOUISIANA AGR EXPT STN DEPT PLANT PATHOL & CROP PHYSIOL BATON ROUGE, LA 70803 USA].

Waterlogging stress limits the productivity of winter wheat (Triticum aestivum L. emend, Thell.) in many parts of the world. When wheat is grown under waterlogged conditions, a reddish-brown mineral coating can form on the epidermal surface of the roots. In wetland plants such as rice, the amount of mineral coating formed on root surfaces is positively related to yield, This study was conducted to determine whether mineral coating on the roots of wheat is related to yield potential under waterlogged conditions. Root mineral coatings formed under waterlogged conditions were studied in 12 cultivars and two breeding lines over three years of greenhouse pot studies, Soil redox potential in the waterlogged treatment ranged between -46 and 171 mV, and grain yield was suppressed by 28-49% compared to well-drained controls, Mineral coating formed on the roots from the waterlogged treatment was determined to be composed primarily of iron, based on ICP elemental analysis, iron-specific staining, and ion-mapping by scanning electron microscopy using an X-ray detector. Of 11 elements quantified by ICP spectroscopy, six were significantly affected by waterlogging treatment, and three of these, Fe, Mn and P, were well-correlated negatively to yield, Aerenchyma formation in the heavily coated waterlogged roots appeared to disrupt the internal root structure, and exceeded 40% of cross-sectional area in one cultivar, Unlike rice, which shows a positive relationship between oxygen release from

roots, grain yield and mineral coating, in winter wheat, the amount of mineral coating is negatively related to grain yield under waterlogged conditions. [References: 21].

4866 Hammond, KE.; Evans, DE.; Hodson, MJ. (1995) **ALUMINIUM SILICON INTERACTIONS IN BARLEY (HORDEUM VULGARE L) SEEDLINGS.** *Plant & Soil. 173(1):89-95.* English. [OXFORD BROOKES UNIV SCH BIOL & MOLEC SCI GIPSY LANE OXFORD OX3 0BP ENGLAND].

The response of seedlings of the monocot Hordeum vulgare L. cv. Bronze to 0, 25 and 50 mu M aluminium in factorial combination with 0, 1.4, 2.0 and 2.8 mM Si was tested in hydroponic culture at pH 4.5. Nutrient solution (500 mu M calcium nitrate) and Al/Si treatments were designed to avoid the precipitation of Al from solution. Silicon treatments gave significant amelioration of the toxic effects of Al on root and shoot growth and restored calcium levels in roots and shoots at harvest to levels approaching those of control plants. Aluminium uptake by roots was also significantly diminished in the presence of Si. Silicon alone gave a slight stimulation of growth, insufficient to explain its ameliorative effect on Al toxicity. The mechanism of the Si effect on Al toxicity in monocotyledons awaits further investigation. [References: 21].

4867 Hautala, EL.; Holopainen, JK. (1995) **GRAMINE AND FREE AMINO ACIDS AS INDICATORS OF FLUORIDE-INDUCED STRESS IN BARLEY AND ITS CONSEQUENCES TO INSECT HERBIVORY.** *Ecotoxicology & Environmental Safety. 31(3):238-245.* English. [UNIV KUOPIO DEPT ENVIRONM SCI ECOL LAB POB 1627 SF-70211 KUOPIO FINLAND].

Barley leaves were sprayed with aqueous NaF, which caused accumulation of fluoride in the foliage, but no visible symptoms were detectable. No significant correlation was observed between foliar fluoride concentration and content of the indole alkaloid gramine after exposure to fluoride levels of 20 to 60 mg F liter(-1). Fluoride exposure did not explicitly affect the performance of Carausius morosus or Rhopalosiphum padi on barley. After exposure to fluoride levels of 100 and 200 mg F liter(-1), as NaF, fluoride treatment had a significant effect on gramine concentration of the first leaf of barley, being highest at a fluoride treatment of 200 mg liter(-1), and there was a slight, but significant positive correlation between the log-transformed foliar fluoride concentration and log-transformed gramine concentration of the first leaf. Fluoride treatment increased levels of some individual free amino acids in barley foliage. Exposure of young barley to NaF in aqueous form caused accumulation of fluoride in barley foliage and resulted in increased levels of gramine in the first leaf and levels of some free amino acids in foliage. It is possible that the fluoride-induced concurrent increase in gramine concentration in barley leaves could override the eventual increase in nutritive value to herbivorous insects after fluoride exposure. More detailed biochemical studies of the induction of gramine production are needed to understand the fluoride effects in secondary metabolism of barley. (C) 1995 Academic Press, Inc. [References: 44].

4868 May, KW.; Kozub, GC. (1995) **GENOTYPE X ENVIRONMENT INTERACTIONS FOR TWO-ROW BARLEY GRAIN YIELD AND IMPLICATIONS FOR SELECTION OF TEST LOCATIONS.** *Canadian Journal of Plant Science. 75(3):571-575.* English. [AGR & AGRIFOOD CANADA RES CTR LETHBRIDGE AB T1J 4B1 CANADA].

The response of barley grain yield to Canadian prairie environments was studied to evaluate genotype x environment interactions, and to group locations according to genotype response, which identifies locations whose removal would not significantly affect the validity of conclusions. The data were also used to illustrate a method for handling a large genotype x location x year data base with few common entries. Information from 20 test locations with 11-19 annual entries over 7 yr was used. Analyses of variance of data sets with three to seven common entries in adjacent years indicated significant genotype x location x year interactions for grain yield. The structure of the genotype x location interaction was studied using cluster analysis within each year and summarized over years. Cluster analysis using individual years allowed more test entries and should increase the reliability of the conclusions compared to that using average over years with few entries. Clustering identified six locations with dissimilar genotype yield responses. In the 7 yr, 19 pairs of locations usually clustered together. The 19 pairs involved eight of the 20 locations and most were in the same geographical region. Some of the eight locations could be eliminated without significant loss of reliability. Rankings of test entries for grain yield at locations within a cluster were generally similar when genotype effects were larger. [References: 13].

4869 Novitskaya, G.V.; Vol'nova, T.L.; Suvorova, T.A. (1994) **[Effect of fusicoccin on the composition and content of membrane lipids in winter wheat during low-temperature adaptation]. Vliyanie fuzikoktsina na sostav i soderzhanie membrannykh lipidov v usloviyakh adaptatsii ozimoj pshenitsy k nizkoj temperature.** *Prikladnaya biokhimiya i mikrobiologiya (Russian Federation) v. 30(6) p. 917-922.* 21 ref. Russian. (AGRIS 95-100285).

The effect of fusicoccin on the composition of membrane polar lipids and their fatty acid residues in leaves and tillering nodes of winter wheat has been studied by thin-layer and gasliquid chromatography during low-temperature adaptation. The content of polar lipids (sulfo-, phospho- and especially galactolipids) is shown to increase under the effect of fusicoccin in leaves and tillering nodes of hardened and nonhardened winter wheat plants. The degree of unsaturation of membrane lipid fatty acids was not affected by fusicoccin, while the content of linolenic acid increased.

4870 Ponce, R.G.; Salas, M.L. (Centro de Ciencias Medioambientales, CSIC Serrano, Madrid (Spain)) (1992) **Effects of tri-allate [herbicide] and N fertilization on wheat grain yield and its components [wild oats; Avena sterilis; weed control; Spain].** *Plant Protection Quarterly (Australia) v. 7(3) p. 140-141.* 1 table, 2 fig., 10 ref. English. (AGRIS 95-115554).

An experiment was carried out in semi-arid conditions of Central Spain, to study the effect of pre-emergence applications of the herbicide tri-allate, at applied doses of 1.2 kg a.i. per ha on a wheat field heavily infested by wild oat (Avena sterilis ssp. macrocarpa Mo.) The main plots, treated or not with herbicide received 0, 42, 84 or 126 kg per ha N. The control of the weed was 52 or 82 percent in the two different years, according to the adequacy of rainfall in autumn-winter. Only when tri-allate is used is there a clear response on number of ears per sq m and consequently wheat grain yield. The wild oat competition grew with increasing N rates.

4871 Rahman, SM.; Khalil, MI.; Ahmed, MF. (1995) **YIELD WATER RELATIONS AND NITROGEN UTILIZATION BY WHEAT IN SALT-AFFECTED SOILS OF BANGLADESH.** *Agricultural Water Management. 28(1):49-56.* English. [BANGLADESH INST NUCL AGR DIV SOIL SCI POB 4 MYNENSINGH 2200 BANGLADESH].

Salinity is the most dominant factor limiting crop production during dry winter season (November-May) in the salt-affected soils of Bangladesh. Cultivation of salt-tolerant crop cultivars of wheat, barley and pulses with careful management practices can bring substantial change in the agricultural practice towards increased cropping intensity of the country. The 4-year experiments on wheat showed that grain yield increased by 28% with irrigation alone and by 35% with fertilizer only. Combined application of irrigation and fertilizer increased the yield by about 80%. N-15 isotope-aided studies indicated that the uptake of fertilizer N, Ndff and N utilization by wheat were, in general, considerably lower in the salt-affected soils. Water-use efficiency of wheat increased considerably with the application of fertilizers under both irrigated and non-irrigated conditions. No significant change in soil properties (e.g. pH, EC and CEC) was observed as a result of irrigation and fertilizer application. Continuous cropping, however, increased the total and fertilizer N uptake, %Ndff and %N utilization by wheat with considerable yield. [References: 9].

4872 Ryan, PR.; Delhaize, E.; Randall, PJ. (1995) **MALATE EFFLUX FROM ROOT APICES AND TOLERANCE TO ALUMINIUM ARE HIGHLY CORRELATED IN WHEAT.** *Australian Journal of Plant Physiology. 22(4):531-536.* English. [CSIRO DIV PLANT IND POB 1600 CANBERRA ACT 2601 AUSTRALIA].

Aluminium (Al) can stimulate the efflux of malate and other organic acids from root apices of wheat (Triticum aestivum L.) seedlings. This response has been implicated in a mechanism of Al tolerance since the amount of malate released from an Al-tolerant genotype was 5-10-fold greater than the amount released from a near-isogenic, but Al sensitive, genotype. In the present study, 36 wheat cultivars were screened for Al tolerance and for the amount of malate released from their root apices with

a standard Al treatment. Excised root apices (3.0 mm) were used to measure malate efflux, and the relative tolerance to Al was determined from root growth measurements in 3 and 10 mu M AlCl3 with 200 mu M CaCl2, pH 4.3. There was a significant correlation between relative tolerance of the genotypes to Al and the amount of malate released from their root apices. Growth measurements were also used to investigate the amelioration of Al toxicity by exogenous malate. In the presence of 3 mu M Al alone, relative root growth of an Al-sensitive genotype was reduced to 13% of the control. Addition of 10 mu M malate to the solution increased relative root growth to 50%, and 20 mu M malate completely alleviated the Al-induced inhibition of root growth. The results support the hypothesis that the Al-stimulated efflux of malate from root apices is involved in a general mechanism for Al tolerance in wheat. [References: 24].

4873 Salama, M.M.; Dieb, M.M.; Saad, A.L.G. (National Research Centre, Cairo (Egypt). Petroleum Research Inst.) (1994) **Effect of dipole moment on toxicity of some sulfonylurea derivatives against wheat [germination].** *Annals of Agricultural Science, Moshtohor (Egypt) v. 32(1) p. 633-639.* 2 tables; 7 ref. English. (AGRIS 95-115564).

4874 Sergeeva, S.I.; Chekurov, V.M. (1994) **[Relationship between epicotyl's and root system's size and wheat yielding capacity and drought resistance]. Vzaimosvyaz' mezhdu razmerami ehpikotilya, kornevoj sistemy i zasukhoustojchivost'yu rastenij pshenitsy.** *Sel'skokhozyajstvennaya biologiya. Seriya Biologiya rastenij (Russian Federation) (no.3) p. 115-119.* 13 ref. Russian. (AGRIS 95-115565).

The drought effect on the plant viability and yielding capacity has been studied on two wheat lines of a single variety with differing epicotyl length. Under the drought effect, the plants of the long-epicotyl line exceeded those of the short-epicotyl line and the initial variety by the viability, the productive tillering, the seed number per head, and the thousand-seed weight. The possible relationship between the epicotyl length, the development of a deep-penetrating root system, and the drought resistance has been considered.

4875 Volkmar, KM.; Chang, C. (1995) **INFLUENCE OF HYDROPHILIC GEL POLYMERS ON WATER RELATIONS AND GROWTH AND YIELD OF BARLEY AND CANOLA.** *Canadian Journal of Plant Science. 75(3):605-611.* English. [AGR & AGRIFOOD CANADA RES STN POB 3000 LETHBRIDGE AB T1J 4B1 CANADA].

Hydrophilic super-absorbent polymers retain large amounts of plant-available moisture and have been promoted for use as soil amendments in drought-prone regions. This controlled-environment study evaluated the capacity of two commercial polymer gels, Grogel and Transorb, to mitigate the effects of recurring moderate water-deficit stress (dry-down to 50% field capacity before rewatering) on growth and yield of barley and canola. Rates of 0.03, 0.12, 0.47 and 1.87 g polymer kg(-1) sandy loam soil (1, 4, 16 and 64 times the recommended commercial application rate) were tested. Plants were grown at a soil moisture content of approximately 50% of field capacity. Neither polymer was effective at the commercially recommended rate. Barley and canola grain yields were unaffected at any Grogel rate, and Transorb had no effect on barley grain yield. Grogel at the highest rate enhanced early shoot mass, mature biomass production and grain yield of barley and increased leaf RWC. Canola had greater early and late vegetative biomass, but pod yield was not increased by Grogel at any rate. Transorb was most effective at four times the recommended rate, significantly increasing tiller and fertile spike number and mature biomass production at that rate. Leaf RWC were unaffected by Transorb treatment. Grogel stimulated root growth of barley but had no effect on roots of canola. Both polymers tended to increase consumptive water use. Spatial restriction was found to drastically reduce the water retention of both polymers and limit the absorbency of both polymers in this study. The high rates of polymer required to elicit a crop yield response under relatively mild water-deficit conditions limit the value of these polymers for agricultural field use of the crop species tested. [References: 30].

4876 Williams, M.; Shewry, PR.; Lawlor, DW.; Harwood, JL. (1995) **THE EFFECTS OF ELEVATED TEMPERATURE AND ATMOSPHERIC CARBON DIOXIDE CONCENTRATION ON THE QUALITY OF GRAIN LIPIDS IN WHEAT (TRITICUM AESTIVUM L) GROWN AT TWO LEVELS OF NITROGEN APPLICATION.** *Plant Cell & Environment. 18(9):999-1009.* English. [UNIV WALES COLL CARDIFF SCH MOLEC & MED BIOSCI POB 911 CARDIFF CF1 3US S GLAM WALES].

Wheat plants were cultivated under growth regimes combining two temperatures (ambient and 4 degrees C above ambient temperature) with two concentrations of carbon dioxide (350 and 700 mu mol mol(-1)) and two nitrogen fertilizer applications (high and low), The aim of this study was to define any changes in the acyl lipid composition of wheat grains which could result from alterations in the growth conditions, Qualitative and quantitative changes were observed in both non-starch and starch lipid fractions, Temperature was by far the most influential growth factor, although interactions between all three growth conditions occurred, as confirmed by analysis of variance, Growth at elevated temperatures had the general effect of reducing the amounts of accumulated lipids, particularly non-polar lipids (1322mg fatty acids per 100g fresh weight at ambient temperatures as opposed to 777mg fatty acids per 100 g fresh weight at 4 degrees C above ambient temperatures), There were changes in the proportions of the major non-starch as well as the starch lipids, In the former category, non-polar lipids (principally triacylglycerols), the membrane glycosylglycerides and phosphatidylcholine were the main constituents, whereas in the starch lipids, lysophosphatidylcholine and lysophosphatidylethanolamine represented over 70% of the total, Depending on the growth conditions, the percentages of lipids such as monogalactosyldiacylglycerol, digalactosyldiacylglycerol and phosphatidylcholine (non-starch) or the starch lysophosphatidylethanolamine varied 2-fold or more, Significant changes in the acyl composition of individual lipids were also observed, most often in the proportions of palmitate, oleate and linoleate, The observed alterations in wheat lipids are likely to affect the properties of any flours derived from grain grown under climate change conditions. [References: 42].

4877 Yau, SK.; Nachit, MM.; Ryan, J.; Hamblin, J. (1995) **PHENOTYPIC VARIATION IN BORON-TOXICITY TOLERANCE AT SEEDLING STAGE IN DURUM WHEAT (TRITICUM DURUM).** *Euphytica. 83(3):185-191.* English. [INT CTR AGR RES DRY AREAS POB 5466 ALEPPO SYRIA].

Nineteen durum wheat landraces, cultivars or advanced lines of different origins in West Asia and North Africa (WANA), and three barley and two bread wheat varieties were evaluated for their boron (B) toxicity tolerance. Seedlings were grown at five levels of soluble soil B in a plastic house under controlled temperatures. Significant differences existed between the durum wheat entries in days-to-symptom appearance and foliar symptom score. Under the highest soil B treatment, large differences existed between entries for dry weight per plant ($P < 0.05$) but differences were non-significant for shoot B concentrations. Days-to-symptom appearance was highly correlated with symptom score, which was not correlated with shoot B concentrations. Boron toxicity symptom scores of the durum wheat entries ranged from the sensitive barley check to the moderately sensitive bread wheat check. As expected, days-to-symptom appearance decreased and symptom severity increased as the soil B concentrations increased. The result of this study supported the preliminary finding that small, though statistically significant, variation in B toxicity symptom scores exist in durum wheat. The higher CV of symptom scores found here was mainly due to one sensitive entry, Cakmak. If Cakmak was excluded from the analysis, the CV would be reduced by half, to 10%. Durum wheat genotypes which are more tolerant to B toxicity should be sought. Based on the results of this study, and of soil surveys and information collected in WANA, germplasm collected from Algeria, Iraq, Libya, Syria, and the Anatolian Plateau of Turkey should be screened first. [References: 16].

H60 WEEDS

4878 Adam, L. (Lehr und Versuchsanstalt fuer Integrierten Pflanzenbau e.V., Gueterfelde (Germany)); Gottwald, R.; Patschke, K. (1994) **[Tips for weed and pest control in 1994: Plant protection with the right measure]. Hinweise zur Unkraut- und Schaedlingsbekaempfung im Jahre 1994: Pflanzenschutz mit richtigem Mass.** *Neue Landwirtschaft (Germany) (no.3) p. 24-29.* 2 ill., 1 table. German. (AGRIS 95-115910).

4879 Ball, DA.; Klepper, B.; Rydrych, DJ. (1995) **COMPARATIVE ABOVE-GROUND DEVELOPMENT RATES FOR SEVERAL ANNUAL GRASS WEEDS AND CEREAL GRAINS.** *Weed Science. 43(3):410-416.* English. [OREGON STATE UNIV COLUMBIA BASIN AGR RES CTR POB 370 PENDLETON, OR 97801 USA].

Above-ground seedling development was characterized for five annual grass weeds: downy brome, bulbous bluegrass, jointed goatgrass, Italian ryegrass, wild oat; and three cereals: winter wheat, winter barley, and winter triticale in field experiments over two years. The rate of leaf production on the main stem of each species was linearly related to cumulative growing degree days (GDD) since planting. Leaf production rates were faster for bulbous bluegrass, downy brome, Italian ryegrass, wild oat, and barley than for wheat, triticale, and jointed goatgrass. The main stem development stage when individual tillers appeared was similar in all species except under poor seedbed conditions in 1991, in which case lower-node tillers were delayed in the cereals and jointed goatgrass, but not in most of the weed species. Bulbous bluegrass, downy brome, and barley had the same percentage of plants produce the first four primary tillers on the main stem in both years; the other species showed more year-to-year variation. Seedling heights at full emergence were generally greater for large-seeded species. Small-seeded species compared to large-seeded species tended to have greater relative increases in plant height over time. Knowledge of comparative development rates between these weeds and cereals could provide information for development of growth models for each of the species and could also improve understanding of the competitive relationships between grass weeds and cereal grains. [References: 41].

4880 Barrera Moreno, Emiliano (1994) **[Chemical control of (Sicyos deppei G. Don) and wild oat (Avena fatua L.) in summer wheat (Triticum aestivum L.) at Cuautlalpan, Estado de Mexico]. Control quimico de chayotillo (Sicyos deppei G. Don) y avena silvestre (Avena fatua L.) en el cultivo de trigo (Triticum aestivum L.) de verano en Cuautlalpan, Estado de Mexico.** Universidad Autonoma Chapingo (Mexico). Departamento de Parasitologia Agricola. 74 p. Spanish. (AGRIS 95-100426).

4881 Blackshaw, R.E.; O'Donovan, J.T. (Agriculture Canada Research Station, Lethbridge, Alta. T1J 4B1 (Canada)) (1993) **Higher crop seed rates can aid weed management. vol. 3.** *Brighton crop protection conference, weeds. Proceedings of an international conference, Brighton, UK, 22-25 November 1993. p. 1003-1008.* British Crop Protection Council (BCPC). 4 ref. English. (AGRIS 95-100358).

4882 Blair, A.M.; Green, M.R. (ADAS Boxworth Research Centre, Boxworth, Cambridge CB3 8NN (United Kingdom)) (1993) **Integrating chemical and mechanical weed control to reduce herbicide use. vol. 3.** *Brighton crop protection conference, weeds. Proceedings of an international conference, Brighton, UK, 22-25 November 1993. p. 985-990.* British Crop Protection Council (BCPC). 5 ref. English. (AGRIS 95-100379).

4883 Bulavin, L.A.; Averyna, N.G.; Shalyga, M.U.; Yaronskaya, A.B.; Pal'ko, T.P. (Belarus Research Institute of Arable Farming and Fodders, Zhodzina (Belarus)) (1994) **[Comparative evaluation of the efficiency of 2M-4XP herbicide and photodynamic herbicide glutaphen in weeds control on barley sowings]. Parawnal'naya atsehnka ehfektywnastsi gerbitsydu 2M-4XP i fotadynamichnaga gerbitsydu glutafen u barats'be z pustazellem na pasevakh yachmenyu.** *Vestsi Akadehmii Agrarnykh Navuk Belarusi (Belarus) (no.3) p. 32-37.* 4 tables, 7 ref. Byelo Russian. (AGRIS 95-115831).

4884 Campagna, G. (Bologna Univ. (Italy)) (1995) **[Trends and prospects of chemical weed control [Emilia-Romagna]]. Evoluzione e prospettive del diserbo chimico [Emilia Romagna].** *Informatore Fitopatologico (Italy) v. 45(3) p. 52-56.* Italian. (AGRIS 95-115837).

4885 Christoffoleti, P.J.; Westra, P. (1994) **Competition effects with mixed stands of wheat and kochia (Kochia scoparia) biotypes resistant and susceptible to acetolactase synthase inhibitor herbicides.** *Scientia Agricola (Brazil) v. 51(2) p. 245-251.* 12 ref. English. (AGRIS 95-115774).

4886 Cleal, R.A.E.; May, M.J. (ADAS Arthur Rickwood Research Centre, Mepal, Ely, Cambridgeshire CB6 2BA (United Kingdom)) (1993) **Broad-leaved weed control in sugarbeet in the presence of cereal shelter crops. vol. 3.** *Brighton crop protection conference, weeds. Proceedings of an international conference, Brighton, UK, 22-25 November 1993. p. 1035-1040.* British Crop Protection Council (BCPC). 2 ref. English. (AGRIS 95-100414).

4887 Ehlert, D. (Institut fuer Agrartechnik Bornim, Potsdam (Germany). Abt. Technik im Pflanzenbau); Schmerler, J. (1994) **[Future production form in plant cropping?]. Teilflaechenspezifische Bewirtschaftung: Zukuenftige Produktionsform im Pflanzenbau?** *Neue Landwirtschaft (Germany) (no.3) p. 72-76.* 3 ill. German. (AGRIS 95-115714).

4888 Fisher, N.M.; Davies, D.H.K.; Whytock, G.P. (Crop Systems Department, Scottish Agricultural College, Bush Estate, Penicuik, Midlothian EH26 0PH (United Kingdom)) (1993) **Reliability of broad-leaved weed control in cereals using low doses of herbicide. vol. 3.** *Brighton crop protection conference, weeds. Proceedings of an international conference, Brighton, UK, 22-25 November 1993. p. 1223-1228.* British Crop Protection Council (BCPC). 4 ref. English. (AGRIS 95-100415).

4889 Foster, D.K.; Ward, P.; Hewson, R.T. (Agriculture Business Unit, Hoechst UK Limited, East Winch Hall, East Winch, King's Lynn, Norfolk PE32 1HN (United Kingdom)) (1993) **Selective grass-weed control in wheat and barley based on the safener fenchlorazole-ethyl. vol. 3.** *Brighton crop protection conference, weeds. Proceedings of an international conference, Brighton, UK, 22-25 November 1993. p. 1267-1272.* British Crop Protection Council (BCPC). 7 ref. English. (AGRIS 95-100359).

4890 Grundy, A.C.; Froud Williams, R.J.; Boatman, N.D. (Department of Agricultural Botany, TOB2 Early Gate, School of Plant Sciences, University of Reading, Reading, Berkshire RG6 2AU (United Kingdom)) (1993) **The use of cultivar, crop seed rate and nitrogen level for the suppression of weeds in winter wheat. vol. 3.** *Brighton crop protection conference, weeds. Proceedings of an international conference, Brighton, UK, 22-25 November 1993. p. 997-1002.* British Crop Protection Council (BCPC). 13 ref. English. (AGRIS 95-100345).

4891 Ionescu, F.; Paunescu, G.; Similaru, E.; Nicola, I. (Institutul de Cercetari pentru Cereale si Plante Tehnice Fundulea, Simnic (Romania). Statiunea de Cercetari Agricole Simnic Craiova) (1994) **[Research regarding the dynamics of dominant weeds in wheat crops in experiments with herbicides and rotations of long term at SCA Simnic-Craiova]. Cercetari privind dinamica buruienilor dominante din cultura graului in experientele cu erbicide si asolamente de lunga durata la SCA Simnic-Craiova.** *Lucrari stiintifice (Romania) v. 9 p. 125-139.* 4 tables; 4 graphs; 13 ref. Romanian. (AGRIS 95-115775).

The dynamic of dominant weeds in wheat crops within some experiments with herbicides and long-term rotations was observed on brown-reddish faintly luvic soil during 1961-1990 at SCA Somnic-Craiova in central Oltenia. There have been assessed that the dominant weeds in wheat crops were the following: Matricaria inodora, Anthemis austriaca, Anthemis arvensis, Matricaria chamomilla, whereas the species Vicia angustifolia, Vicia tetrasperma, Agrostemma githago, Lathyrus tuberosus, Rubus caesius disappeared. By treatments with herbicides on base of Dicamba have been controlled almost all dicotyledonous weeds, whereas the perennial species multiplied, especially Convolvulus arvensis and Cirsium arvense, being resistant to herbicides. In 4-year rotation, the infestation degree with weeds was reduced 3-4 times compared to the single-crop system or 2-year rotation during several years of use.

4892 Johnson, DH.; Talbert, RE.; Horton, DR. (1995) **CARRYOVER POTENTIAL OF IMAZAQUIN TO COTTON, GRAIN SORGHUM, WHEAT, RICE, AND CORN.** *Weed Science. 43(3):454-460.* English. [AMER CYANAMID CO POB 400 PRINCETON, NJ 08543 USA].

The duration of imazaquin soil activity on corn, grain sorghum, rice, and cotton was studied from 1988 to 1990. Zmazaquin applied at 0.035, 0.07, 0.14 (1x rate), and 0.28 kg ai ha-1 was incorporated into the soil, and rotational crops were planted at various times after application. Initial crop visual injury was directly related to imazaquin application rate. Cotton was most susceptible, followed by corn, grain sorghum, and rise. The

carryover of imazaquin from soybeans to cotton, grain sorghum, and wheat was studied in separate experiments in Arkansas in 1987 to 1989. Wheat planted in the fall following soybean harvest was not affected by imazaquin residues. Grain sorghum planted the following spring was injured (16-35%), but there was no yield reduction. Cotton recovered from early injury (< 35%) in one year and did not recover from severe injury (> 50%) in the other, resulting in yield reduction. [References: 23].

4893 Lamoreaux, R.J.; Jain, R.; Hess, F.D. (Sandoz Agro. Inc., P.O. Box KK, Gilroy, CA 95021 (USA)) (1993) **Efficacy of dimethenamid, metolachlor and encapsulated alachlor in soil covered with crop residue.** vol. 3. *Brighton crop protection conference, weeds. Proceedings of an international conference, Brighton, UK, 22-25 November 1993. p. 1015-1020.* British Crop Protection Council (BCPC). 11 ref. English. (AGRIS 95-100421).

4894 Makowski, RMD. (1995) **ROUND-LEAVED MALLOW (MALVA PUSILLA) INTERFERENCE IN SPRING WHEAT (TRITICUM AESTIVUM) AND LENTIL (LENS CULINARIS) IN SASKATCHEWAN.** *Weed Science. 43(3):381-388.* English. [AGR & AGRIFOOD CANADA RES STN POB 440 REGINA SK S4P 3A2 CANADA].

The competitive ability of annual round-leaved mallow was determined in spring wheat and lentil at Indian Head and Regina, Saskatchewan, in 1985 and 1986 using paired quadrats. Significant biomass and seed yield loss occurred in three of four tests in lentil and two of three tests in spring wheat. Differences in numbers of wheat tillers produced between weedy and weed-free plots were found in three of four tests. A two-variable model comprised of early season crop density loss and round-leaved mallow biomass best accounted for the majority of variation in crop yield loss for both lentil and wheat, and tiller density loss in wheat. In 1985 at Indian Head, where no yield loss occurred for either wheat or lentil, round-leaved mallow had been seeded immediately before the crop. Greater yield losses occurred at Regina, in the presence of an older, well-established infestation. In the years and locations with the greatest crop yield losses, round-leaved mallow emerged before the crop causing poor crop emergence. At Regina in 1986, crop yield losses were more than 60% in wheat and 90 to 100% in lentil because of large differences in crop density between weed-free and weedy subplots. Round-leaved mallow exhibited great variability in growth, producing more biomass per plant, more capsules per plant, and more capsules per gram of biomass in the less competitive crop, lentil, than in wheat. Density and biomass of round-leaved mallow were not correlated; with a density of 200 plants m(-2), round-leaved mallow biomass in wheat ranged from 100 to 500 g m(-2); while in lentil, from 200 to as high as 1000 g m(-2), approximately double the range found in wheat. The type of round-leaved mallow infestation (newly seeded or well-established) and environmental conditions (mainly early season precipitation) account for differences between sites and between years. [References: 20].

4895 Melander, B. (1995) **IMPACT OF DRILLING DATE ON APERA SPICA-VENTI L AND ALOPECURUS MYOSUROIDES HUDS IN WINTER CEREALS.** *Weed Research. 35(3):157-166.* English. [DANISH INST PLANT & SOIL SCI DEPT WEED CONTROL & PESTICIDE ECOL DK-4200 SLAGELSE DENMARK].

The impact of drilling date on Apera spica-venti and Alopecurus myosuroides in winter cereals was investigated in field trials in 1991 and 1992. Two drilling dates were considered with an interval of 14 to 16 days between dates. Generally, drilling date had an inconsistent effect on weed plant populations in spring, but seedling emergence of both species appeared to be delayed at the later drilling compared with the earlier date. This delay may partly explain the reduced competitive ability of A, myosuroides in wheat in 1991 and 1992 and of A. spica-venti in wheat in 1991 at the later drilling date. The seed population per plant of both species was lower at the later date in some instances, whereas in others drilling date had no effect. Reduced seed production was mainly caused by a reduction of the number of inflorescences per plant. The potential of utilizing drilling dates as a cultural control measure against grass weeds is discussed. [References: 41].

4896 Nowicka, B.; Rola, J. (Instytut Uprawy Nawozenia i Gleboznawstwa, Wroclaw (Poland). Zaklad Ekologii i Zwalczania Chwastow) (1994) **[Reaction of winter wheat: Almari, Kamila, Nike, Oda, Parada, Rada to herbicides]. Reakcja odmian pszenicy ozimej: Almari, Kamila, Nike, Oda, Parada, Rada na herbicydy.** 33 Research Session of Institute of Plant Protection; Poznan (Poland); 1993. *Materials of the 33rd Research Session of Institute of Plant Protection. Pt. 2. Posters. Pruszynski, S.; Lipa, J.J. (eds.). Instytut Ochrony Roslin, Poznan (Poland) p. 176-179.* Panstwowe Wydawnictwo Rolnicze i Lesne. 2 tables; 3 ref. Polish. (AGRIS 95-115887).

The researches were conducted during the years of 1990-92 with six varieties of winter wheat and 13 herbicides. (The split-block method was used). None of tested varieties had shown significantly decrease in the yield. Noticed tendencies in yield changes might point out lower tolerance of some varieties to several herbicides, but yield changes were never higher than 5 percent.

4897 Ogilvy, S.E.; Green, M.R.; Groves, S.J.; Jones, A.E. (ADAS High Mowthorpe, Duggleby, Malton, North Yorkshire YO17 8BP (United Kingdom)) (1993) **SCARAB - the impact of less intensive herbicide use on the diversity and distribution of weed species in three arable rotations.** vol. 3. *Brighton crop protection conference, weeds. Proceedings of an international conference, Brighton, UK, 22-25 November 1993. p. 1241-1246.* British Crop Protection Council (BCPC). 3 ref. English. (AGRIS 95-100429).

4898 Ognjanovic, R.; Lomovic, S. (Institut za istrazivanja u poljoprivredi "Srbija", Kragujevac (Yugoslavia). Centar za stmna zita) (1994) **[The effect of herbicides and time application on winter wheat yield]. Dejstvo herbicida i roka primene na prinos ozime psenice.** *Savremena poljoprivreda (Yugoslavia) v. 42(5) p. 59-63.* 4 tables; 15 ref. Serbian. (AGRIS 95-115716).

It was concluded that the weeds decreased yield of winter wheat from 9.8 to 23 or 513 to 1200 kg/ha grains. The weeding as protection means of winter wheat was more efficient in comparison to herbicides application for 151 kg/ha grains. Herbicides application in the jointing stage weaker affected on the weeds caused greater phytotoxicity and decreased grain yield of winter wheat in comparison with application ones in the tillering stage. Basagran DP and Lontrel 418-C were efficiently in decreasing weedness than Banvel DP and Banvel P-OHIS. Under strong weedness herbicides application is the only efficient means in the winter wheat protection.

4899 Pageau, D.; Tremblay, GF. (1995) **EFFECT OF QUACKGRASS ON THE PRODUCTIVITY OF BARLEY SEEDED AT DIFFERENT SEEDING RATES AND ROW SPACINGS.** *Canadian Journal of Plant Science. 75(3):613-618.* French. [AGR & AGROALIMENTAIRE CANADA FERME RECH NORMANDIN PQ G0W 2E0 CANADA].

A 4-yr study was conducted to evaluate the effect of two row spacings (10 and 20 cm) and five seeding rates of the cereal (100, 200, 300, 400 and 500 viable seeds m(-2)) on the interference between quackgrass [Elymus repens (L.) Nevski] and barley (Hordeum vulgare L. 'Cadette'). Narrow row spacings had no effect on the yield of barley in presence or absence of quackgrass. However, seeding rates influenced the productivity and development of barley when quackgrass was present. At a seeding rate of 100 seeds m(-2), the yield reduction caused by the presence of quackgrass was 41%. When barley was seeded at 500 seeds m(-2), the yield reduction was 19%. These yield reductions were mainly attributed to a decrease of spike density. In presence of quackgrass, the specific weight, number of kernels per spike, number of spikes per plant, 1000-kernel weight, harvest index and N concentration of grain were reduced. In contrast to a decrease of the row spacing, increasing seeding rate can be used to reduce interference between quackgrass and barley. [References: 23].

4900 Proven, M.J.; Davies, D.H.K.; Courtney, A.D. (ADAS Drayton, Alcester Road, Stratford upon Avon, Warwickshire CV37 9RQ (United Kingdom)) (1993) **An approach to developing appropriate herbicide options for winter wheat where cleavers are a problem.** vol. 3. *Brighton crop protection conference, weeds. Proceedings of an international conference, Brighton, UK, 22-25 November 1993. p. 1211-1216.* British Crop Protection Council (BCPC). 13 ref. English. (AGRIS 95-100428).

4901 Richards, M.C. (Scottish Agricultural College, West Mains Road, Edinburgh EH9 3JG (United Kingdom)) (1993) **The effects of agronomic factors on competition between cereals and weeds; the implications in integrated crop production.** vol. 3. *Brighton crop protection conference, weeds.*

Proceedings of an international conference, Brighton, UK, 22-25 November 1993. p. 991-996. British Crop Protection Council (BCPC). 2 ref. English. (AGRIS 95-100413).

4902 Schenke, U. (1995) **[Weed control through strengthening the competitive power of winter wheat]. Unkrautkontrolle durch Foerderung der Konkurrenzkraft von Winterweizen.** *Oekologie und Landbau (Germany) (no.1) p. 29-30.* 2 graph; 7 ref. German. (AGRIS 95-115883).

4903 Singh, S.; Malik, RK.; Panwar, RS.; Balyan, RS. (1995) **INFLUENCE OF SOWING TIME ON WINTER WILD OAT (ARENA LUDOVICIANA) CONTROL IN WHEAT (TRITICUM AESTIVUM) WITH ISOPROTURON.** *Weed Science. 43(3):370-374.* English. [HARYANA AGR UNIV HISAR 125004 HARYANA INDIA].

Field experiments were conducted during the winters of 1987-88 and 1988-89 at Haryana Agricultural University, Hisar, India to evaluate the response of winter wild oat to sowing date and isoproturon application time in wheat. In another experiment, the effect of sowing time on emergence and growth of winter wild oat and wheat sown separately was studied. The treatments that provided more than 75% control of winter wild oat were: isoproturon at 0.75 kg ha(-1) applied at the 2-1eaf stage of winter wild oat; isoproturon 1 kg ha(-1) applied at the 4-leaf stage of winter wild oat in the November 30 planting; and isoproturon 0.50 kg ha(-1) applied at the 1- to 2-leaf stage of winter mild oat in the December 20 sowing. Isoproturon did not provide more than 50% control of winter wild oat in the November 10 sowing. Mortality of winter wild oat increased from 38 to 72 to 87% in November 10, November 30, and December 20 sowings, respectively. Mortality of winter wild oat was similar in November 30 and December 20 sowings but higher grain yield was recorded in November 30 sowing. Due to vigorous growth of winter wild oat in the November 10 sowing, isoproturon did not provide good control. December 20 sowing favored wheat growth due to lower density and late emergence of winter wild oat but reduction in wheat grain yield was greater. When averaged over isoproturon treatments, the grain yield of wheat was 4607, 5297, and 4457 kg ha(-1) in the November 10, November 30, and December 20 sowings, respectively. [References: 33].

4904 Torofder, G.S.; Ahmed, A.; Hossain, A.; Rahman, M.M.; Aziz, A.; Mrittunjoy (1992) **Effect of weed competition period on the yield of wheat [in Bangladesh].** *Bangladesh Journal of Agricultural Research (Bangladesh) v. 17(2) p. 205-208.* 10 ref. English. (AGRIS 95-115773).

4905 Wicks, G.A. (Nebraska Univ., North Platte (USA). Dept. of Agronomy); Felton, W.L.; Welsby, S.M. (New South Wales Agriculture, Tamworth (Australia). Agricultural Research Centre) (1993) **Effect of rainfall on glyphosate performance on stressed grass weeds following wheat harvest.** *Plant Protection Quarterly (Australia) v. 8(1) p. 2-6.* 6 tables, 1 fig., 10 ref. English. (AGRIS 95-115995).

Control of volunteer wheat with glyphosate at 225 g per ha was best when watered 6 days before applying glyphosate or 1 and 4 days after spraying. A similar trend occurred with awnless barnyard grass. Small liverseed grass (5-10 cm) required 900 g per ha of glyphosate for only 70 percent control which diminished rapidly with larger plants and where watering was delayed until 6 days after spraying. Larger barnyard grass also required higher rates of glyphosate and control was better when stress was reduced before rather than after spraying. Glyphosate at 225 g per ha required more than 22 hours of rain-free period for control of volunteer wheat and small awnless barnyard grass. Six hours were required to control small awnless barnyard grass when glyphosate rate was 675 g per ha, but even 900 g per ha did not control the awnless barnyard grass larger than 10 cm.

4906 Wicks, GA.; Martin, DA.; Mahnken, GW. (1995) **CULTURAL PRACTICES IN WHEAT (TRITICUM AESTIVUM), ON WEEDS IN SUBSEQUENT FALLOW AND SORGHUM (SORGHUM BICOLOR).** *Weed Science. 43(3):434-444.* English. [UNIV NEBRASKA DEPT AGRON N PLATTE, NE 69101 USA].

The effect of herbicide and urea-ammonium nitrate (UAN) combinations on winter wheat injury in absence of noncompetitive weeds and weed control during a winter wheat-fallow and a winter wheat-sorghum-fallow rotation were investigated. Winter wheat was planted at different dates to obtain different growth stages for spraying in the spring. Winter wheat produced greater grain yields when planted Sept. 15 or Sept. 25, 1987, 1988, and 1989 vs. Sept. 1 at North Platte, NE, while at Sidney, NE, grain yield was higher in wheat planted on Sept. 10 or Sept. 20, 1988, compared to Aug. 26. Spring-applied UAN increased grain yield on wheat planted Sept. 10 compared to no UAN in 1988-89 at Sidney, but not in 1987-88, while at North Platte, grain yields were not affected by UAN. At Sidney 2, 4-D ester at 0.6 kg ae ha(-1), 2, 4-D amine plus dicamba at 0.3 plus 0.1 kg ae ha(-1), metsulfuron at 0.007 kg ai ha(-1) plus 0.25% nonionic surfactant (NIS), and metsulfuron plus 2, 4-D ester at 0.007 plus 0.3 kg ha(-1) plus NIS decreased grain yields compared to one handweeding. At North Platte in 1988-89, when UAN was applied with 2, 4-D ester, 2, 4-D amine plus dicamba, or metsulfuron plus 2, 4-D plus MS grain yields were reduced compared to the handweeded check on wheat planted Sept. 15. Occasionally, metsulfuron plus 2, 4-D ester plus MS treated wheat yielded less grain than metsulfuron plus NIS treated wheat. One or more herbicide treatments reduced wheat grain yields 4 of 15 application dates. Crop injury was related to growth stage and health of winter wheat when treatments were applied. Wheat under stress was more susceptible to herbicide damage than healthy wheat. Metsulfuron and metsulfuron plus 2, 4-D controlled kochia, tumble thistle, and redroot pigweed better after wheat harvest than 2, 4-D or 2, 4-D plus dicamba at North Platte, but allowed summer annual grass weeds to grow. Yields of grain sorghum planted after a 10-mo fallow period were higher following winter wheat treated with three of four herbicides than the handweeded treatment. [References: 21].

J11 HANDLING, TRANSPORT, STORAGE AND PROTECTION OF PLANT PRODUCT

4907 Alagusundaram, K.; Jayas, DS.; Muir, WE.; White, NDG.; Sinha, RN. (1995) **DISTRIBUTION OF INTRODUCED CARBON DIOXIDE THROUGH WHEAT BULKS CONTAINED IN BOLTED-METAL BINS (VOL 38, PG 895, 1995).** *Transactions of the ASAE. 38(4):1112.* English.

4908 Almasi, R. (Poljoprivredni fakultet, Novi Sad (Yugoslavia)) (1994) **[Observing of flour moth population [Ephestia kuehniella Zeller] in wheat mills with sexual pheromone traps]. Posmatranje populacije brasnenog moljca [Ephestia kuehniella Zeller] u mlinovima za psenicu, pomocu klopki sa seksualnim feromonom.** *Zito hleb (Yugoslavia) v. 21(4) p. 103-107.* 3 graphs; 11 ref. Serbian. (AGRIS 95-116074).

The flour moth population dynamics in one calendar year was investigated, with examples taken from the wheat mills and with the help of traps with synthetic sexual pheromones. The experiments showed high effectivity of the traps with pheromone (92.16) in relation to the separated alive butterflies in one sample (1.18), as well in relation to all evolution stages in a sample (7.84). With the help of traps the moment and effectivity of treating can be easily fortified. Through the capture of the great number of the males the copulation, and contamination of the products are reduced.

4909 Brunner, H. (1995) **[Freeze conservation of malting barley]. Kuehlkonservierung von Braugerste.** *Brauwelt (Germany) v. 135(5-6) p. 219-222, 235-236.* 11 ill., 2 tables; 6 ref. German. (AGRIS 95-116216).

4910 Fouad, M.S. (Minia Univ. (Egypt). Faculty of Agriculture) (1993) **Protection of stored wheat from the granary weevil, Sitophilus granarius L. by some plant powders and extracts.** *Minia Journal of Agricultural Research and Development (Egypt) v. 15(3) p. 695-715.* 3 ill. 3 tables; 27 ref. English. (AGRIS 95-116072).

4911 Pradzynska, A. (Instytut Ochrony Roslin, Poznan (Poland)) (1994) **[Attempt to establish thermal parameters to control cereal weevil in grain]. Proba ustalenia parametrow cieplnych dla zwalczania wolka zbozowego w ziarnie.** 33 Research Session of Institute of Plant Protection; Poznan (Poland); 1993. *Materials of the 33rd Research Session of Institute of Plant Protection. Pt. 2. Posters. Pruszynski, S.; Lipa, J.J. (eds.). Instytut Ochrony Roslin, Poznan (Poland) p. 57-61.* Panstwowe Wydawnictwo Rolnicze i Lesne. 2 fig., 2 tables; 3 ref. Polish. (AGRIS 95-116071).

The main purpose of this investigations was to find out what temperature is needed to kill eggs, larvae, pupae and adults of Cereal

weevil (Sitophilus granarius L.) and during what time. To destroy eggs, larvae and pupae of this beetle in grain the heat treatment must last 7 hours at 45 degrees C and only 3 hours at 50 degrees C. To obtain 100 percent mortality of the beetles 14 hours is needed at 45 degrees C or only 2 hours at 50 degrees C. These temperatures did not reduce the germination ability of treated wheat seeds.

4912 Sahay, KM.; Dakshinamurthy, A. (1995) **SEPARATION TECHNOLOGY FOR INFESTED WHEAT IN BULK STORAGE.** *Journal of Food Science & Technology-Mysore. 32(3):255-258.* English. [CENT INST AGR ENGN NABI BAGH BERASIA RD BHOPAL 462018 INDIA].

Studies on separation of infested grains from a bulk of wheat showed unsuitability of a common vibratory type air screen cleaner at 6.8 m/s air velocity and poor performance of specific gravity separator. An entoleter was, therefore, developed to break the comparatively weaker infested grains. At 1470-1780 rpm, if the infestation level in wheat is limited to 20%, the entoleter separated 95% of the infested grains.

L01 ANIMAL HUSBANDRY

4913 Richter, G. (Thueringer Landesanstalt fuer Landwirtschaft, Remderoda (Germany)); Lemser, A.; Mueller, A. (1995) **[Enzymes in turkey feed: can the nutritive value of wheat be improved?]. Enzyme im Putenfutter: Kann der Futterwert von Weizen verbessert werden?** *Deutsche Gefluegelwirtschaft und Schweineproduktion (Germany) v. 47(9) p. 35-37.* 1 ill., 2 tables. German. (AGRIS 95-101088).

L02 ANIMAL FEEDING

4914 Almirall, M.; Estevegarcia, E. (1995) **IN VITRO STABILITY OF A BETA-GLUCANASE PREPARATION FROM TRICHODERMA LONGIBRACHIATUM AND ITS EFFECT IN A BARLEY BASED DIET FED TO BROILER CHICKS.** *Animal Feed Science & Technology. 54(1-4):149-158.* English. [INST RECERCA & TECNOL AGROALIMENTARIES CTR MAS BOVE DEPT ANIM NUTR APARTAT 415 E-43280 REUS SPAIN].

A feeding experiment and a series of in vitro incubations in conditions simulating those of the gastrointestinal tract were carried out to evaluate the efficacy of a liquid, crude beta-glucanase preparation from Trichoderma longibrachiatum for use as feed supplement in poultry barley based diets. Addition of the beta-glucanase preparation at a level of 0.129 g kg(-1) to a barley based mash diet significantly ($P < 0.05$) improved feed consumption, weight gain and feed:gain ratio. Viscosity of the small intestinal content was reduced significantly ($P < 0.05$) when beta-glucanase was added. For in vitro evaluation the beta-glucanase preparation was incubated at low, neutral and high pH, with or without proteolytic enzymes (pepsin and pancreatin). Before the beta-glucanase determination pH was restored to 5. At pH 2 in glycine-HCl buffer, beta-glucanase retained 20% of original activity at 15 min, and was almost inactivated at 45 min. At pH 3.2 beta-glucanase was essentially stable, its relative activity decreasing to 90% only at 90 min. Similar results were obtained with added pepsin (4000 U ml(-1)), suggesting that the beta-glucanase preparation was resistant to proteolysis by pepsin. When beta-glucanase preparation was incubated at pH 8.5 (0.1 M NaHCO3-HCl buffer) beta-glucanase activity decreased progressively, with only 30% of activity remaining at 90 min. Incubation at pH 7 (0.1 M phosphate buffer) did not affect the activity of beta-glucanase; however, when pancreatin (2 mg ml(-1) pancreatin 8 USP) was added beta-glucanase activity was reduced to 50% in 15 min, and at pH 8.5 was almost completely inactivated. To determine thermal stability, beta-glucanase was incubated at various temperatures at pH 5 (0.1 M sodium acetate buffer) for 10 min. At 70 degrees C activity was reduced to 65%, at 80 degrees C to 20%, and at 100 degrees C it was almost totally inactivated. These results suggest that supplementary enzymes survive the potential hazards of the gastrointestinal tract in sufficient quantity to improve performance in broiler chicks fed barley based diets. [References: 21].

4915 Crempien L, Christian (Instituto de Investigaciones Agropecuarias, Santiago (Chile). Estacion Experimental La Platina) (1993) **[Effect of lupin grain supplementation on ewes grazing wheat stubble]. Efecto de la suplementacion con grano de lupino en ovejas a pastoreo en rastrojos de trigo.** *Agricultura Tecnica (Chile) v. 53(4) p. 310-314.* 14 ref. Spanish. (AGRIS 95-101196).

4916 Crempien L, Christian (Instituto de Investigaciones Agropecuarias, Santiago (Chile). Estacion Experimental La Platina) (1994) **[Lupin and barley in the summer feeding of hoggets]. Uso del lupino y cebada en la alimentacion estival de borregas.** 17. Reunion anual de la Sociedad Chilena de Produccion Animal; Chillan (Chile); 20-22 Oct 1992. *Agricultura Tecnica (Chile) v. 54(2) p. 136-140.* 12 ref. Spanish. (AGRIS 95-101197).

Twenty seven Hidango ewe lambs were aligned to three groups in phalaris senescent pastures. Group 1 received lupin grain plus barley, group 2 barley alone in isocaloric terms. In relation to the former group and group 3, did not receive any concentrate. Groups 1 and 2, lost body weight and body condition during the first 12 days. During liveweight gaining period, groups 1, 2 and 3, gained 7.33, 3.06 and 3.75 kg, respectively and 1.11, 0.13 and 0.11 grades in body condition. At the end of the trial, group 1 was different to the other groups in body weight and condition ($P<=0.05$).

4917 Crempien L, Christian (Instituto de Investigaciones Agropecuarias, Santiago (Chile). Estacion Experimental La Platina); Badilla C, Claudio (1994) **[Effect of lupin supplementation in ewes fed with wheat straw or senescent phalaris]. Efecto de la suplementacion con lupino en ovejas alimentadas con paja de trigo o falaris senescente.** 17. Reunion anual de la Sociedad Chilena de Produccion Animal; Chillan (Chile); 20-22 Oct 1992. *Agricultura Tecnica (Chile) v. 54(2) p. 141-146.* 18 ref. Spanish. (AGRIS 95-101198).

Sixty Precocious Merino ewes were divided in two groups: one fed with wheat straw and other with senescent phalaris, both roughages chopped within a length of 3 to 5 cm. Each group was assigned treatments with different amounts of lupin grain: 0, 100, 200, 300 and 400 g/day in a factorial design (2x5). Liveweight (P.V.) and body condition (CC) were analyzed by analysis of variance. Group and individual intake were analyzed through regressions, and the last variable was also revised through factorial covariance to observe interactions. In treatment 1, group intake was linearly related to lupin intake ($y= 5.3379+0.0034x$, $r= 0.934$; $P<= 0.001$) and phalaris intake was related in quadratic terms ($y= 5.5205 + 0.0079x - 0.000015x2$, $r0.845$; $P <= 0.05$). P.V. and CC loss were negatively related to lupin intake, differences in P.V. were observed from week 5 and in CC from week 3 ($P <= 0.05$). Ewes with 0 to 200 g/day of lupin lost P.V., those with 300 g/day were in maintenance and groups with 400 g/day gained body weight.

4918 Kyriazakis, I.; Emmans, GC. (1995) **THE VOLUNTARY FEED INTAKE OF PIGS GIVEN FEEDS BASED ON WHEAT BRAN, DRIED CITRUS PULP AND GRASS MEAL, IN RELATION TO MEASUREMENTS OF FEED BULK (VOL 73, PG 197, 1995).** *British Journal of Nutrition. 74(1):145.* English.

4919 Latvietis, J. (Latvia University of Agriculture, Jelgava (Latvia). Animal Nutrition) (1995) **[How to utilize fodder grain more effectively]. Ka efektivak izmantot lopbaribas graudus.** *Latvijas Lauksaimnieks (Latvia) (no.3) p. 14-16.* 4 table. Latvian. (AGRIS 95-117461).

The valuability of feeding fodder grain to livestock, especiallg to pigs is explained. Nutritional value of the elements in grain content is analysed considering their influence on animal health and productivity. The experiment carried out at the teaching and research farm "Vecauce" and farm Bene on feeding pigs with fodder concentrates with and without enriching additives is described. The economic efficiency of feeding concentrates with additives is discussed. The experimental data are shown in tables.

4920 Philip, JS.; Gilbert, HJ.; Smithard, RR. (1995) **GROWTH, VISCOSITY AND BETA-GLUCANASE ACTIVITY OF INTESTINAL FLUID IN BROILER CHICKENS FED ON BARLEY-BASED DIETS WITH OR WITHOUT EXOGENOUS BETA-GLUCANAS.** *British Poultry Science. 36(4):599-603.* English. [UNIV NEWCASTLE DEPT BIOL & NUTR SCI NEWCASTLE UPON TYNE NE1 7RU TYNE & WEAR ENGLAND].

1. Three groups of birds were fed for up to 35 days on diets containing 500 g barley (cv. Condor) /kg diet, with or without exogenous beta-glucanase, either a commercial preparation or a recombinant endoglucanase. 2. Birds which received diets containing the exogenous

enzymes grew faster for the first 3 weeks but after that there was no apparent difference in rate of growth. 3. beta-Glucanase activities in the crop and small intestine of birds given exogenous enzymes were generally higher than those of birds given only the basal diet. 4. Viscosity of intestinal fluid in birds given only the basal diet decreased with age but there was no corresponding increase in beta-glucanase activity. This discounts bacterial beta-glucanase as a contributory factor in the adaptation to beta-glucanase apparent in older birds. [References: 11].

4921 Phillips, WA.; Horn, GW.; Smith, ME. (1995) **EFFECT OF PROTEIN SUPPLEMENTATION ON FORAGE INTAKE AND NITROGEN BALANCE OF LAMBS FED FRESHLY HARVESTED WHEAT FORAGE.** *Journal of Animal Science. 73(9):2687-2693.* English. [USDA ARS GRAZINGLANDS RES LAB EL RENO, OK 73036 USA].

Wether lambs (mean BW = 32 kg) fed wheat forage freshly harvested daily (Exp. 1, n = 28; Exp. 2, n = 25) were used to evaluate the effects of supplemental energy and protein on forage intake, diet digestibility, and N retention. Experiment 1 was conducted in the winter of 1988 and the four treatments were 1) CONTROL, no supplement; 2) ENERGY, low-protein corn-based supplement; 3) CSM, 22% CP supplement with cottonseed meal; and 4) CGM, 22% CP supplement with corn gluten meal. Experiment 2 was conducted in the spring of 1989, and the five treatments were 1) CONTROL; 2) ENERGY; 3) CSM, 23% CP with cottonseed meal; 4), FTM, 25% CP supplement with feather meal and corn gluten meal; and 5) BM, 25% CP supplement with blood meal and corn gluten meal. All supplements were isoenergetic and composed 22 and 24% of total DMI in Exp. 1 and 2, respectively. In Exp. 1, forage intake was not affected but total and digestible DMI were increased (P < .01) by energy and protein supplementation. Protein supplements did not (P > .10) increase total and digestible DMI compared to ENERGY supplementation but tended (P < .10) to increase N retention (g/d). In Exp. 2, digestible DMI and N retention did not differ among the five treatments. Results suggest that lambs consuming wheat forage in the vegetative stage (Exp. 1) will have greater digestible DMI if supplemental energy or protein is provided. When more mature wheat forage was fed (Exp. 2), energy seemed to limit animal performance. d [References: 34].

4922 Richter, G. (L.U.F.A., Thueringen (Germany)) (1994) **[Fattening of broiler chickens with wheat and barley: Enzymes improve the fattening performance]. Broilermast mit Weizen und Gerste: Enzyme verbessern die Mastleistung.** *Neue Landwirtschaft (Germany) (no.3) p. 61.* 1 ill., 1 table. German. (AGRIS 95-117721).

4923 Steenfeldt, S.; Knudsen, KEB.; Borsting, CF.; Eggum, BO. (1995) **THE NUTRITIVE VALUE OF DECORTICATED MILL FRACTIONS OF WHEAT .2. EVALUATION WITH RAW AND ENZYME TREATED FRACTIONS USING ADULT COCKERELS.** *Animal Feed Science & Technology. 54(1-4):249-265.* English. [NATL INST ANIM SCI DEPT SMALL FARM ANIM FOULUM RES CTR POB 39 DK-8830 TJELE DENMARK].

The nutritive value of raw and enzyme treated whole grain wheat and six mill fractions produced by successive decortication was studied. The mill fractions, which varied considerably in chemical composition, consisted of one fraction enriched in pericarp/testa, one fraction enriched in aleurone and four fractions with graded levels of endosperm tissues. The whole wheat kernels and the six mill fractions constituted 895 g kg(-1) of dry matter (DM) of the experimental diets, with fish meal as the only other main component added. The highest content of protein and gross energy (GE) was found in the fraction enriched in aleurone cells. However, a higher amount of non-starch polysaccharides (NSP) was also found in the pericarp/testa (385 g kg(-1) DM) and aleurone (182 g kg(-1) DM) enriched diets versus the endosperm enriched diets (less than 100 g kg(-1) DM). Significantly negative correlations were found between apparent protein digestibility (APD) and insoluble non-starch polysaccharides (I-NSP) (P < 0.05) and the apparent metabolisable energy (AME(n)) and I-NSP (P < 0.001). In contrast, soluble NSP (S-NSP) did not significantly contribute to any negative effect on neither digestibility nor AME(n). The APD and AME(n) values in the aleurone enriched diet were 84.7% and 12.8 MJ kg(-1) DM, and in the pericarp/testa enriched diet 75.2% and 8.0 MJ kg(-1) DM, respectively. The APD and AME(n) values in the endosperm rich diets were on average 88.6% and 15.6 MJ kg(-1) DM, respectively. Results from this study also revealed that the cockerels were able to digest from 10.7% total NSP in pericarp/testa to an average of 42.8% in the endosperm based diets. The lower digestibility and AME(n) in pericarp/testa and aleurone enriched diets were caused by the thick cell walls in these layers made up of especially insoluble cellulose and arabinoxylans, which impose a reduction in the availability of nutrients. Enzyme treatment with cell wall degrading and proteolytic enzymes resulted in significant depolymerization and solubilisation of cell wall NSP and of starch. The AME(n) increased significantly in the diets based on the whole wheat kernel and pericarp/testa (P < 0.05). The enzyme treatment improved APD significantly in diets with whole wheat kernel and aleurone (P < 0.05). It is assumed that disruption of cell walls owing to enzyme action and release of cell wall content was primarily responsible for the observed improvement in digestibility and AME(n). It is further believed that released cell wall monosaccharides probably have, to some extent, contributed energy to the cockerels. [References: 49].

4924 Sudekum, KH.; Roh, H.; Brandt, M.; Rave, G.; Stangassinger, M. (1995) **COMPARATIVE DIGESTION IN CATTLE AND SHEEP FED WHEAT SILAGE DIETS AT LOW AND HIGH INTAKES.** *Journal of Dairy Science. 78(7):1498-1511.* English. [CHRISTIAN ALBRECHTS UNIV KIEL INST TIERERNAHRUNG & STOFFWECHSELPHYSIOL D-24098 KIEL GERMANY].

Winter wheat (Triticum aestivum L.), harvested at late milk, early dough, and hard dough stages of maturity was ensiled for nutritive comparisons. Diets were adjusted to 13% CP with a soy protein concentrate and fed to six ruminally fistulated growing steers and nine adult wethers in a repeated 3 x 3 Latin square design to study the effects of maintenance and ad libitum intakes on digestibility of different feed fractions. At both intakes, digestion values for the steers were greater than or equal to those for the sheep for all feed fractions except CP. Wethers achieved greater intake per unit of BW than steers during ad libitum intake. Voluntary OM intakes of steers only differed between the milk stage diet and the dough stage diets. At low intake, the diets containing the more mature silage were more digestible. At high intake, the OM of diet containing the early dough stage silage was most digestible. Increased intake caused a depression in digestibility of different feed fractions. The magnitude of the depression varied among diets and fractions. Data indicated that the nutritive value of diets based on whole crop wheat silage is affected by stage of maturity, animal species, and amount of intake. The assessment of the nutritive value of diets based on whole crop wheat silage should therefore be made with the animal species and at the amount of intake for which the diets are intended. [References: 40].

4925 Sundberg, B.; Pettersson, D. (Sveriges Lantbruksuniv., Uppsala (Sweden). Inst. foer Livsmedelsvetenskap) (1992) **Production responses and plasma lipid concentrations of broiler chickens receiving diets based on a processed barley fraction.** Uppsala Livsmedelscentrums Rapportserie (Sweden); no. 4 p. D-N:2. p. D-N:2. English. (AGRIS 95-117727).

4926 Vranjes, MV.; Wenk, C. (1995) **THE INFLUENCE OF EXTRUDED VS UNTREATED BARLEY IN THE FEED, WITH AND WITHOUT DIETARY ENZYME SUPPLEMENT ON BROILER PERFORMANCE.** *Animal Feed Science & Technology. 54(1-4):21-32.* English. [FED INST TECHNOL INST ANIM SCI NUTR GRP UNIV STR 2 CH-8092 ZURICH SWITZERLAND].

The experiment was conducted to study the effect of extruded vs. unprocessed barley in the diet (400 g kg(-1)) on the response of broiler chickens to Trichoderma viride enzyme supplement (cellulase, 10 500 U g(-1); endo-beta-(1:3)(1:4)-glucanase; 24 000 U g(-1) and xylanase, 32 000 U g(-1)). The four experimental diets were as follows: B, unprocessed barley; BE, unprocessed barley + enzyme (200 mg kg(-1)); ExB, extruded barley; ExBE, extruded barley + enzyme (200 mg kg(-1)). The diets were fed as pellets. Extruded compared with unextruded barley gave higher soluble fibre (28 vs. 36 g kg(-1)) and lower insoluble (190 vs. 163 g kg(-1)) and total (219 vs. 200 g kg(-1)) dietary fibre values. Extrusion increased extract viscosity (1.3 vs. 3.7 cP) and water binding capacity (1.6 vs. 2.2 ml g(-1) dry matter) of the barley. During the first week, birds fed extruded barley in the diet increased water consumption (P less than or equal to 0.05), A significant depression in feed efficiency (days 7-21), feed AME, and in fat and protein utilisation was observed when extruded barley was included in the diet.

Extrusion reduced the AME content of barley by 0.82 MJ kg(-1) DM. Inclusion of extruded barley in the diet potentiated the weight gain (2.8 vs. 7.6%; P = 0.31) and feed efficiency (+ 0.8 vs. - 6%; P = 0.07) response to dietary enzyme. Greater enzyme effects with the diet containing extruded barley were also found for feed AME (1.6 vs. 2.9%; P = 0.39), fat utilisation (0.4 vs, 5.4%; P less than or equal to 0.05), nitrogen utilisation (-0.5 vs. 5.6%; P = 0.12), as well as beta-glucan degradability (10.4 vs. 15.6%; P = 0.41). In general, the enzyme had more impact on chick performance than barley form. [References: 29].

L51 ANIMAL PHYSIOLOGY-NUTRITION

4927 Fredriksson, H. (Sveriges Lantbruksuniv., Uppsala (Sweden). Inst. foer Livsmedelsvetenskap) (1992) **Occurrence of lactobacilli capable of degrading mixed-linked beta-glucans in the digestive tract of hens fed cereal-based diets.** Uppsala Livsmedelscentrums Rapportserie (Sweden); no. 4 p. D-N:4. p. D-N:4. English. (AGRIS 95-118524).

4928 Martin, C. (Institut National de la Recherche Agronomique, Saint Genes Champanelle (France). Centre de Clermont Theix); Michalet Doreau, B. (1994) **Variation in mass and fibrolytic activity of rumen microorganisms associated with particles: Effect of barley and buffer supplements.** Proceedings of the Society of Nutrition Physiology (Germany); v. 3 p. 18. DLG. 3 ref. p. 18. English. (AGRIS 95-101660).

4929 Mawuenyegah, O. (Shimane Univ., Matsue shi (Japan)); Chiba, T.; Harumoto, T.; Fujihara, T. (1994) **Effect of ammoniation and soya-bean meal supplementation on the utilization of barley straw in sheep.** Proceedings of the Society of Nutrition Physiology (Germany); v. 3 p. 26. DLG. 2 ref. p. 26. English. (AGRIS 95-101736).

4930 Noziere, P. (Institut National de la Recherche Agronomique, Saint Genes Champanelle (France). Centre de Clermont Theix); Michalet Doreau, B. (1994) **Effect of barley supplement on in situ forage digestion and relations with bacteria fibrolytic activities into bags.** Proceedings of the Society of Nutrition Physiology (Germany); v. 3 p. 21. DLG. 4 ref. p. 21. English. (AGRIS 95-101661).

4931 Ortega Cerrilla, Ma. Esther; Finlayson H, J. (1993) **[Treating barley with glutaraldehyde or formaldehyde to protect starch from ruminal degradation]. Tratamiento de la cebada con glutaraldehido o formaldehido para proteger el almidon de la degradacion ruminal.** Reunion Nacional de Investigacion Pecuaria. Jalisco 1993; Guadalajara, Jal. (Mexico); 27-30 Sep 1993. *[National meeting of livestock research. (Guadalajara, Jal., 27-30 Sep, 1993)(Abstracts)]. Reunion Nacional de Investigacion Pecuaria. (Guadalajara, Jal., 27-30 Sep. 1993 (Resumenes)) p. 154.* CENID Microbiologia. Spanish. (AGRIS 95-101654).

4932 Peyraud, J.L. (Institut National de la Recherche Agronomique, Saint Gilles (France)); Widyobroto, B.P. (1994) **Effect of the nature and the rate of ruminal degradation of carbohydrates on site and extent of digestion in dairy cows.** Proceedings of the Society of Nutrition Physiology (Germany); v. 3 p. 34. DLG. p. 34. English. (AGRIS 95-101664).

4933 Pfeiffer, A. (Forschungs und Studienzentrum fuer Veredlungswirtschaft Weser Ems, Vechta (Germany)); Henkel, H. (1995) **[The influence of low protein supply at restricted feeding level on compensatory growth of fattening pigs]. Der Einfluss proteinreduzierter Fuetterung auf das kompensatorische Wachstum beim Mastschwein.** *Zuechtungskunde (Germany) v. 67(1) p. 75-86.* 6 tables; 32 ref. German. (AGRIS 95-101657).

L53 ANIMAL PHYSIOLOGY-REPRODUCTION

4934 Muir, J.P. (Istituto de Producao Animal, Matola (Mozambique)); Massaete, E.S. (1995) **[Reproductive performance of rabbits fed wheat bran with tropical forages or Leucaena leucocephala]. Performances de reproduction de lapines nourries avec du son de ble et des fourrages tropicaux ou des feuilles de Leucaena leucocephala.** *World Rabbit Sciences (France) v. 3(2) p. 91-93.* 10 ref. English. (AGRIS 95-101927).

N02 FARM LAYOUT

4935 Freiherr von Muenchhausen, H. (Bundesforschungsanstalt fuer Landwirtschaft, Braunschweig (Germany). Inst. fuer Betriebswirtschaft) (1994) **[The environmental impact of different farm sizes]. Umweltvertraeglichkeit unterschiedlicher Betriebsgroessen in der Landwirtschaft.** Landbauforschung Voelkenrode. Sonderheft (Germany); no. 152 p. 197-210. FAL, Selbstverlag. 6 ill.; 8 ref. p. 197-210. German. (AGRIS 95-121341).

N10 AGRICULTURAL STRUCTURES

4936 Britton, M.G.; Zhang, Q.; McCullagh, K. (1993) **Moisture induced vertical loads in model grain bin.** *American Society of Agricultural Engineers. Meeting (USA); no. 934503 7 p.* references. Paper presented at the "1993 International Winter Meeting sponsored by The American Society of Agricultural Engineers, " December 12-17, 1993, Chicago, Illinois. English. (AGRIS 95-121427).

4937 Horabik, J.; Molenda, M.; Ross, I.J. (1993) **Comparison of load distribution in two similar grain bins.** *American Society of Agricultural Engineers. Meeting (USA); no. 934502 17 p.* references. Paper presented at the "1993 International Winter Meeting sponsored by The American Society of Agricultural Engineers, " December 12-17, 1993, Chicago, Illinois. English. (AGRIS 95-121388).

4938 Horabik, J.; Molenda, M.; Thompson, S.A.; Ross, I.J. (1992) **Asymmetry of bin loads induced by eccentric discharge.** *Paper - American Society of Agricultural Engineers (USA); no. 924021 20 p.* references. Paper presented at the "1992 International Summer Meeting sponsored by The American Society of Agricultural Engineers, " June 21-24, 1992, Charlotte, North Carolina. English. (AGRIS 95-103140).

4939 Jackson, H.A.; Kinsman, R.G.; Masse, D.I.; Munroe, J.A.; Sauer, F.D.; Patni, N.K.; Buckley, D.J.; Pattey, E.; Desjardins, R.; Wolynetz, M.S. (1993) **Measuring greenhouse gas emissions in a controlled environment dairy barn.** *American Society of Agricultural Engineers. Meeting (USA); no. 934521 18 p.* references. Paper presented at the "1993 International Winter Meeting sponsored by The American Society of Agricultural Engineers, " December 12-17, 1993, Chicago, Illinois. English. (AGRIS 95-121390).

4940 Molenda, M.; Horabik, J.; Ross, I.J. (1993) **Dynamic load response at start of bin discharge.** *American Society of Agricultural Engineers. Meeting (USA); no. 934501 16 p.* references. Paper presented at the "1993 International Winter Meeting sponsored by The American Society of Agricultural Engineers, " December 12-17, 1993, Chicago, Illinois. English. (AGRIS 95-121387).

4941 Molenda, M.; Horabik, J.; Ross, I.J. (1992) **Loads in model grain bins as affected by filling methods.** *Paper - American Society of Agricultural Engineers (USA); no. 924022 12 p.* references. Paper presented at the "1992 International Summer Meeting sponsored by The American Society of Agricultural Engineers, " June 21-24, 1992, Charlotte, North Carolina. English. (AGRIS 95-103141).

N20 AGRICULTURAL MACHINERY AND EQUIPMENT

4942 El Behery, A. (Purdue University, West Lafayette, Indiana); Krutz, G.W. (1993) **Development of beater-type stationary thresher for Egyptian wheat and rice conditions.** *American Society of Agricultural Engineers. Meeting (USA); no. 93-8518 8 p.* ref. Paper presented at the "1993 International Winter Meeting sponsored by the American Society of Agricultural Engineers, " December 14-17, 1993, Chicago, Illinois. English. (AGRIS 95-121566).

4943 Fisher, K.B.; Shropshire, G.J.; Peterson, C.L.; Dowding, E.A. (1993) **A spatially variable liquid fertilizer applicator for wheat.** *American Society of Agricultural Engineers. Meeting (USA); no. 931074 13 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 95-121841).

4944 Ripke, F. O. (Landwirtschaftskammer Hannover (Germany). Pflanzenschutzamt) (1995) **[Purposive application of plant protecting agents]. Weniger Pflanzenschutzmittel gezielter applizieren.** *Zuckerruebe (Germany) v. 1(suppl.1) p. 10-14.* 9 ill., 1 table. German. (AGRIS 95-121496).

4945 Shropshire, G.; Peterson, C.; Fisher, K. (1993) **Field experience with differential GPS.** *American Society of Agricultural Engineers. Meeting (USA); no. 931073 12 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 95-121840).

P10 WATER RESOURCES AND MANAGEMENT

4946 El Shafie, F.S.; El Koumey, B.Y. (Monoufeyia Univ., Shebin El Kom (Egypt). Faculty of Agriculture) (1994) **Influence of use of sewage effluent in irrigation on soil and plants [fenugreek, barley and mallow].** *Menofiya Journal of Agricultural Research (Egypt) v. 19(5 part 2) p. 2521-2534.* 4 tables; 17 ref. English. (AGRIS 95-122393).

P30 SOIL SCIENCE AND MANAGEMENT

4947 Commins, P.J. (New South Wales Agriculture, Dubbo (Australia)); Khu, J.F. (New South Wales Dept. of Conservation and Land Management, Bourke (Australia)); Chan, K.Y. (New South Wales Agriculture, Rydalmere (Australia). Biological and Chemical Research Inst.); Fraser, K.I. (New South Wales Agriculture, Menangle (Australia). Elizabeth Macarthur Agricultural Inst.) (1994) **Management of semi-arid hardsetting red soils.** New South Wales Agriculture. 16 ref. 9 p. English. (AGRIS 95-104025).

Gives results of a project undertaken to characterise hard-setting soils and gain a better understanding of the causes of hard-setting, so that management strategies can be developed to ameliorate the condition. Both inherent qualities and traditional cultivation practices contribute to hard-setting. Soil organic carbon levels are important in improving soil structure, and these can be increased by retaining crop residues, and by incorporating a pasture phase into cropping. Grass pastures may be more effective than medic or lucerne pastures. Long term economic analysis shows that rotation cropping on these soils is more profitable than continuous cropping in spite of low initial cash flows.

P33 SOIL CHEMISTRY AND PHYSICS

4948 Hayano, K.; Watanabe, K.; Asakawa, S. (1995) **ACTIVITY OF PROTEASE EXTRACTED FROM RICE-RHIZOSPHERE SOILS UNDER DOUBLE CROPPING OF RICE AND WHEAT.** *Soil Science & Plant Nutrition. 41(3):597-603.* English. [NATL INST AGROENVIRONM SCI TSUKUBA IBARAKI 305 JAPAN].

Protease-active extracts were prepared from 2 rice-rhizosphere and non-rhizosphere *soil samples* 3 proteolytic isolates from the soil samples which were taken from water logged paddy fields (Gray Lowland Soils) under double cropping of rice and wheat that had been treated with chemical fertilizer (CF) or organic manure (OM). The activities were assayed and characterized using an artificial substrate, benzyloxycarbonyl-L-phenylalanyl-L-tyrosyl-L-leucine (ZFTL). The protease-active extracts from the rhizosphere and non-rhizosphere of the CF and OM soils (abbreviated as CFR, CFN, OMR, and OMN) showed an optimum pH between 7 and 8. The extracts hydrolyzed ZFTL to Tyr-Leu and Leu; generally, Tyr-Leu was the main reaction product. Activities of all the samples were inhibited by EDTA and p-chloromercuribenzoic acid (PCMB) but not by pepstatin and phenylmethanesulfonyl fluoride (PMSF). These results indicate that the main components of the ZFTL-hydrolases in CFR, CFN, OMR, and OMN were essentially similar. Optimum pH for the activity of the protease extracted from a Gram negative rod (MNB003) and two actinomycetous isolates (MNA014 and MRA017) was about 8, 8, and 8.5, respectively. Extract from the culture of MNB003 hydrolyzed ZFTL to Tyr-Leu and Leu, and the protease activity was inhibited by EDTA and PCMB. Protease activities of the extracts from cultures of the two actinomycetes were inhibited by EDTA but not by PCMB. The extract from culture of MNA014 produced mainly Tyr-Leu from ZFTL while MRA017 produced Leu. Characteristics of the protease activity from cultures of MNB003 and MNA014 were similar to those of the enzyme extracted from a paddy field soil under single crapping (Takeuchi and Hayano 1994: Soil Sci. Plant Nutr., 40, 691-695) and from an Andosol under tomato cultivation (Hayano et al. 1987: Biol. Fertil. Soils, 4, 179-183), respectively. [References: 6].

4949 Kitse, E. (Estonian Agricultural Univ., Tartu (Estonia). Inst. of Soil Science and Agrochemistry) (1994) **[Humus supply of the Estonian arable automorphic soils and its effect on the efficiency of a mineral fertilizer and barley yield]. Eesti haritavate automorfsete muldade moju mineraalvaetiste efektiivsusele ja odra saagile.** *Transactions of Estonian Agricultural University (Estonia); Agronomy (no.178) p. 73-76.* 1 table; 2 ref. Estonian. (AGRIS 95-122760).

An average humus supply of the arable automorphic soils in Estonia varies in a rather wide range- 58.179 kg ha (-1) 10 (-3), in addition there are inner variations in soil types. The widest variation can be seen in the humus supply of pebble and limestone rendzinas (V0.10)- 82 and 80 per cent, respectively. The narrowest variation depending on the soil texture and parent material (rock) is in brown lessive soils -49.51 per cent. At the application of low fertilizer rates (less than 75 kg ha.(-1)) the differential efficiency of mineral fertilizers was the highest on the soils with a small or moderate humus supply (12 kg kg (-1)). By increasing fertilizer rate the situation was changed - on the soils with a small humus supply under the influence of fertilizers an increase in the yield was continuous, but on those with a large humus supply it was of no efficiency. The importance of mineral fertilizers on the yield formation of barley grains under the effect of fertilizer rate, which is economically justified, is the highest (70 per cent) on the soils with small humus supply. On the soils with large or mean humus supply these figures are 50 and 30 per cent, respectively. To sum up, at planning the fertilizer dressings, which will be applied to barley, humus supply of the soil should be taken into consideration. The amount of a fertilizer and its efficiency will depend on the quantity of the soil humus supply.

4950 Korsunskaya, L.P.; Gummatov, N.G.; Pachepskij, Ya.A. (1994) **[Seasonal dynamics of root biomass, carbohydrates content and structural indices of the grey forest soil]. Sezonnaya dinamika soderzhaniya kornevoj biomassy, uglevodov i pokazatelej struktury seroj lesnoj pochvy.** *Pochvovedenie (Russian Federation) (no.10) p. 75-78.* 14 ref. Russian. (AGRIS 95-104153).

The seasonal dynamics of root biomass, soil carbohydrates, of aggregate composition, water retention capacity and density have been investigated experimentally in the grey forest soil under barley. The impact of roots on macroporosity has been shown. The specific surface reliably decreased when carbohydrates were oxidized in samples by the Cheshire method.

4951 Krezel, R. (Akademia Rolnicza, Wroclaw (Poland). Katedra Ogolnej Uprawy Roli i Roslin) (1994) **[Chemical properties of the medium soil as the result of different plants grown in 2-, 3-, and 4-field crop rotations]. Wlasciwosci chemiczne gleby sredniej uksztaltowane pod wplywem roznych roslin uprawianych w zmianowaniach 2-, 3-, i 4-polowych.** *Zeszyty Naukowe Akademii Rolniczej we Wroclawiu. Rolnictwo (Poland) (no.238) p. 87-92.* 2 tables; 5 ref. Polish. (AGRIS 95-104325).

The amounts of organic C, humus fractions, P2O5, K2O, CaO and the pH were determined in the medium soil. The soil contained 39 percent of clay particles. This testing was carried out from the 4th to the 7th year of the static crop succession experiment. It was found that in 2-course crop rotations with cereal crops or cereal - root crops there was a tendency toward the decrease of N and C content. The highest level of N but the lowest of P2O5 was determined in the soil in Norfolk type crop succession. The most beneficial ratio of humus fractions was detected in 3-field rotation with cereal crops and horse bean.

4952 Krezel, R.; Gandecki, R.; Kordas, L.; Zimny, L. (Akademia Rolnicza, Wroclaw (Poland). Katedra Ogolnej Uprawy Roli i Roslin) (1994) **[Physical characteristics of the medium soil formed in 2-, 3- and 4-field crop rotations]. Wlasciwosci fizyczne gleby sredniej uksztaltowane w zmianowaniach 2-, 3- i 4-polowych.** *Zeszyty Naukowe Akademii Rolniczej we*

Wroclawiu. Rolnictwo (Poland) (no.238) p. 93-100. 2 tables; 14 ref. Polish. (AGRIS 95-104326).

Mean values (from years 1986-89) of the analysis of selected physical characteristics of the ten medium soil are presented. They were obtained from the experiments with 10 crop successions differing from each other with the structure of sowing of cereal plants and the length of rotation. It was found that an increased share of cereal crops in crop succession effected the physical characteristics of the soil negatively. The variation of the above mentioned characteristics depended on the species of the grown plants.

4953 Riley, H. (SFL Apelsvoll Forskingsstasjon, Nes paa Hedmark (Norway). Avd. Kise); Eltun, R. (SFL Apelsvoll Forskingsstasjon, Kapp (Norway)) (1994) **The Apelsvoll cropping system experiment II. Soil characteristics.** *Norwegian Journal of Agricultural Sciences (Norway) v. 8(3/4) p. 317-333.* 9 tables, 9 figures; 14 ref. English. (AGRIS 95-104329).

4954 Sturz, AV.; Carter, MR. (1995) **CONSERVATION TILLAGE SYSTEMS, FUNGAL COMPLEXES AND DISEASE DEVELOPMENT IN SOYBEAN AND BARLEY RHIZOSPHERES IN PRINCE EDWARD ISLAND.** *Soil & Tillage Research. 34(4):225-238.* English. [PRINCE EDWARD ISL DEPT AGR FISHERIES & FORESTRY POB 1600 CHARLOTTETOWN PE C1A 7N3 CANADA].

A potential for reduced soil macroporosity (below 12% soil volume) under direct drilling, with a concomitant increase in soil relative saturation, is associated with an increase in crown and root rots in Prince Edward Island field crops. Four long-term tillage systems (moldboard plowing, paraplowing-direct drilling, rotary cultivation and direct drilling) were compared in relation to the pathogenic fungal complexes formed in a two crop rotation in spring barley (Hordeum vulgare L.) and soybean (Glycine max L. Merrill) over a 3 year period in a cool humid region of eastern Canada. The principal phytopathogenic fungal complex of Rhizoctonia solani Kuhn, Fusarium avenaceum (Fr.) Sacc. and F. oxysporum Schl. remained constant over the treatments. Tillage practice did not affect the number of colony forming units of R. solani in the rhizosphere. The recovery of R. solani from root tissues tended to be lower following conservation tillage and was attributed to antagonism associated with elevated numbers of saprophytic trash microflora concentrated at the soil surface. Disease levels in potato (Solanum tuberosum L.) plantlet bioassays were not influenced significantly by soil source or tillage regime, However, plantlet growth tended to be depressed following transplantation into soil from soybean plots in 1993, Under optimum soil physical conditions conservation tillage did not appear to influence disease levels in barley and soybean rotations. [References: 35].

P34 SOIL BIOLOGY

4955 Alvarez, R.; Santanatoglia, OJ.; Garcia, R. (1995) **SOIL RESPIRATION AND CARBON INPUTS FROM CROPS IN A WHEAT SOYABEAN ROTATION UNDER DIFFERENT TILLAGE SYSTEMS.** *Soil Use & Management. 11(2):45-50.* English. [UNIV BUENOS AIRES FAC AGRON RADIOISOTOPOS LAB AVDA SAN MARTIN 4453 RA-1417 BUENOS AIRES DF ARGENTINA].

The production of CO2 in the field and the contribution of carbon from crops to the soil were evaluated for the double crop wheat-soyabean rotation on a typical soil of the Rolling Pampa to assess the effects of two tillage systems, mouldboard ploughing and shallow discing, on the soil carbon balance. Microbial biomass and respiration under controlled conditions were also determined. No differences in soil microbial biomass contents were detected between tillage systems after two years, but the biological activity of incubated soils and the mineralized fraction of organic carbon were greater (P=0.05) at the 0-5 cm depth in disc tillage. This suggested an increase in the labile fraction of organic matter in that layer, though the total carbon content of the soil did not vary significantly. Soil moisture was not a limiting factor at any time of the year and production of CO2 in the field was regulated by temperature (r>0.89, P=0.01). There were no differences between tillage systems in the emission of CO2 to the atmosphere, which was estimated at 11.6 t C/ha/yr. The contribution in dry matter from the crops ranged from 15.3 to 17.0 t/ha/yr, and the carbon input was approximately 7.0 t/ha/yr. Consequently, the soil lost carbon with the wheat-soyabean rotation but tillage systems did not affect carbon inputs and losses from the agrosystem.

4956 Belimov, A.A.; Postavskaya, S.M.; Khamova, O.F.; Kozhemyakov, A.P.; Kunakova, A.M.; Gruzdeva, E.V. (1994) **[Effect of inoculation of barley with diazotrophic bacteria and their survival depending on soil moisture and temperature]. Prizhivaemost' i ehffektivnost' kornevykh diazotrofov pri inokulyatsii yachmenya v zavisimosti ot temperatury i vlazhnosti pochvy.** *Mikrobiologiya (Russian Federation) v. 63(5) p. 900-908.* 17 ref. Russian. (AGRIS 95-104446).

In pot experiments the antibiotic-resistant mutants of four diazotrophic bacteria were used to study their population dynamics in rhizoplane of barley grown under normal, subnormal or elevated conditions of soil moisture and temperature. The temperature of plant cultivation had no effect on survival rate of introduced bacteria. The soil moisture was a determinant factor (as compared with plant genotype and nitrogen status of plants) in the ability of bacteria to colonize the rhizoplane. A maximum number of all studied strains was observed at water shortage in soil (30% WHC). The benefical effect of inoculation of barley with the present strains was a maximum when the plants were grown under unfavourable environmental conditions. It is suggested that a higher tolerance of inoculated plants for stress conditions may be the important mechanism of interaction between diazotrophic bacteria and plants.

4957 Belimov, AA.; Kojemiakov, AP.; Chuvarliyeva, CV. (1995) **INTERACTION BETWEEN BARLEY AND MIXED CULTURES OF NITROGEN FIXING AND PHOSPHATE-SOLUBILIZING BACTERIA.** *Plant & Soil. 173(1):29-37.* English. [ST PETERSBURG AGR MICROBIOL RES INST BIOL NITROGEN LAB PODBELSKY SH 3 PUSHKIN 8 ST PETERSBURG 189620 RUSSIA].

Pot experiments were carried out to investigate the effect of inoculation with pure and mixed cultures of nitrogen fixers Azospirillum lipoferum 137, Arthrobacter mysorens 7 and the phosphate-solubilizing strain Agrobacterium radiobacter 10 on growth and mineral nutrition of two barley cultivars. A significant positive effect on grain yield both of the studied barley cultivars was obtained after inoculation with mixtures of A. lipoferum 137 + A. radiobacter 10 and A. lipoferum 137 + A. mysorens 7 only. The acetylene reduction activity on roots or in batch culture was significantly higher when A. lipoferum 137 and A. radiobacter 10 were combined. Using N-15 isotope dilution technique it was established that these mixed cultures significantly increased the accumulation of nitrogen fertilizer in the plants. The strain A. radiobacter 10 promoted a better accumulation of phosphorus fertilizer by plants and A. mysorens 7 increased the total phosphorus content in plant tissues. The maximum positive effect of joint inoculation on plant development was observed when the combined nitrogen in soil was in short supply. It was concluded that inoculation with bacterial mixtures provided a more balanced nutrition for the plants and the improvement in root uptake of nitrogen and phosphorus was the major mechanism of interaction between plants and bacteria. The introduced bacteria were able to colonize actively the rhizoplane of barley. No interspecific competition or antagonism were established between components of the bacterial mixtures in the rhizoplane. The strains A. mysorens 7 and A. radiobacter 10 improved viability of A. lipoferum 137 when the plants were grown in acid soil. Field experiments carried out on 3 barley cultivars confirmed the assertion that inoculation with mixed cultures significantly increases the grain yield and nitrogenous nutrition of plants as compared with single cultures. [References: 33].

4958 Bremer, E.; Ellert, BH.; Janzen, HH. (1995) **TOTAL AND LIGHT-FRACTION CARBON DYNAMICS DURING FOUR DECADES AFTER CROPPING CHANGES.** *Soil Science Society of America Journal. 59(5):1398-1403.* English. [AGR & AGRIFOOD CANADA BOX 3000 LETHBRIDGE AB T1J 4B1 CANADA].

The dynamics of soil organic C after a change in cropping practice are important in defining the potential impact of the new practice on soil behavior and net CO2 exchange. Our objective was to determine the duration and magnitude of a shift in soil organic C after a change in summer fallow frequency in spring wheat (Triticum aestivum L.) systems. Total organic and light-fraction C in continuous wheat (W), fallow-wheat-wheat (FWW), and fallow-wheat (FW) treatments were determined in soil samples collected periodically from 1954 to 1992 from a long-term spring

wheat study located in the northern Great Plains. Organic C concentrations in the 0- to 15-cm depth were 11% lower in the FW and FWW treatments than in the W treatment from 1967 to 1992. Organic C concentrations in the 15- to 30-cm depth were not affected by treatment, but varied among sampling years due to differences in effective sampling depth. Light-fraction C concentrations were 38% lower in the FW and FWW treatments than in the W treatment from 1967 to 1992. Reduced light-fraction C accounted for about one-third of the decrease in total organic C due to inclusion of fallow in the crop rotation. The negative influence of fallow was primarily due to enhanced decomposition in the fallow year. We conclude that most losses of soil organic C due to introduction of a falloff system occur within two decades, and that further loss of organic C is negligible provided soil erosion is minimal. [References: 30].

4959 Deleij, FAAM.; Sutton, EJ.; Whipps, JM.; Fenlon, JS.; Lynch, JM. (1995) **IMPACT OF FIELD RELEASE OF GENETICALLY MODIFIED PSEUDOMONAS FLUORESCENS ON INDIGENOUS MICROBIAL POPULATIONS OF WHEAT.** *Applied & Environmental Microbiology. 61(9):3443-3453.* English. [UNIV SURREY SCH BIOL SCI GUILDFORD GU2 5XH SURREY ENGLAND].

In a field release experiment, an isolate of Pseudomonas fluorescens, which was chromosomally modified with two reporter gene cassettes (lacZY and Kan(r)-xylE), was applied to spring wheat as a seed coating and subsequently as a foliar spray. The wild-type strain was isolated from the phylloplane of sugar beet but was found to be a common colonizer of both the rizosphere and phylloplane of wheat as well. The impact on the indigenous microbial populations resulting from release of this genetically modified microorganism (GMM) was compared with the impact of the unmodified, wild-type strain and a nontreated control until 1 month after harvest of the crop. The release of the P. fluorescens GMM and the unmodified, wild-type strain resulted in significant but transient perturbations of some of the culturable components of the indigenous microbial communities that inhabited the rhizosphere and phylloplane of wheat, but no significant perturbations of the indigenous culturable microbial populations in nonrhizosphere soil were found. Fast-growing organisms that did not produce resting structures (for example, fluorescent pseudomonads and yeasts) seemed to be most sensitive to perturbation. In terms of hazard and risk to the environment, the observed microbial perturbations that resulted from this GMM release may be considered minor for several reasons. First, the recombinant P. fluorescens strain caused changes that were, in general, not significantly different from those caused by the unmodified wild-type strain; second, perturbations resulting from bacterial inoculations were mainly small; and third, the release of bacteria had no obvious effects on plant growth and plant health. [References: 46].

4960 Deleij, FAAM.; Sutton, EJ.; Whipps, JM.; Lynch, JM. (1995) **SPREAD AND SURVIVAL OF A GENETICALLY MODIFIED PSEUDOMONAS AUREOFACIENS IN THE PHYTOSPHERE OF WHEAT AND IN SOIL (VOL 1, PG 207, 1994).** *Applied Soil Ecology. 2(1):65.* English. [UNIV SURREY SCH BIOL SCI GUILDFORD GU2 5XH SURREY ENGLAND].

4961 Kanal, A. (1995) **EFFECT OF INCORPORATION DEPTH AND SOIL CLIMATE ON STRAW DECOMPOSITION RATE IN A LOAMY PODZOLUVISOL.** *Biology & Fertility of Soils. 20(3):190-196.* English. [ESTONIAN AGR UNIV DEPT SOIL SCI VILJANDI RD 2400 TARTU ESTONIA].

Several studies on the decomposition of straw using the mesh bag technique were carried out under field conditions in south Estonia. Straw of spring and winter cereals (Hordeum vulgare L., Secale cereale L., Triticum aestivum L.) was compared over different periods and at two depths (5 and 20 cm). Calculation of straw decomposition was based on the ash-free organic matter weight loss. Depending on experimental and climatic conditions the decomposition rate fluctuated from 42% to 75% during the 1st year. The three experimental factors incorporation period, incorporation depth and straw species all had a significant effect on the decomposition of straw. The decaying processes proceeded more rapidly in the upper layer and during the initial months; later there were no differences in decomposition rate between the two depths. During the period without vegetation, i.e. from freezing (December) to thawing (April) of the soil, the decomposition rate was 6-7% and during autumn it was about 10%. Greater loss of straw occurred early in the growing season and in the upper layer. The release of nitrogen from straw was slow and N quantity in straw increased due to microbiological immobilization during the 1st year. [References: 45].

4962 Roper, MM.; Ladha, JK. (1995) **BIOLOGICAL N-2 FIXATION BY HETEROTROPHIC AND PHOTOTROPHIC BACTERIA IN ASSOCIATION WITH STRAW.** *Plant & Soil. 174(1-2):211-224.* English. [CSIRO CTR MEDITERRANEAN AGR RES WEMBLY WA 6014 AUSTRALIA].

Much of the crop residues, including cereal straw, that are produced worldwide are lost by burning. Plant residues, and in particular straw, contain large amounts of carbon (cellulose and hemicellulose) which can serve as substrates for the production of microbial biomass and for biological N-2 fixation by a range of free-living, diazotrophic bacteria, Microorganisms with the dual ability to utilise cellulose and fix N-2 are rare, but some strains that utilize hemicellulose and fix N-2 have been found. Generally, cellulolysis and diazotrophy are carried out by a mixed microbial community in which N-2-fixing bacteria utilise cellobiose and glucose produced from straw by cellulolytic microorganisms. N-2-fixing bacteria include heterotrophic and phototrophic organisms and the latter are apparently more prominent in flooded soils such as rice paddies than in dryland soils. The relative contributions of N-2 fixed by heterotrophic diazotrophic bacteria compared with cyanobacteria and other phototrophic bacteria depend on the availability of substrates from straw decomposition and on environmental pressures. Measurements of asymbiotic N2 fixation are limited and variable but, in rice paddy systems, rates of 25 kg N ha(-1) over 30 days have been found, whereas in dryland systems with wheat straw, in situ measurements have indicated up to 12 kg N ha(-1) over 22 days. Straw-associated N-2 fixation is directly affected by environmental factors such as temperature, moisture, oxygen concentration, soil pH and clay content as well as farm management practices. Modification of managements and use of inoculants offer ways of improving asymbiotic N-2 fixation. In laboratory culture systems, inoculation of straws with cellulolytic and diazotrophic microorganisms has resulted in significant increases in N-2 fixation in comparison to uninoculated controls and gains of N of up to 72 mg N fixed g(-1) straw consumed have been obtained, indicating the potential of inoculation to improve N gains in composts that can then be used as biofertilisers. Soils, on the other hand, contain established, indigenous microbial populations which tend to exclude inoculant microorganisms by competition. As a consequence, improvements in straw-associated N-2 fixation in soils have been achieved mostly by specific straw-management practices which encourage microbial activity by straw-decomposing and N-2-fixing microorganisms. Further research is needed to quantify more accurately the contribution of asymbiotic N-2 fixation to cropping systems. New strains of inoculants, including those capable of both cellulolytic and N-2-fixing activity, are needed to improve the N content of biofertilisers produced from composts. Developments of management practices in farming systems may result in further improvements in N-2 fixation in the field. [References: 119].

4963 Scott, EM.; Rattray, EAS.; Prosser, JI.; Killham, K.; Glover, LA.; Lynch, JM.; Bazin, MJ. (1995) **A MATHEMATICAL MODEL FOR DISPERSAL OF BACTERIAL INOCULANTS COLONIZING THE WHEAT RHIZOSPHERE.** *Soil Biology & Biochemistry. 27(10):1307-1318.* English. [UNIV LONDON KINGS COLL DEPT MICROBIOL DIV BIOSPHERE SCI CAMPDEN HILL RD LONDON W8 7AH ENGLAND].

A mathematical model has been constructed to describe bacterial growth and movement in the rhizosphere. In the model, bacteria are introduced into the soil on inoculated seeds and growth occurs, after seed germination, on material produced as root exudates. Movement of substrates away from the rhizosphere into the bulk soil is by diffusion and microbial movement is mediated by carriage on the root surface. The relationship between specific growth rate and substrate concentration is described by Monod kinetics and death occurs at a constant specific rate. An important component of the model is treatment of the effects of matric potential on the distribution and activity of bacteria in different microhabitats. Simulation of the model quantifies the distribution of both bacteria and substrate with depth and time in the rhizosphere and demonstrates significant differences between substrate concentrations at high and low matric potentials. Sensitivity analysis of model predictions indicates the parameters which govern microbial growth to be more important determinants of microbial

movement than plant-associated parameters. Predictions of the model compared well with experimental data on microbial movement in the rhizosphere of wheat plants grown in microcosms, and inoculated with luminescence-marked Pseudomonas fluorescens, and provide the basis for quantitative risk assessment following environmental release of genetically-engineered microorganisms. [References: 27].

4964 Silva, L.H.B. da; Miranda, J.C.C. de; Miranda, L.N. de (1994) **[Effect of vesicular-arbuscular mycorrhiza in the growth of wheat varieties with different aluminum tolerance, in cerrado soil]. Efeito da micorriza vesiculoarbuscular no crescimento de variedades de trigo sensivel e tolerante ao aluminio, em solo de cerrado.** *Revista Brasileira de Ciencia do Solo (Brazil) v. 18(3) p. 407-414.* 36 ref. Portuguese. (AGRIS 95-123193).

4965 Singh, H. (1995) **NITROGEN MINERALIZATION, MICROBIAL BIOMASS AND CROP YIELD AS AFFECTED BY WHEAT RESIDUE PLACEMENT AND FERTILIZER IN A SEMI-ARID TROPICAL SOIL WITH MINIMUM TILLAGE.** *Journal of Applied Ecology. 32(3):588-595.* English. [BANARAS HINDU UNIV DEPT BOT VARANASI 221005 UTTAR PRADESH INDIA].

1. The effects of wheat residue placement and chemical fertilizer on microbial biomass, N-mineralization and crop yield were examined. 2. Available N ranges were 7.2-10.4 mu g g(-1) in control plots, 11.6-17.3 mu g g(-1) in fertilized plots, 8.5-13.3 mu g g(-1) in plots treated with wheat residue, and 9.6-13.7 mu g g(-1) in those treated with wheat residue plus fertilizer. NaHCO3-P-i ranges in the soil were 9.0-12.0 mu g g(-1) in control plots, 11.2-16.0 mu g g(-1) in fertilized plots, 10.2-14.2 mu g g(-1) in wheat residue plots and 12.2-16.7 mu g g(-1) in plots amended with wheat residue plus fertilizer. 3. Treatment with wheat residue plus fertilizer resulted in the maximum rate of N-mineralization, followed by the fertilizer and then by the wheat residue treatment. The mineralization rate ranges were 3.4-9.8, 4.2-14.3, 4.0-11.2 and 4.6-16.6 mu g g(-1) N month(-1) for control, fertilizer, wheat residue and wheat residue plus fertilizer-treated plots, respectively. 4. The maximum effect of inputs on microbial biomass was realized under the wheat residue plus fertilizer treatment, followed by wheat residue, and was least in fertilizer plots. 5. Both crop biomass and grain yield showed a maximum response to the wheat residue plus fertilizer application. 6. Above-ground crop biomass ranges were 679-991 g m(-2) for the rice crop and 390-675 g m(-2) for the lentil crop. Grain yields were 108-146 g m-(2) and 102-174 g m(-2) for the rice and lentil crops. 7. Wheat residue applied in combination with fertilizer to a rice-lentil rotation under rainfed, reduced tillage cultivation increased the activity of soil organic matter, thereby enhancing the nutrient supply rate, which in turn resulted in better crop growth and grain yield. [References: 37].

4966 Tarafdar, JC.; Marschner, H. (1995) **DUAL INOCULATION WITH ASPERGILLUS FUMIGATUS AND GLOMUS MOSSEAE ENHANCES BIOMASS PRODUCTION AND NUTRIENT UPTAKE IN WHEAT (TRITICUM AESTIVUM L) SUPPLIED WITH ORGANIC PHOSPHORUS AS NA-PHYTATE.** *Plant & Soil. 173(1):97-102.* English. [CENT ARID ZONE RES INST JODHPUR 342003 RAJASTHAN INDIA].

In a pot experiment, wheat was grown for 50 days in two heat-sterilized low-phosphorus (P) soils supplied with organic P as Na-phytate. Seed inoculation with the phosphatase-producing fungus (PPF) Aspergillus fumigatus or soil inoculation with the vesicular-arbuscular mycorrhizal (VAM) fungus Glomus mosseae increased shoot and root dry weight and root length, phosphatase activity in the rhizosphere and shoot concentrations of P and to a lesser extent of K and Mg. As a rule, the greatest effects on those parameters were most in the combined inoculation treatment (*PPF+VAM*). Shoot concentrations of Cu and Zn were only enhanced by VAM, not by PPE At harvest, depletion of organic P in the rhizosphere soil increased in the order of: sterilized soil < PPF < VAM < PPF+VAM which corresponded with the enhanced P concentrations in the plants. The results demonstrate that organic P in form of Na-Phytate is efficiently used by VAM and that use of organic P can be increased by simultaneous inoculation with phosphatase-producing fungi. [References: 30].

4967 Youssef, S.M.; Ali, R.A.; El Kammah, M.A.; Mashali, S.A. (Tanta Univ., Kafr El Sheikh (Egypt). Faculty of Agriculture) (1994) **Effect of different forms of nitrogen fertlizers and nitrification inhibitors on protein content and yield component of wheat crops.** *Journal of Agricultural Sciences, Mansoura Univ. (Egypt) v. 19(4) p. 1587-1598.* 2 ill. 7 tables; 16 ref. English. (AGRIS 95-123205).

P35 SOIL FERTILITY

4968 Allison, MF.; Hetschkun, HM. (1995) **FIVE YEARS OF STRAW INCORPORATION AND ITS EFFECT ON GROWTH, YIELD AND NITROGEN NUTRITION OF SUGARBEET (BETA VULGARIS).** *Journal of Agricultural Science. 125(Part 1):61-68.* English. [INST ARABLE CROPS RES BURY ST EDMUNDS IP28 6NP SUFFOLK ENGLAND].

In 1990-92, held experiments were performed at Broom's Barn Experimental Station to study the effect of 5 years' repeated straw incorporation on sugarbeet. Straw incorporation had no effect on plant population density. Processing quality was reduced by incorporated straw but N had a much larger effect. The effect of incorporated straw on the mineral N content of the soils and N uptake by beet was inconsistent, and this may be related to the amount of soil mineral N present when the straw was incorporated. The efficiency of fertilizer use was unaffected by straw incorporation. On Broom's Barn soils when straw was incorporated, the optimal economic N dressing was c. 120 kg N/ha, and in unincorporated plots it was c. 100 kg N/ha. At the optimal economic N rate, incorporated straw increased beet yields. [References: 27].

4969 Blanco, MJ.; Almendros, G. (1995) **FORECASTING AGROBIOLOGICAL PROPERTIES OF WHEAT STRAW WITH DIFFERENT ADDITIVES - MULTIPLE REGRESSION MODELS INCLUDING CHEMICAL PARAMETERS.** *Communications in Soil Science & Plant Analysis. 26(15-16):2473-2484.* English. [CIEMAT INST ENERGIAS RENOVABLES DIV BIOMASA AVENIDA COMPLUTENSE 22 E-28040 MADRID SPAIN].

The agrobiological properties of 37 composts prepared from wheat straw with a series of organic or mineral additives have been determined through standard chemical analyses and greenhouse experiments with soils of different carbonate content and in the presence, or absence of mineral fertilization. Plant yield on soils treated with the composts was studied in successive stages of development of rye grass (Lolium rigidum), showing significant differences that paralleled the values of a limited number of compost parameters. Under greenhouse conditions and in the presence of mineral supply, the least matured composts led to improved plant yield only in the early harvests, decreasing thereafter which points to a behavior typical for the microbial immobilization of the additional nutrients. The germination (phytotoxicity) index was found poorly correlated with the yield in the different soils, whereas the N and lignin contents provided the most significant information, the results suggesting no cause-to-effect relationship in such correlations. The multiple regression models showed significant differences as regards the system studied when the limiting influence of nitrogen (N) was reduced through additional fertilization. The most significant coefficients for the plant yield were those reflecting the total mineralization rates of the compost, the composition of the water-soluble fraction, and the concentration of lipids whereas, when no mineral solution was added, the yield was explained mainly by the N content in compost and in water-soluble products. In successive harvests, the significance level of the compost N level tended to increase, whereas that of lipid decreased, the former factor showing the greatest influence when carbonates are present in the soil. [References: 14].

4970 Bremer, E.; Janzen, HH.; Gilbertson, C. (1995) **EVIDENCE AGAINST ASSOCIATIVE N-2 FIXATION AS A SIGNIFICANT N SOURCE IN LONG-TERM WHEAT PLOTS.** *Plant & Soil. 175(1):13-19.* English. [AGR & AGRI FOOD CANADA POB 3000 LETHBRIDGE AB T1J 4B1 CANADA].

In monocropped cereal systems, annual N inputs from non-fertilizer sources may be more than 30 kg ha(-1) We examined the possibility that these inputs are due to biological N-2 fixation (BNF) associated with roots or decomposing residues. Wheat was grown under greenhouse conditions in pots (34 cm long by 10 cm diameter) containing soil from a plot cropped to spring wheat since 1911 without fertilization. The roots and soil were sealed from the atmosphere and exposed to a N-15(2)-enriched atmosphere for three to four weeks during vegetative, reproductive or post-reproductive stages. This technique permitted detection of as little as 1 mu g fixed N plant(-1) in plant material and 40 mu g fixed N plant(-1) in soil.

No fixation of N-15(2) occurred during either of the first two labelling periods. In the final labelling period, straw returned to the soil was significantly enriched in N-15, especially in a pot with a higher soil moisture content. Total BNF in this pot was 13 mu g N plant(-1), or about 30 g N ha(-1). In a separate experiment with soil from the same plot, we detected BNF only when soil was amended with glucose at a high soil moisture content. Measured associative BNF was insufficient to account for observed N gains under field conditions. [References: 27].

4971 Stumpe, H. (Halle Wittenberg Univ., Halle (Germany). Inst. fuer Pflanzenernaehrung und Duengung. Abt. Duengung); Garz, J.; Schliephake, W. (1993) **[Investigations concerning the amounts of inorganic soil nitrogen in a series of field trials carried out with winter wheat on a sandloess-braunschwarzerde (Haplic Phaeozem) at Halle during 13 years]. Untersuchungen ueber den anorganischen Bodenstickstoff in einer 13jaehrigen Versuchsreihe mit Winterweizen auf einer Sandloess-Braunschwarzerde in Halle.** *Archives of agronomy and soil science (Germany) v. 37(2) p. 153-162.* 5 tables; 22 ref. German. (AGRIS 95-123327).

4972 Uhlen, G.; Kolnes, A.G.; Thorbjoernsen, B. (Norges Landbrukshoegskole, Aas (Norway). Inst. for Jord og Vannfag) (1994) **Effects of long-term crop rotations, fertilizer, farm manure and straw on soil productivity. I. Experimental design and yields of grain, hay and row crops.** *Norwegian Journal of Agricultural Sciences (Norway) v. 8(3/4) p. 243-258.* 9 tables, 2 figures; 9 ref. English. (AGRIS 95-104508).

P36 SOIL EROSION, CONSERVATION AND RECLAMATION

4973 Formanek, G.E.; McCool, D.K.; Hall, L.J.S.; Foster, G.R. (1993) **Contour practice subfactor for dryfarmed cropland Northwestern Wheat and Range Region.** *American Society of Agricultural Engineers. Meeting (USA); no. 932109 12 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 95-123468).

4974 Nicola, I.; Ionescu, I.; Duicu, I.; Ionescu, F. (Institutul de Cercetari pentru Cereale si Plante Tehnice Fundulea, Simnic (Romania). Statiunea de Cercetari agricole Simnic Craiova) (1994) **[Characteristic aspects of the relief, the microrelief and of soils in the southern part of the "Getic piedmont", Dolj county]. Aspecte caracteristice ale reliefului, microreliefului si solurilor din sudul piemontului getic, judetul Dolj.** *Lucrari stiintifice (Romania) v. 9 p. 243-249.* 4 graphs; 5 ref. Romanian. (AGRIS 95-123498).

The areas on slopes represent almost 15 percent of the piedmont surface of the Dolj county. The slopes were modelled by sliding processes. The lithological constitution of the areas affected by sliding in the studied zone shows stratification of various kind, whose granulometry oscillates between clay and sand. This is the cause why the sliding processes are connected with those of failure. The variance of the factors taking part in the process of soil genesis of the areas on slopes make it necessary to find the optimum technological variants.

P40 METEOROLOGY AND CLIMATOLOGY

4975 Corbett, J.D. (Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico)) (1994) **The use of geographic information systems to characterize target environments.** *The subtropical, midaltitude, and highland maize subprogram. Bjarnason, M. (ed.) (Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). Maize Program) p. 85-86.* CIMMYT. 1 map. English. (AGRIS 95-104608).

Q02 FOOD PROCESSING AND PRESERVATION

4976 Andersson, R.; Westerlund, E.; Aaman, P. (Sveriges Lantbruksuniv., Uppsala (Sweden). Inst. foer Livsmedelsvetenskap) (1992) **Investigation on composition and properties of wheat flour milling fractions.** Uppsala Livsmedelscentrums Rapportserie (Sweden); no. 4 p. L:6. p. L:6. English. (AGRIS 95-123943).

4977 Baba, M. (Institut National de la Recherche Agronomique, Rabat (Maroc). Departement de Technologie Agro Alimentaire); Bakhella, M. (1994) **[Hardness of Moroccan wheats]. Etude de la durete des bles marocains.** *Industries des Cereales (France) (no 86) p. 27-38.* 46 ref., 10 tableaux. French. (AGRIS 95-104766).

4978 Bojat, S. (Tehnoloski fakultet, Novi Sad (Yugoslavia)); Vukobratovic, R.; Kis, M. (1994) **[Instant barley flakes as raw material in bread and baked goods production]. Jecmene instant pahuljice kao sirovina u izradi hleba i peciva.** *Zito hleb (Yugoslavia) v. 21(5) p. 117-126.* 8 tables; 20 ref. Serbian. (AGRIS 95-123958).

The instant barley flakes were added directly by dough mixing without previous preparation, as well as with previous preparation with swolling in duration of 60 minutes. The results of this investigation point to the possibility for barley flakes addition in a quantity from 15 to 20 in the production of bread and baked goods with flakes. Through swolling the effect that barley flakes better built into dough and finished products is obtained. Bread and baked goods with barley flakes are characterized with aromatic and meltable crust, just a little sour, pleasant and meltable crust, as well as rather larger content of natural ballast substances.

4979 Das, U.R.; Zaman, M.A.; Islam, M.H.; Hossain, S.A. (1992) **Comparative studies on chapaties [bread in Bangladesh] prepared from maize, wheat and maize-wheat mixed flours.** *Bangladesh Journal of Agricultural Research (Bangladesh) v. 17(2) p. 200-204.* 6 ref. English. (AGRIS 95-123954).

Suitability of three maize varieties viz., Shuvra, Barnali and Mohar, and proportions of mixing maize and wheat (cv. Kanchan) flours for making chapati was studied. Sole Kanchan dough showed extreme stickiness as gluten content was high, but it decreased with addition of maize flour. Spread of sole Shuvra dough during flattening was poor but those of all other sole and combination treatments were very good to fair. Margins of chapaties of all the treatments were very good to fair except sole Barnali and sole Shuvra which were uneven. Baking quality was good except for sole Barnali and sole Shuvra. The smell of baked chapaties from sole Barnali was liked very much, whereas that of sole Kanchan was liked moderately and others were liked moderately to slightly. Panelists gave scores for colours and tastes of all maize treatments similar to that of sole Kanchan except the combination of Mohar-Kanchan in 1:2 ratio. Textures of all the treatments did not differ significantly from sole Kanchan except sole Barnali, sole Mohar, Barnali-Kanchan in 1:1 ratio, and Mohar-Kanchan in 1:1 and 1:2 ratios.

4980 Derdelinckx, G.; Neven, H.; Demeyer, I.; Delvaux, F. (Katholieke Univ. Leuven (Belgium). Faculteit Landbouwkundige en Toegepaste Biologische Wetenschappen. Centre for Malting and Brewing Sciences); Arnott, P. (1995) **Belgian special beers: Refermented beers, white and wheat beers, amber and dark beers, spiced and hoppy beers.** *Cerevisia. Belgian Journal of Brewing and Biotechnology (Belgium) ISSN 0770-1713 v. 20(1) p. 67-73.* 2 tables. English. (AGRIS 95-124157).

4981 Dubois, M. (Association Amicale des Anciens Eleves de l'Ecole Nationale Superieure de Meunerie et des Industries Cerealieres, Paris (France)) (1994) **[The yield of a wheat flour in dough for the baking industries]. Le rendement en pate en boulangerie et en industries de cuisson.** *Industries des Cereales (France) (no 86) p. 39-45.* French. (AGRIS 95-104888).

4982 Feuchtmayr, L.; Jung, J. (1995) **[Malting of winter barley]. Vermaelzung von Winter-Braugerste.** *Brauwelt (Germany) v. 135(5-6) p. 237-240.* 6 tables. German. (AGRIS 95-123715).

4983 Gontard, N.; Marchesseau, S.; Cuq, JL.; Guilbert, S. (1995) WATER VAPOUR PERMEABILITY OF EDIBLE BILAYER FILMS OF WHEAT GLUTEN AND LIPIDS. *International Journal of Food Science & Technology. 30(1):49-56.* English. [CIRAD SAR IENSIA SIARC 73 RUE JEAN FRANCOIS BRETON BP 5035 F-34032 MONTPELLIER FRANCE].

Various formulations and methods of fabricating edible bilayer films consisting of wheat gluten as a structural layer and a thin lipid layer as a moisture barrier were investigated and examined for water vapour permeability. Solid lipids such as beeswax or paraffin wax deposited in a molten state onto the base film were the most effective water vapour barriers. A film consisting of wheat gluten, glycerol and diacetyl tartaric ester of monoglyceride as one layer, and beeswax as the other yielded a water vapour permeability of 0.0048 g mm m(-2) mmHg(-1) 24h(-1), which was less than that obtained with low density polyethylene. [References: 28].

4984 Graeber, S. (Universitaet Hohenheim, Stuttgart (Germany). Inst. fuer Lebensmitteltechnologie); Lang, K.; Noll, B.; Kuhn, M. (1994) **[Influence of recipe and dough process on baking results of whole meal rolls from spelt wheat]. Einfluesse von Rezepturbestandteilen und Fuehrungsbedingungen auf das Backergebnis bei Dinkelvollkornkleingebaeck.** *Getreide Mehl und Brot (Germany) v. 48(6) p. 36-41.* 1 ill., 8 graphs, 4 tables; 13 ref. German. (AGRIS 95-104877).

4985 Handreck, B.; Poetschke, L. (1994) **[Process analysis of the reduction of semolina in the roller mill]. Analisi del processo di rimacina della semola.** *Tecnica Molitoria (Italy) v. 45(9) p. 932-942.* 4 tables; 8 graphs; 7 ref. Italian. (AGRIS 95-123739).

The semolina reduction was carried out and evaluated under the application of a second-degree test plan. The tests showed that the accurate selection and combination of the grinding parameter can considerably contribute to a reduction of the energy requirement and to an increase of the yield of light-colored flours. The roll diameter has little influence on the grinding results. The greatest influence on the fine product yield and ash contents is given by grinding gap. Increasing circumferential speeds of the rolls will lead to an increase of the fine product portion, independently of the roll surface. The differential speed has a significant influence on the specific energy requirement, but it is clearly less significant on the remaining objective values. Increases of the throughput will lead, independent of the roll surface, to an increase of the ash content and of the specific energy requirement. The computations of optimization showed, taking into account the objective values fine product portion, ash contents and mass-specific energy requirement, optimum combinations of the limiting values: grinding gap, circumferential speed of the rolls, differential and specific throughput.

4986 Hnilica, P. (Ceska Zemedelska Univ., Prague Suchdol (Czech Republic)) (1995) **[The effect of speed of hammers and particles on the process and demand of energy in grinding]. Vliv rychlosti kladivek a castic na proces a energetickou narocnost mleti.** *Zemedelska Technika - UZPI (Czech Republic) v. 41(1) p. 1-13.* 7 graphs, 3 tables; 34 ref. Czech. (AGRIS 95-123738).

Theoretically, the physical importance of constants in a previously experimentally confirmed relation between specific consumption of energy and increase in specific surface in grinding of cereals in the hammer mill is approximately derived. Both the quantities, characterizing the material and process, and the above-mentioned constants depend on a speed of hammers. The result is influenced as by circumferential speed of hammers as by circumferential speed of circulation of particles in a grinding chamber and rheological properties of grain. The grindability of wheat and barley within circumferential speeds of hammers 33 to 98 m.s-1 grows with speed and was not influenced by the size of sieve mashes.

4987 Khatkar, BS.; Bell, AE.; Schofield, JD. (1995) **THE DYNAMIC RHEOLOGICAL PROPERTIES OF GLUTENS AND GLUTEN SUB-FRACTIONS FROM WHEATS OF GOOD AND POOR BREAD MAKING QUALITY.** *Journal of Cereal Science. 22(1):29-44.* English. [UNIV READING DEPT FOOD SCI & TECHNOL POB 226 READING RG6 6AP BERKS ENGLAND].

The dynamic rheological properties of glutens and gluten fractions (gliadin and glutenin) of two U.K.-grown wheat cultivars, Hereward and Riband, having good and poor bread quality, respectively, were studied. Gluten and glutenin doughs from cv. Hereward had higher G' and lower tan delta values than those from cv. Riband al all frequencies studied. A more pronounced difference in G' and tan delta was observed between the glutenin doughs of the two wheats than between their respective gluten doughs. The theological properties, i.e. G' and tan delta values, of gliadin doughs were similar for both wheats. Varying the gliadin/glutenin ratio by adding the isolated gliadin or glutenin sub-fractions to the parent glutens showed that the G' values decreased and the tan delta values increased as the gliadin/glutenin ratio was increased for both cultivars, indicating a considerable decrease in elasticity as the gliadin/glutenin ratio increased. The decrease in G' may be attributed to a plasticising effect of gliadin and 'interference' of gliadin with glutenin-glutenin interactions. The reduction in G' was much more pronounced when the gliadin/glutenin ratio was increased between 0.15 and 1.0 than between 1 0 and above. Gluten from cv. Hereward had higher G' and lower tan delta values than cv. Riband gluten at all gliadin/glutenin ratios, indicating that cv. Hereward gluten had greater elastic character than cv. Riband gluten. Although significant effects of other non-protein hydrocolloid components cannot be discounted, these observations are consistent with the view that the viscoelasticity of the glutenin sub-fraction of gluten and differences in the ratio of gliadin to glutenin are the main factors governing inter-cultivar differences in the viscoelasticity of wheat gluten. (C) 1995 Academic Press Limited [References: 42].

4988 Klingler, R.W. (Technische Fachhochschule Berlin (Germany)) (1994) **[Stabilization of wheat germs by microwave heating]. Stabilisierung von Weizenkeimen durch Mikrowellenerwaermung.** *Getreide Mehl und Brot (Germany) v. 48(6) p. 18-21.* 7 graphs, 1 table; 14 ref. German. (AGRIS 95-104771).

4989 Kokelaar, JJ.; Prins, A. (1995) **SURFACE RHEOLOGICAL PROPERTIES OF BREAD DOUGH COMPONENTS IN RELATION TO GAS BUBBLE STABILITY.** *Journal of Cereal Science. 22(1):53-61.* English. [AGR UNIV WAGENINGEN DEPT FOOD SCI PB 8129 6700 EV WAGENINGEN NETHERLANDS].

The surface theological properties of dough (components) were determined in order to estimate the effect of these properties on disproportionation and coalescence of gas bubbles in bread dough. Three different systems were studied as a model for the gas-dough interface: a diluted aqueous dough dispersion, gluten and wheat lipids spread on water. The surface dilational modulus, E, and tan theta of these systems were determined as a function of frequency using a modified Langmuir trough. Values of E and tan theta found were: 35-100 mN/m and 0.7-0.2, resp., for dough dispersions, 20-45 mN/m and 0.4-0.15, resp., for gluten, and 20-90 mN/m and 1.3-0.1, resp., for lipids in the frequency range tested at room temperature. On the assumption that the gas-dough interface is comparable either to the surface of the dough dispersions tested or to a water surface with spread gluten, it was shown that disproportionation of gas bubbles in dough can be retarded but not prevented. Wheat lipids present in the right concentration in the surface can prevent this foam stabilising mechanism to a larger extent. The surface dilational modulus as well as the surface tension during continuous expansion of dough dispersions were also determined at 45 degrees C. The surface dilational modulus of a dough dispersion at 45 degrees C was 7-25 mN/m, which was approximately 5 times smaller than at room temperature. Results of surface tension measurements during continuous expansion in a Langmuir trough showed that values for surface tension were only slightly higher than at equilibrium (ca. 2 mN/m) at 45 degrees C and at deformation rates of the surface comparable to those at oven rise. These results suggest that thin dough films at higher temperatures will be less stable than at room temperature. Implications in relation with coalescence in dough are discussed. No significant differences in surface theological properties of dough dispersions of wheats with different bread-making qualities were found in the sinusoidal oscillation tests nor in the continuous expansion tests. Surface rheological properties, therefore, appear not to be the main factor responsible for differences in baking quality amongst different wheats. (C) 1995 Academic Press Limited [References: 31].

4990 Marklinder, I. (Uppsala Univ. (Sweden). Inst. foer Hushaallsvetenskap); Sundberg, B. (1992) **Barley sour doughs fermented by Lactobacillus spp. for making beta-glucan enriched bread.** Uppsala Livsmedelscentrums Rapportserie (Sweden); no. 4 p. T:15. p. T:15. English. (AGRIS 95-123714).

4991 Martinezanaya, MA.; Collar, C.; Debarber, CB. (1995) **COMPARISON OF WHEAT FLOURS FROM DIFFERENT EUROPEAN COUNTRIES IN**

MICROBIOLOGICALLY STARTED BREADMAKING PROCESSES. *Cereal Foods World. 40(9):605-610.* English. [INST AGROQUIM & TECNOL ALIMENTOS CEREALES LAB AP POSTAL 73 E-46100 BURJASSOT SPAIN].

Ten selected EU flours of different extraction rates were used in a sourdough process started with two frozen lactobacilli cultures from Lactobacillus brevis or L. plantarum. Interactions among process conditions, classification of samples according to their functional properties, and the most significant grouping variables were determined. Samples were characterized according to acidification properties, fermentative and theological characteristics of doughs, and physicochemical and sensory attributes of breads. Flour significantly influenced the majority of analytical variables. Some acidification properties and theological parameters depended on both type of flour and strain of microorganism. Three factors accounted for 70% of the variability of the data. The first factor was strongly related to sensory attributes of breads, density and texture. The second factor was mainly determined by energy in extensigraph. Finally, acidification properties of breads had the heaviest loadings in the third factor. Some flours had very distinctive characteristics and grouped separately. [References: 32].

4992 Merx, H. (Bundesanstalt fuer Getreide , Kartoffel und Fettforschung in Detmold und Muenster, Detmold (Germany)); Seibel, W.; Rabe, W.; Menden, E. (1994) **[Influence of germination parameters on the vitamin content and the microbiological quality of "Spriesskorn" (rye and wheat). Part 2: Influence of kernel moisture and germination temperature]. Einfluss von Keimungsparametern auf den Vitamingehalt und die mikrobiologische Qualitaet von Spriesskorn (Roggen und Weizen). 2. Mitt.: Einfluss der Keimgutfeuchte und der Keimtemperatur.** *Getreide Mehl und Brot (Germany) v. 48(6) p. 22-27.* 2 graphs, 4 tables; 23 ref. German. (AGRIS 95-104769).

4993 Muller, R. (1995) **FACTORS INFLUENCING THE STABILITY OF BARLEY MALT BETA-GLUCANASE DURING MASHING.** *Journal of the American Society of Brewing Chemists. 53(3):136-140.* English. [BRF INT LYTTEL HALL NUTFIELD RH1 4HY SURREY ENGLAND].

Barley malt beta-glucanase has a half-life of approximately 40 min at 45 degrees C. Three experimental procedures increased the survival of this activity to 85% under the same conditions. Addition of sodium dithionite to the mash was effective, as was reducing the pH of the cold malt slurry (to pH 2.3 for 20 min) before returning to normal mash pH (5.6) prior to heat treatment. Separation of the beta-glucanase activity from other proteins also enhanced stability. Recombination of separated fractions indicated that the inhibitory factor had a relative molecular weight of about 66, 000. This fraction did not have beta-glucanase activity but coincided with a peak of peroxidase activity that was lost during acid/base treatment. [References: 25].

4994 Oury, FX.; Rousset, M.; Berard, P.; Pluchard, P.; Doussinault, G. (1995) **BREAD-MAKING QUALITY OF WHEAT HYBRIDS - EFFECT OF HIGH MOLECULAR WEIGHT GLUTENINS IN A STATE OF HETEROZYGOTY.** *Canadian Journal of Plant Science. 75(3):633-642.* French. [INRA AMELIORAT PLANTES STN DOMAINE CROUELLE F-63039 CLERMONT FERRAND FRANCE].

Thirty-three winter wheat hybrids produced using a chemical hybridizing agent and their 27 parents were compared for bread-making quality. The F-1 was intermediate between the two parents for grain hardness, Pelshenke test and W of alveograph. Correspondence analyses and tree-based models showed strong associations between high molecular weight glutenin composition and Pelshenke or alveograph. For the Pelshenke test, the Glu-D1 encoded subunits were preponderant, and the effect of the alleles appeared additive between loci, as well as within locus. For the alveograph, Glu-B1 was the most important locus. Dominance effects appeared, involving the 7 + 8 allele associated with high values for tenacity and extensibility. [References: 33].

4995 Rahman, A.K.M.S.; Rahman, M.F.; Hossain, M.; Feroza, B.; Nath, P.K.; Hoq, M.M. (1994) **Enzymatic saccharification of wheat starch by glucoamylase from Aspergillus niger A-20 and the alcoholic fermentation of the hydrolysates by Saccharomyces cerevisiae JY.** *Bangladesh Journal of Microbiology (Bangladesh) v. 11(2) p. 103-110.* 15 ref. English. (AGRIS 95-123737).

Saccharification studies of crude glucoamylase preparations showed that the action of enzyme extract on raw starch was not significant (22.3%). At 80 Deg.C, a substantial amount of hydrolysis occurred after 72 h of incubation. It was observed that the conversion rate increased to 85% upon acid steeping. Alcoholic fermentation of saccharified wheat starch was also carried out with the ethanol producing yeast Saccharomyces cerevisiae JY. It produced 5.15% (v/v) ethanol in a medium containing 10% starch (saccharified to 8.43% fermentable sugars) at temperature 30 deg. C (pH 5.0). The conversion efficiency was 95.45%.

4996 Schwarz, PB.; Casper, HH.; Beattie, S. (1995) **FATE AND DEVELOPMENT OF NATURALLY OCCURRING FUSARIUM MYCOTOXINS DURING MALTING AND BREWING.** *Journal of the American Society of Brewing Chemists. 53(3):121-127.* English. [N DAKOTA STATE UNIV DEPT CEREAL SCI FARGO, ND 58105 USA].

There was widespread occurrence of Fusarium head blight and the mycotoxin deoxynivalenol (DON) on barley produced in Minnesota, North Dakota, and South Dakota during 1993. To study the fate of Fusarium mycotoxins during malting and brewing, five barley samples infested with Fusarium graminearum were selected from the 1993 crop in North Dakota. DON levels ranged from 4.8 to 22.5 mu g/g of barley. Zearalenone(1.5 mu g/g) and 15-acetyldeoxynivalenol (15-ADON)(2.1 mu g/g) were detected on one of the samples. Steeping generally reduced the mycotoxin level to near the estimated level of detection. However, mold growth and production of DON occured during germination. DON levels in five-day green malts represented 18-114% of that present on the original barley. The magnitude of this variation suggests differences in mold viability or in the nature of infestation between individual samples. Zearalenone and 15-ADON also increased during germination. After brewing, 80-93% of the DON present on the malt grist was detected in the beer. A small amount of DON was detected on the spent grains. Zearalenone and 15-ADON were not detected in beer; 60 and 18% respectively, of the zearalenone and 15-ADON present on the malt grist was found in the spent grains. [References: 24].

4997 Sekhon, KS.; Singh, N.; Kaur, H.; Nagi, HPS. (1995) **IMPROVING THE FUNCTIONAL AND BREAD MAKING PROPERTIES OF SPROUTED INDIAN WHEAT.** *Journal of Food Processing & Preservation. 19(2):147-160.* English. [GURU NANAK DEV UNIV DEPT FOOD SCI & TECHNOL AMRITSAR 143005 PUNJAB INDIA].

The effect of reducing dough pH to 4.2 and addition of 2-4% gluten on theological and pasting properties of sound and sprouted wheat flours are reported. Baking properties studied using "Medium Time Fermentation" and "Short Time Fermentation" methods revealed that an acceptable bread could be produced from even highly sprouted wheat by lowering the pH and adding 4% vital gluten to the flour, and using the "Short Time Fermentation Method".

4998 Shiiba, K.; Negishi, Y.; Okada, K. (1995) **DETERMINATION OF CARBOHYDRATES IN THE GLUTENIN AGGREGATIVE SUBUNIT.** *Journal of the Japanese Society for Food Science & Technology-Nippon Shokuhin Kagaku Kogaku Kaishi. 42(3):207-209.* English. [NISSHIN FLOUR MILLING CO LTD FOOD RES CTR 5-3-1 TURUGAOKA OI SAITAMA 354 JAPAN].

Using differential solubility in 70% ethanol, the polypeptide components of the reduced and cyanoethylated glutenin from the prepared dough were fractionated into three fractions (AF-1, AF-2, and AF-3). In these fractions, AF-1 was identified as an aggregative subunit of glutenin from the results of SDS-PAGE. The sugar composition of carbohydrates in AF-1 was determined by gas chromatography, which revealed the presence of arabinose, xylose, and mannose as well as glucose and galactose. The presence of arabinose and xylose as a major sugar component in AF-1 suggested a significant role for pentosan (hemicellulose component) in aggregation. However, the differences between the sugar components of AF-1 fractionated from fermented and unfermented dough were almost negligible except for decreasing the amount of glucose. [References: 9].

4999 Sissons, M.; Taylor, M.; Proudlove, M. (1995) **BARLEY MALT LIMIT DEXTRINASE - ITS EXTRACTION, HEAT STABILITY, AND ACTIVITY DURING MALTING AND MASHING.** *Journal of the American*

Society of Brewing Chemists. 53(3):104-110. English. [BRF INT LYTTEL HALL COOPERS HILL RD NUTFIELD RH1 4HY SURREY ENGLAND].

The importance of limit dextrinase in malting and brewing has been reevaluated by using a specific dyed substrate assay. Maximum activity can be extracted from malt by a relatively lengthy extraction at pH 5.0. Hammer milling improves the extraction of the enzyme, compared to roller milling. The released enzyme loses activity quickly in a mash at temperatures above 63 degrees C, but when in its bound form, the enzyme retains activity for longer. Gibberellic acid applied at relatively high rates increases the levels of the enzyme in malt after day two of germination. The kilning regime used for lager and ale malts (using the pilot facilities at BRF International) reduced the activity of the green malt by 24 and 85%, respectively. The free enzyme was more susceptible to heat inactivation. Mashing conditions that promoted release of the bound enzyme led to a significant alteration of the wort carbohydrate composition in favor of increased fermentability. [References: 25].

5000 Spaenkuch, C.; Fass, M. (1994) **[Impact milling and sifting of grain]. Trockenmahlung und Sichtung von Getreide.** *Muehle + Mischfuttertechnik (Germany) v. 49(40) p. 555.* 2 ill., 1 graph. German. (AGRIS 95-104770).

5001 Tanovic, G.; Tepavac, Dj.; Almadi, S. (Tehnoloski fakultet, Novi Sad (Yugoslavia)) (1993) **[Investigation of conditions of preprocessing of wheat for milling by cold conditioning]. Ispitivanje uslova pripreme psenice za mlevenje postupkom hladnog kondicioniranja.** *Zito hleb (Yugoslavia) v. 20(4) p. 109-118.* 10 graphs; 2 tables; 6 ref. Serbian. (AGRIS 95-123741).

5002 Thomas, KC.; Dhas, A.; Rossnagel, BG.; Ingledew, WM. (1995) **PRODUCTION OF FUEL ALCOHOL FROM HULL-LESS BARLEY BY VERY HIGH GRAVITY TECHNOLOGY.** *Cereal Chemistry. 72(4):360-364.* English. [UNIV SASKATCHEWAN DEPT APPL MICROBIOL & FOOD SCI SASKATOON SK S7N 5A8 CANADA].

Very high gravity mashes (>30 g dissolved solids per 100 ml) were prepared from an experimental hull-less barley (SB90354) and fermented with active dry yeast. A maximum ethanol concentration of 17.1% (v/v) was realized in fermented mash, and a total ethanol yield of 443 L per tonne of barley (dwb) was obtained. To prevent excess viscosity during mashing, it was necessary to hydrolyze beta-glucan in ground barley using crude preparations of beta-glucanase or Biocellulase. While both these preparations possessed an endoglucanase activity, no measurable exoglucanase activity was detected. A typical mash prepared at a water-to-grain ratio of 3:1 and without hydrolysis of beta-glucan had a viscosity of 2, 480 BU, while the viscosities of the mashes prepared after hydrolysis of beta-glucan with beta-glucanase or Biocellulase were 560 and 240 BU, respectively. Hydrolysis of beta-glucan not only reduced the viscosity of the barley mash but also released water bound and trapped by the beta-glucan gel. The free amino nitrogen (FAN) content of the barley mashes was high when compared to wheat mashes, and about 80% of this FAN was taken up by yeast. In spite of the high FAN content of the mash, an exogenously added nitrogen supplement stimulated yeast growth and fermentation. [References: 15].

5003 Tschirner, M. (1995) **[Retrospect and prospect on construction of malteries]. Rueckschau und Ausblick im Maelzereibau.** *Brauwelt (Germany) v. 135(5-6) p. 241-242.* German. (AGRIS 95-123716).

5004 Willm, C. (Ecole Nationale Superieure de Meunerie et des Industries Cerealieres, Paris (France). Chaire de Meunerie); Jollet, S. (1994) **[Milling preparation of wheat]. Preparation du ble a la mouture.** *Industries des Cereales (France) (no 86) p. 12-26.* 5 illus., 26 ref., 5 tableaux, 15 graph. French. (AGRIS 95-104765).

Q03 FOOD CONTAMINATION AND TOXICOLOGY

5005 Nakamura, N.; Kumazawa, S.; Matsunaga, T. (1995) **IN VITRO ELECTROCHEMICAL DETECTION OF WHEAT ALLERGEN USING RAT BASOPHILIC LEUKAEMIA (RBL-1) CELLS.** *Applied Microbiology & Biotechnology. 43(4):622-625.* English. [TOKYO UNIV AGR & TECHNOL DEPT BIOTECHNOL KOGANEI TOKYO 184 JAPAN].

We have investigated an electrochemical method of detecting foods that cause an allergic reaction. Rat basophilic leukaemia (RBL-1) cells were sensitized with serum from a rat that was allergic to wheat. A sample containing the protein fraction of a food was added to the cells and incubated. The cells were immobilized on a membrane filter and attached to a basal-plane pyrolytic graphite electrode. When a potential was applied in the range 0-1.0 V relative to a saturated calomel electrode, an anodic peak current appeared at around 0.33 V. This peak current, attributed to serotonin, increased with time, and the maximum current (0.5 mu A) was obtained 20-25 min of incubation. The response of the RBL-1 cells was specific to the protein fraction of wheat. The peak current increased linearly with increasing protein concentration in the range of 0.01-0.5 mu g ml(-1). These results suggest that the concentration of the protein bringing about the allergic reaction can be determined by cyclic voltammetry within 25 min. This method is more sensitive than the conventional skin tests. [References: 11].

5006 Rosenkvist, H.; Hansen, A. (1995) **CONTAMINATION PROFILES AND CHARACTERISATION OF BACILLUS SPECIES IN WHEAT BREAD AND RAW MATERIALS FOR BREAD PRODUCTION.** *International Journal of Food Microbiology. 26(3):353-363.* English. [ROYAL VET & AGR UNIV CTR FOOD RES HOWITZVEJ 13 DK-2000 FREDERIKSBERG DENMARK].

The Bacillus counts in white and wholemeal wheat leaves produced without preservatives or sour dough were consistently 10(6) cfu/g after two days of storage at ambient summer temperatures (25-30 degrees C). Identified species were B. subtilis (70%), B. licheniformis (24%), B. pumilus (2%) and B. cereus (2%). The dominance of B. subtilis in bread could be explained by the higher resistance to heat of this species as determined by inoculation studies. Among 14 species isolated from retail bread and wheat grains, B. subtilis was the only species associated with ropiness. Samples of raw materials, particularly bran, seeds and oat products, contained low levels (10(0)-10(2) cfu/g) of Bacillus spores, surviving a heat treatment (100 degrees C, 10 min) corresponding to a baking process. Even low spore levels in raw materials with the frequently isolated species, B. licheniformis (49%) and B. subtilis (10%), resulted in 10(7) Bacillus per g bread crumb in two days as determined by test bakings. The results indicate a need for controlling growth of Bacillus in bread. [References: 28].

5007 Schildbach, R. (1995) **[Influence of the natural environmental factors on contamination of malting barley with fungi]. Einfluss natuerlicher Umweltfaktoren auf die Schimmelpilz Kontamination an Braugerste.** *Brauwelt (Germany) v. 135(5-6) p. 211-212, 214, 216-218.* 4 ill., 6 tables. German. (AGRIS 95-124255).

Q04 FOOD COMPOSITION

5008 Annemueller, G.; Bauch, T.; Nagel, R.; Boehm, W. (1995) **[The level of endo-beta-glucanase - a scale for "cytolytic power" of malt?]. Der Endo-beta-Glucanasegehalt - ein Mass fuer die "cytolytische Kraft" des Malzes?** *Brauwelt (Germany) v. 135(5-6) p. 206-207, 210.* 1 ill., 1 table; 13 ref. German. (AGRIS 95-124558).

5009 Badamchian, M.; Spangelo, B.L.; Bao, Y.; Hagiwara, Y.; Hagiwara, H.; Ueyama, H.; Goldstein, A.L. (1994) **Isolation of a vitamin E analog from a green barley leaf extract that stimulates release of prolactin and growth hormone from rat anterior pituitary cells in vitro.** *The Journal of nutritional biochemistry (USA) v. 5(3) p. 145-150.* references. English. (AGRIS 95-105196).

We have previously reported that green barley leaf extract, a dried extract of young green barley leaves that is widely used in Japan and other countries as a nutritional supplement, contains a molecule(s) that enhances the release of growth hormone and/or prolactin from rat anterior pituitary cells in vitro. Using reverse-phase high performance liquid chromatography and fast atom bombardnent-mass spectrometry (FAB-MS) we have now isolated and chemically characterized the molecule possessing this neuroendocrine activity. The molecule is alpha-tocopherol succinate, an analog of alpha-tocopherol or vitamin E. This is the first report documenting a role for this vitamin E analog on pituitary endocrine release.

5010 Bargale, PC.; Irudayaraj, J.; Marquis, B. (1995) **STUDIES ON RHEOLOGICAL BEHAVIOUR OF CANOLA AND WHEAT.** *Journal of Agricultural Engineering Research. 61(4):267-274.* English. [UNIV SASKATCHEWAN DEPT AGR & BIORESOURCE ENGN SASKATOON SK S7N 5A9 CANADA].

The modulus of elasticity, maximum compressive contact stress and the force relaxation behaviour of single wheat and canola (rapeseed) kernels at different moisture contents were determined. In the force relaxation experiments, the effect of different deformation rates and strain levels were examined. Results indicated that the modulus of elasticity and maximum compressive contact stress decreased linearly with increase in moisture content of the grains, A three-term Maxwell model was found to adequately describe the force relaxation behaviour of both grain kernels when compared with one- and two-term models. The optimum number of terms in the model was determined based on the criteria of maximum relative difference (less than or equal to 5%). The moisture content was found to have a significant effect on stress relaxation behaviour of both grains. (C) 1995 Silsoe Research Institute [References: 26].

5011 Bhumbla, V.K.; Singh, Y. (1993) **Resistance model to predict thermal conductivity of bulk grain.** *American Society of Agricultural Engineers. Meeting (USA); no. 936045 20 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 95-124576).

5012 Cai, W.; Diosady, LL.; Rubin, LJ. (1995) **DEGRADATION OF WHEAT STARCH IN A TWIN-SCREW EXTRUDER.** *Journal of Food Engineering. 26(3):289-300.* English. [UNIV TORONTO DEPT CHEM ENGN & APPL CHEM TORONTO ON M5S 1A4 CANADA].

Wheat starch was processed in a Baker-Perkins MPF-50D co-rotating twin-screw extruder, at moisture contents of 25% and 30%, screw speeds of 200 rpm and 300 rpm, feed rate of 30 kg/h, and barrel temperature settings of 100, 120, 140 and 160 degrees C. High performance size exclusion chromatography was used to determine the extent of degradation of starch along the extruder channel. Starch degradation was found to take place in the cooking zone. The first-order mechano-degradation models, which were developed for a single-screw extruder were extended to the twin-screw extruder and improved by including a more accurate description of gelatinization in the model. The degradation is described by the equation: chi = 1 - [1 - exp[-k(0) exp (- (Delta E(0) - beta tau)/(RT)) t]] [1 - exp(-k tau t + B)] where tau is the average shear stress, t is the mean residence time of the melt in the active zone of the screw channel, Delta E(0) is the activation energy, R is the ideal gas constant, beta is the activation volume, k and k(0) are experimental constants. [References: 17].

5013 Chasseray, P. (Ecole Nationale Superieure de Meunerie et des Industries Cerealieres, Paris (France). Sciences Biologiques et Biotechnologique des Cereales) (1994) **[Technological characteristics of the 94 wheat yield and of the flour [Soissons, Sideral, Thesee, Scipion, Forby, Recital, Rossini]]. Les caracteristiques technologiques des bles de la recolte 94 et de leur farine [Soissons, Sideral, Thesee, Scipion, Forby, Recital, Rossini].** 45. Journees de l'ENSMIC; Paris (France); 24-25 Nov 1994. *Industries des Cereales (France) (no 90) p. 12-18.* 13 graph. French. (AGRIS 95-105205).

5014 Cleemput, G.; Vanoort, M.; Hessing, M.; Bergmans, MEF.; Gruppen, H.; Grobet, PJ.; Delcour, JA. (1995) **VARIATION IN THE DEGREE OF D-XYLOSE SUBSTITUTION IN ARABINOXYLANS EXTRACTED FROM A EUROPEAN WHEAT FLOUR.** *Journal of Cereal Science. 22(1):73-84.* English. [TNO NUTR & FOOD RES INST DIV BIOCHEM & GENE TECHNOL POB 360 3700 AJ ZEIST NETHERLANDS].

Total water-extractable arabinoxylan from flour of the European bread making wheat cultivar Camp Remy was fractionated by ethanol precipitation. Both H-1-NMR spectroscopy and methylation analysis of the isolated arabinoxylan fractions showed wide variation in the degree of xylose substitution. More highly substituted arabinoxylan fractions were precipitated at higher ethanol concentrations. At ethanol concentrations of 10-30% (v/v) (1 --> 3), (1 --> 4)-beta-D-glucan co-precipitated with arabinoxylan. Re-precipitation of the polymer mixture resulted in a partial separation of the arabinoxylan from the mixture. Arabinoxylans with wide structural variation were also isolated by extraction of the flour with aqueous ethanol solutions of decreasing concentations. By this isolation technique, fractions with the highest degree of substitution were extracted with the most concentrated (50%) ethanolic solutions. The range of structural variation in the fractions was quite similar for both isolation methods. A decrease in the proportion of unsubstituted xylose residues occurred concomitantly with a decrease in the proportion of monosubstituted xylose units and with an increase in the proportion of disubstituted xylose units. An increase in the proportion of paired disubstituted xylose units as the arabinose to xylose ratio of the arabinoxylan fractions increased, and the presence of monosubstituted xylose residues next to disubstituted xylose residues in the highly substituted fractions, were illustrated by H-1-NMR spectroscopy. Methylation analysis indicated an increase in traces of side chains of arabinose residues and in the levels of O-2 substituted xylose residues as the arabinose to xylose ratio increased. (C) 1995 Academic Press Limited [References: 33].

5015 Dexter, J.E. (Commission Canadienne des Graines, Winnipeg (Canada). Laboratoire de Recherche); Martin, D.G. (1994) **[Influence of the protein content on the milling properties of CWRS wheat [Canadian Western Red Spring]]. L'influence de la teneur en proteines sur le comportement en mouture du ble CWRS [ble de printemps roux de l'Ouest canadien].** *Industries des Cereales (France) (no 86) p. 3-11.* 39 ref., 7 tableaux. French. (AGRIS 95-105203).

5016 Doerfner, H. H. (Ulmer Spatz, Neu Ulm (Germany)) (1994) **[Grain crop 1994. Pleasant results]. Getreideernte 1994. Erfreuliche Ergebnisse.** *Brot und Backwaren (Germany) v. 42(10) p. 26-30.* 2 ill., 12 graphs, 2 tables. German. (AGRIS 95-105309).

5017 Dozet, I. (Tehnoloski fakultet, Novi Sad (Yugoslavia)); Psodorov, Dj.; Sekulic, R. (1993) **[The possibility of control of cereals and cereal products by methods based on near-infrared spectroscopy principles]. Mogucnosti kontrole zita i proizvoda od zita metodama zasnovanim na principima bliske infracrvene spektroskopije.** *Zito hleb (Yugoslavia) v. 20(3) p. 63-69.* 4 graphs; 2 tables; 12 ref. Serbian. (AGRIS 95-124586).

5018 Faurot, AL.; Saulnier, L.; Berot, S.; Popineau, Y.; Petit, MD.; Rouau, X.; Thibault, JF. (1995) **LARGE SCALE ISOLATION OF WATER-SOLUBLE AND WATER-INSOLUBLE PENTOSANS FROM WHEAT FLOUR.** *Food Science & Technology-Lebensmittel-Wissenschaft & Technologie. 28(4):436-441.* English. [INRA CTR RECH AGROALIMENTAIRES BP 1627 F-44316 NANTES 03 FRANCE].

A procedure has been developed which allows the isolation of enriched pentosan fractions from wheat flour. The procedure is based on mixing flour and water (50 kg/150L). After centrifugation the supernatant is heat-treated and then concentrated by crossflow ultrafiltration to give water-soluble pentosans, whereas the insoluble residue is treated with Alcalase and then Termamyl to give water-insoluble pentosans. Starting from 50 kg of flour from three different varieties (Soissons, Thesee, Apollo), water-soluble and water-insoluble pentosans containing respectively 100-200 g of water-soluble and 250-350 g of water-insoluble arabinoxylans, were prepared within 2 d. Water-soluble pentosans are constituted of approx. 40% arabinoxylans and are contaminated by proteins, whereas water-insoluble pentosans are composed of arabinoxylans (ca. 30%) and are contaminated by residual starch (ca 40%). Enrichment factors in arabinoxylans ranged from 98 to 66 for water-soluble and 27 to 19 for water-insoluble pentosans as compared with initial flour. (C) 1995 Academic Press Limited [References: 16].

5019 Foutz, T.L.; Thompson, S.A.; Evans, M.D. *(1992)* **Comparison of loading response of packed grain and individual kernels.** *Paper - American Society of Agricultural Engineers (USA); no. 924014 25 p.* references. Paper presented at the "1992 International Summer Meeting sponsored by The American Society of Agricultural Engineers," June 21-24, 1992, Charlotte, North Carolina. English. (AGRIS 95-105215).

5020 Freund, K. (Technische Univ. Berlin (Germany). Fachbereich Lebensmittelwissenschaft und Biotechnologie); Handreck, B. (1994)

[Breakage condition of different wheat cultivars during compression]. Bruchverhalten verschiedener Weizensorten bei Druckbelastung. *Getreide Mehl und Brot (Germany) v. 48(6) p. 8-12.* 5 graphs, 1 table; 5 ref. German. (AGRIS 95-105210).

5021 Heron, S. (Institut Universitaire de Technologie d'Orsay (France)); Tchapla, A. (1994) **[Using a molecular interaction model to optimize the separation of fatty triglycerides in CLPI [Wheat germ, borage, black currant pips, grape pips, lard, foie gras]]. Utilisation d'un modele d'interaction moleculaire pour l'optimisation de la separation des triglycerides de corps gras en CLPI [Germe de ble, bourrache, pepin de cassis, pepin de raisin, saindoux, foie gras].** *Oleagineux Corps Gras Lipides (France) v. 1(3) p. 219-228.* 28 ref., 6 graph. French. (AGRIS 95-105386).

5022 Huebner, FR.; Nelsen, TC.; Bietz, JA. (1995) **DIFFERENCES AMONG GLIADINS FROM SPRING AND WINTER WHEAT CULTIVARS.** *Cereal Chemistry. 72(4):341-343.* English. [USDA ARS NATL CTR AGR UTILIZAT RES 1815 N UNIV ST PEORIA, IL 61604 USA].

Accurate and reliable classification of U.S. hard red spring (HRS) and hard red winter (HRW) wheats is necessary in marketing. Such classification is difficult because kernels from many of the cultivars that are grown, even of different classes, may have similar phenotypes. Some studies suggest that HRS wheats contain more of the most hydrophobic gliadins than do HRW wheats. We used reversed-phase high-performance liquid chromatography to quantitatively analyze gliadins from HRS and HRW wheats. Diversity among cultivars was large, but statistical analyses revealed significant differences for certain gliadins. Unlike previous reports, however, we observed no difference in amount of the latest eluting gliadins between HRS and HRW wheats. When HRS wheats were grown in California and Arizona as winter wheats, the total protein content was lower, and their gliadin compositions resembled those of the HRW wheats grown in normal HRW environments. These results suggest that quantitative differences in protein compositions of HRS and HRW wheats are primarily due to genetic and environmental, rather than to true class-related differences. [References: 12].

5023 Jakovljevic, J. (Tehnoloski fakultet, Novi Sad (Yugoslavia)); Sekulic, R.; Martinovic, A. (1993) **[Evaluation of the domestic [Yugoslav] wheat cultivars for starch processing: Part 2]. Ispitivanje tehnoloskih vrednosti domacih [jugoslovenskih] sorti psenice za skrobarsku proizvodnju: 2. deo.** *Zito hleb (Yugoslavia) v. 20(5) p. 153-160.* 10 tables; 10 ref. Serbian. (AGRIS 95-124588).

In this examination working out the method for capability and convenience of wheat varieties for starch processing included the treatment which "simulates" the industrial production of starch and gluten, the way of controling the purity of mechanically separated fractions and finally the account of relevant data. Notions like extractability of dry matter and extractability of protein are the basis for the grading model for evaluation of wheat varieties for starch processing. The method showed good reproducibility by getting basic fractions and the capability for differing the convenient wheat varieties from the others. The influence of climate factors has to be checked during next two harvests.

5024 Jakovljevic, J.; Sekulic, R.; Martinovic, A. (Tehnoloski fakulet, Novi Sad (Yugoslavia)) (1993) **[Evaluation of the domestic [Yugoslav] wheat cultivars for starch processing, part 1]. Ispitivanje tehnoloske vrednosti domacih [jugoslovenskih] sorti psenice za skrobarsku preradu, 1. deo.** *Zito hleb (Yugoslavia) v. 20(4) p. 101-108.* 9 tables; 13 ref. Serbian. (AGRIS 95-124587).

In introduction, actual trends in world and Yugoslav industrial wheat starch production are shown. By reason of the increase of wheat starch production and greater demands for wheat gluten, forming of criteria for evaluating the capability of wheat varieties for starch processing is proposed. The comparison to the approaches for variety classification according to the needs of milling and baking industry is made. First results of evaluating the usefulness of basic parameters in starch processing, that is the utilization of dry matter and gluten, are given. Wheat varieties among eight evaluated, which predicted their capability for starch processing, are pointed out.

5025 Javanainen, P.; Linko, YY. (1995) **LACTIC ACID FERMENTATION ON BARLEY FLOUR WITHOUT ADDITIONAL NUTRIENTS.** *Biotechnology Techniques. 9(8):543-548.* English. [HELSINKI UNIV TECHNOL DEPT CHEM ENGN BIOTECHNOL & FOOD ENGN LAB SF-02150 ESPOO FINLAND].

An amylolytic lactic acid producing Lactobacillus amylovorus produced 36 g/l of lactic acid in mixed cultures with L. casei without additional nutrients at 37 degrees C in 48 h, when barley flour concentration was 180 g/l (appr. 108 g/l starch) and barley malt quantity 0.8% of flour weight. This represented an improvement of up to 20% in comparison to the fermentation with L. amylovorus or L. casei alone. By simultaneous glucoamylase addition lactic acid production yield was about doubled. With L. casei the lactic acid yield was from 580 g in 72 h to 667 g in 144 h per kg barley flour. [References: 11].

5026 Kamath, S.; Puri, V.M.; Manbeck, H.B. (1992) **Flow properties of wheat flour at various moisture contents using the Jenike cell.** *Paper - American Society of Agricultural Engineers (USA); no. 924020 16 p.* references. Paper presented at the "1992 International Summer Meeting sponsored by The American Society of Agricultural Engineers, " June 21-24, 1992, Charlotte, North Carolina. English. (AGRIS 95-105313).

5027 Kang, Y.S.; Steele, J.L.; Spillman, C.K.; Chung, D.S. (1992) **Physical properties of wheat.** *Paper - American Society of Agricultural Engineers (USA); no. 92-6554 10 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 95-124574).

5028 Kieper, R.J.; Zhang, Q.; Britton, M.G. (1992) **Interactions between wheat and corrugated steel surface.** *Paper - American Society of Agricultural Engineers (USA); no. 924017 10 p.* references. Paper presented at the "1992 International Summer Meeting sponsored by The American Society of Agricultural Engineers, " June 21-24, 1992, Charlotte, North Carolina. English. (AGRIS 95-105213).

5029 Kim, B.J.; Suh, D.Y.; Suh, H.S. (Rural Development Administration, Milyang (Korea Republic). Yeongnam Crop Experiment Station) (1994) **Comparisons between micro-kjeldahl and near infrared reflectance spectroscopy for protein content analysis of malting barley grain.** *Korean Journal of Crop Science (Korea Republic) v. 39(5) p. 489-494.* 4 illus.; 5 tables; 16 ref. Korean. (AGRIS 95-124818).

5030 Klotz, D. (Inst. fuer Getreideverarbeitung GmbH, Bergholz Rehbruecke (Germany)); Lehrack, A. (1994) **[Bread cereal crop 1994 in Brandenburg]. Brotgetreideernte 94 im Land Brandenburg.** *Deutsche Baecker Zeitung (Germany) v. 81(42) p. 20-22.* 1 graph, 4 tables. German. (AGRIS 95-105211).

5031 Labuschagne, MT.; Vandeventer, CS. (1995) **THE EFFECT OF GLU-B1 HIGH MOLECULAR WEIGHT GLUTENIN SUBUNITS ON BISCUIT-MAKING QUALITY OF WHEAT.** *Euphytica. 83(3):193-197.* English. [UNIV ORANGE FREE STATE DEPT PLANT BREEDING POB 339 BLOEMFONTEIN SOUTH AFRICA].

The aim of this study was to assess the effect of specific Glu-B1 HMW-GS on biscuit-making quality. Three soft spring wheat cultivars with the same Glu-A1 and Glu-D1 HMW-GS, but different Glu-B1 HMW-GS were used in crosses. F-2:4 derived lines were developed from these crosses. Glu-B1 HMW-GS 6 + 8 and 17 + 18; and 7 + 9 and 17 + 18 were compared. Lines with HMW-GS 6 + 8 versus those with HMW-GS 17 + 18 had a higher flour protein- and alveograph P/L ratio, shorter mixograph mixing time, more vitreous. kernels, and a lower alveograph distensibility and strength (all values significant at $p = 0.05$); Lines with HMW-GS 7 + 9 compared to those with 17 + 18 showed significant differences for flour extraction and biscuit diameter. The presence of HMW-GS 17 + 18 was significantly correlated with several biscuit-making quality characteristics in the Dirkwin/Zaragosa F-2:4 lines but not in the Waverley/Zaragosa F-2:4 lines, therefore the effect of HMW-GS 17 + 18 was modified by the genetic background in which they were expressed. [References: 14].

5032 Lawrence, K.C.; Nelson, S.O. (1993) **Density-independent electrical moisture measurements in bulk wheat samples.** *American Society of Agricultural Engineers. Meeting (USA); no. 933078 12 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 95-124583).

5033 Mendoza Perez, Doricela (1993) **[Estimation of bread quality in 20 wheat (Triticum aestivum L.) lines under rainfed conditions]. Estimacion de la calidad panadera de 20 lineas de trigos (Triticum aestivum L.) temporaleros.** Universidad Autonoma Chapingo (Mexico). Departamento de Fitotecnia. 36 p. Spanish. (AGRIS 95-105206).

5034 Muller, S.; Wieser, H. (1995) **THE LOCATION OF DISULPHIDE BONDS IN ALPHA-TYPE GLIADINS.** *Journal of Cereal Science. 22(1):21-27.* English. [DEUTSCH FORSCH ANSTALT LEBENSMITTELCHEM LICHTENBERGSTR 4 D-85748 GARCHING GERMANY].

Gliadin prepared from gluten of the cultivar Rektor by extraction with 70% (v/v) aqueous ethanol adjusted to pH 5.5 was separated by RP-HPLC. Amongst 23 components obtained, two alpha-type gliadins (alpha 3- and alpha 8-gliadin) were selected for the determination of disulphide bonds. After both proteins were digested with thermolysin, differential RP-HPLC (chromatography prior to and after reduction of disulphide bonds) was used for the detection of cystine peptides. Two cystine peptides from alpha 3-gliadin and three cystine peptides from alpha 8-gliadin were isolated by RP-HPLC. The resulting peptides were reduced and alkylated with 4-vinylpyridine, separated by RP-HPLC and their amino acid sequences determined. The cystine peptides from both alpha-type gliadins had similar structures, and the corresponding fragments had homologous sequences. One cystine peptide of each gliadin was composed of three fragments linked by two disulphide bonds. The second cystine peptide consisted of two fragments linked by one disulphide bond. The third cystine peptide derived from alpha 8-gliadin was different from the second peptide in one position of the sequences (glutamic acid instead of glutamine). Comparing complete sequences of alpha-type gliadins described in the literature, the cystine peptides from alpha 3- and alpha 8-gliadins were identical with corresponding sequences of clones A1235 and A212, respectively(11). The structures of the cystine peptides analysed indicate one intramolecular disulphide bond within domain III of alpha-type gliadins and two disulphide bonds between domains III and V. The linkages found correspond to homologous linkages determined far low M(r) subunits of glutenin and glutenin-bound gamma-type gliadins(6). Obviously, these intramolecular disulphide bonds are not linked randomly, but are strongly directed. (C) 1995 Academic Press Limited [References: 14].

5035 Preston, KR.; Morgan, BC.; Dexter, JE. (1995) **INFLUENCE OF PROTEIN SEGREGATION ON THE QUALITY CHARACTERISTICS OF BIGGAR AND GENESIS CANADA PRAIRIE SPRING WHEAT.** *Canadian Journal of Plant Science. 75(3):599-604.* English. [CANADIAN GRAIN COMMISS GRAIN RES LAB 1404-303 MAIN ST WINNIPEG MB R3C 3G8 CANADA].

The influence of protein segregation on the quality characteristics of Biggar, a Canada Prairie Spring Red wheat cultivar, and Genesis, a Canada Prairie Spring White wheat cultivar has been evaluated using 1989, 1990 and 1991 harvest survey samples. Protein segregation had a strong influence on most physical parameters and processing characteristics all three years. However, the dopes of the regression equations of protein content to values for each quality test exhibited heterogeneity between years. For both wheat cultivars, test weight and kernel weight gave consistently high negative correlations to protein content, indicative of less kernel plumpness at high protein content. The resulting lower endosperm content of the higher protein segregates was reflected by higher wheat ash content, and lower flour yield in 2 of the 3 yr. The milling performance of the higher protein segregates was further diminished by consistently high positive correlations of flour grade color to protein content, indicative of diminishing flour brightness. Flour ash content was not related to protein content for either cultivar, indicating that endosperm ash content was not related to protein content. Flour starch damage, which is directly related to kernel hardness, decreased in response to protein content for both cultivars, with the effect being more pronounced for Genesis. Farinograph dough development time, stability and water absorption increased with increasing protein content. Baking water absorption and loaf volume showed highly significant positive correlations with protein content. However, baking strength index, a measure of loaf volume on a constant protein basis, decreased with increasing protein content for both cultivars in 2 of the 3 yr. These data demonstrate that marketing Canada Prairie Spring wheat at specified protein levels would facilitate specific customer requirements by optimizing particular quality attributes and improving uniformity between commercial shipments. [References: 38].

5036 Saric, M. (Tehnoloski fakultet, Novi Sad (Yugoslavia)); Kaludjerski, G.; Borojevic, S. (1993) **[Capability of some test baking methods for evaluation of specificity of wheat varieties and their blend values]. Podobnost nekih nacina probnog pecenja za ocenu specificnosti sorti [psenice] i njihove mesavinske vrednosti.** *Zito hleb (Yugoslavia) v. 20(1-2) p. 3-11.* 10 tables; 5 ref. Serbian. (AGRIS 95-124584).

5037 Saric, M. (Tehnoloski fakultet, Novi Sad (Yugoslavia)); Kaludjerski, G.; Borojevic, S. (1993) **[The possibility for estimation of the wheat blend effect on the basis of rheological properties of dough]. Mogucnost procene mesavinskog efekta psenice na osnovu reoloskih osobina testa.** *Zito hleb (Yugoslavia) v. 20(1-2) p. 13-19.* 12 graphs; 12 ref. Serbian. (AGRIS 95-124585).

5038 Savelli, RA.; Padua, TS.; Dobrzycki, JH.; Calvidal, J. (1995) **TEXTURAL AND MICROSTRUCTURAL ANALYSES OF FRENCH BREAD CONTAINING SWEET POTATO FLOUR.** *Pesquisa Agropecuaria Brasileira. 30(3):395-400.* Spanish. [ESAL LAVRAS MG BRAZIL].

French bread had its wheat flour content partially substituted by several levels of sweet potato flour (0, 5, 10, 15 and 20%). After being processed following traditional methods of bread manufacture, its deformation degree, elasticity and structure were evaluated through texturometry optical microscopy. The results show the degree of deformation and elasticity in the microstructure of the bread depending on the flour substitution level.

5039 Seibel, W. (Bundesanstalt fuer Getreide , Kartoffel und Fettforschung in Detmold und Muenster, Detmold (Germany)); Gerstenkorn, P. (1994) **[The quality of German wheat crop 1994. Part 1: Quantitative and qualitative results in the Federal Republic of Germany]. Die Qualitaet der deutschen Weizenernte 1994. 1. Teil: Quantitatives und qualitatives Ergebnis in Bund und Laendern.** *Muehle + Mischfuttertechnik (Germany) v. 49(41) p. 563-568.* 17 graphs, 5 tables; 3 ref. German. (AGRIS 95-105208).

5040 Seibel, W. (Bundesanstalt fuer Getreide , Kartoffel und Fettforschung in Detmold und Muenster, Detmold (Germany)); Zwingelberg, H. (1994) **[The quality of German wheat crop 1994. Part 2: Milling and baking characteristics of wheat varieties of the Federal Republic of Germany and imported French and Hungarian wheats]. Die Qualitaet der deutschen Weizenernte 1994. 2. Teil: Mahl- und Backqualitaet von Weizensorten und -partien aus der Bundesrepublik Deutschland und importierten franzoesischen und ungarischen Weizen.** *Muehle + Mischfuttertechnik (Germany) v. 49(41) p. 568-571.* 16 tables; 6 ref. German. (AGRIS 95-105209).

5041 Thompson, S.A. (1993) **Variation in the bulk density of high-moisture wheat and corn.** *American Society of Agricultural Engineers. Meeting (USA); no. 934507 18 p.* references. Paper presented at the "1993 International Winter Meeting sponsored by The American Society of Agricultural Engineers," December 12-17, 1993, Chicago, Illinois. English. (AGRIS 95-124581).

5042 Tilley, KA.; Schofield, JD. (1995) **DETECTION OF PHOSPHOTYROSINE IN THE HIGH M(R) SUBUNITS OF WHEAT GLUTENIN.** *Journal of Cereal Science. 22(1):17-19.* English. [UNIV READING DEPT FOOD SCI & TECHNOL POB 226 READING RG6 2AP BERKS ENGLAND].

5043 Vani, B.; Zayas, JF. (1995) **WHEAT GERM PROTEIN FLOUR SOLUBILITY AND WATER RETENTION.** *Journal of Food Science.*

60(4):845-848. English. [KANSAS STATE UNIV DEPT FOODS & NUTR MANHATTAN, KS 66506 USA].

The effects of pH and temperature on water retention (WR), protein solubility (PS), and total solubility (TS) of defatted wheat germ protein flour (WGPF) were studied in a model system. PS of WGPF was compared with those of corn germ protein flour (CGPF), soy flour (SF), nonfat dried milk (NFDM), and egg white powder (EWP) at 1-8%. WR increased with increase in pH from 4 to 8. Maximum WR occurred at 70 degrees C, and slight Variations were observed between 5 and 30 degrees C. PS and TS increased with increases in pH and temperature. PS of proteins was in the order of NFDM > EWP > SF > CGPF=WGPF. The results showed the potential for usage of WGPF in comminuted meats, beef patties, breads, cakes, and cookies. [References: 55].

Q05 FOOD ADDITIVES

5044 Adams, W. (Chemische Fabrik Gruenau GmbH, Illertissen (Germany)); Funke, A.; Goelitz, H.; Doerfner, H. H. (1994) **[Baking effects of DATEM-types with flours from wheat cultivars]. Backwirksamkeit verschiedener DATEM-Typen auf sortenreinen Mehlen.** *Getreide Mehl und Brot (Germany) v. 48(6) p. 31-35.* 7 graphs, 5 tables. German. (AGRIS 95-105503).

5045 Zimmermann, R. (1994) **[Modification of rheological properties of wheat doughs using different additives]. Zur Veraenderung der rheologischen Eigenschaften von Weizenteig durch Zusaetze.** *Getreide Mehl und Brot (Germany) v. 48(6) p. 13-17.* 8 graphs, 3 tables; 4 ref. German. (AGRIS 95-105502).

Q52 FEED PROCESSING AND PRESERVATION

5046 Alomar C, Daniel; Latrille L, Luis; Ferrando F, Alberto; Anrique G, Rene; Balocchi L, Oscar; Fuchslocher P, Rita; Quezada B, Alejandro (Universidad Austral de Chile, Valdivia (Chile). Fac. de Ciencias Agrarias) (1993) **[Effect of adding hay, sugar beet pulp or wheat bran to a direct cut pasture silage in southern Chile]. Efecto de adicionar heno, coseta o afrechillo de trigo a un ensilaje de pradera permanente de corte directo en la decima region.** *Agro Sur (Chile) v. 21(1) p. 52-58.* 15 ref. Spanish. (AGRIS 95-105515).

5047 Williams, BA.; Vanderpeel, AFB.; Beer, H.; Tamminga, S. (1995) **THE USE OF CUMULATIVE GAS PRODUCTION TO DETERMINE THE EFFECT OF STEAM EXPLOSION ON THE FERMENTABILITY OF TWO SUBSTRATES WITH DIFFERENT CELL WALL QUALITY.** *Journal of the Science of Food & Agriculture. 69(1):33-39.* English. [AGR UNIV WAGENINGEN DEPT ANIM NUTR MARIJKEWEG 40 6709 PG WAGENINGEN NETHERLANDS].

Wheat straw, ammoniated wheat straw and corn silage, were treated under constant conditions of steam explosion, differing only in the time for which the material was subjected to steam, prior to discharge from the vessel. The three feedstuffs were evaluated for their fermentability by measurement of cumulative gas production with time. Fermentation curves were fitted to a model and the resultant parameters tested for significant differences by an analysis of variance (using the Tukey test). Neutral detergent fibre and neutral detergent insoluble nitrogen were analysed before and after both steam treatment and fermentation. The substrates were significantly different from each other in terms of gas production parameters. Generally, there was an effect of the time of steaming, which tended to be negative in the case of straw. A significant interaction was found between type of substrate and duration of steam injection. The results suggest that steam explosion, under these conditions, was not a practical approach as a pretreatment for animal feed particularly of poor quality cell walls such as those from wheat straw. [References: 35].

Q54 FEED COMPOSITION

5048 Fan, MZ.; Sauer, WC. (1995) **DETERMINATION OF APPARENT ILEAL AMINO ACID DIGESTIBILITY IN BARLEY AND CANOLA MEAL FOR PIGS WITH THE DIRECT, DIFFERENCE, AND REGRESSION METHODS.** *Journal of Animal Science. 73(8):2364-2374.* English. [UNIV ALBERTA DEPT ANIM SCI EDMONTON AB T6G 2P5 CANADA].

Three methods were evaluated for the determination of apparent ileal digestibility values of amino acids in feedstuffs with a low protein (barley, 10.2% CP) and a high protein content (canola meal, 38.2% CP). Five barrows, average initial BW 40 kg, were fitted with a simple T-cannula at the distal ileum and fed five diets according to a 5 x 5 Latin square design. Diet 1 contained 42.7% canola meal providing the sole source of dietary amino acids. Diets 2, 3, and 4 contained three graded levels of barley (22.5, 45.0, and 67.5%, respectively) and three graded levels of canola meal (36.6, 30.5, and 24.4%, respectively). Diet 5 contained 90.0% barley, which provided the sole source of dietary amino acids. With the exception of diet 5, the diets were formulated to contain 16% CP. Chromic oxide (.4%) was included as the digestibility marker. The pigs were fed twice daily, equal amounts, at 0800 and 2000. The dietary allowance was 1, 800 g/ d. Each experimental. period comprised 8 d. Ileal digesta were collected for a total of 24 h during d 7 and 8 at 2-h intervals. Apparent ileal digestibility values of amino acids in barley were determined with the direct method from diet 5, with the difference method from diets 2, 3, and 4, and with the regression method from diets 1, 2, 3, and 4. Digestibility values of amino acids in canola meal were determined with the direct method from diet 1, with the difference method from diets 2, 3, and 4, and with the regression method from diets 1, 2, 3, and 4. There were no differences ($P > .05$) in the digestibility values in barley between the difference method when barley was included at 67.5% in the diet and the regression method. However, the digestibility values were lower ($P < .05$ or $< .10$) when these were determined with the direct method. There were no differences ($P > .05$) in the digestibility values of canola meal when these were determined with the direct method, the difference method, when canola meal was included at 36.6% in the diet, and the regression method. In conclusion, amino acid digestibility values in feedstuffs with a low protein content should be determined with the difference or regression methods rather than with the direct method. Amino acid digestibility values in feedstuffs with a high protein content can be determined with either method. [References: 24].

5049 Hap, I.; Pelikan, M. (1995) **TECHNOLOGICAL QUALITY OF SOME TRITICALE VARIETIES.** *Rostlinna Vyroba. 41(8):351-356.* Czech. [MENDELOVA ZEMEDELSKA & LESNICKA UNIV ZEMEDELSKA 1 CR-61300 BRNO CZECH REPUBLIC].

Indicators of feeding value (crude protein, ashes, fibre, fat, nitrogen-free extract, metabolizable energy - ME) and indicators of technological quality (bulk density, percentage of full grains, mesh fraction, 1 000-kernel weight, experimental grinding, starch content, gluten content, swelling capacity of gluten, number of reduction, sedimentation value and theological properties). The highest protein content was found out in the Ru-Dagro DH variety (12.39%), the lowest one in the Modus variety (10.77%). MEs content ranged from 13.83 to 14.27 MJ and MEp from 12.77 to 12.96 MJ; what is higher ME (metabolizable energy) than in rye and comparable with wheat. Newly evaluated varieties (Modus, Ru-Dagro DH, SG-U-170) are fully comparable, in some indicators feeding values are significantly better than currently used varieties. The Modus variety (with high TKW 54.98 g, and high percentage of full grains 95.54%) is a relatively most suitable variety for processing in mills. Total yield ranged in tested varieties between 60.3 and 64.4%. The highest content of gluten in meal was found in the variety Ru-Dagro DH (19.74%). Average values of swelling capacity (4.25 ml), sedimentation values (19.78 ml) and numbers of reduction (86 s) were very low. A poor baking quality of evaluated varieties was also confirmed by evaluation on valorigraph: short time of development of dough (45 to 65 s), short time of dough stability, high reduction of consistence (260 to 320 VJ). The SG-U-170 variety seemed to be relatively most suitable of all investigated varieties, and the Modus variety as the least suitable. For production of traditional baking products the use of triticale can be recommended on the basis of the results acquired only in mixtures with high-quality wheat flour or as an eventual replacement of rye flour.

5050 Jeroch, H. (Martin Luther Universitaet, Halle Wittenberg, Halle (Germany). Inst. fuer Tierernaehrung); Daenicke, S. (1994) **[Barley poultry feeds]. Gerste als Gefluegelfutter.** *Muehle + Mischfuttertechnik (Germany) v. 131(48) p. 667-670.* 11 tables. German. (AGRIS 95-105548).

5051 Mannerkorpi, P.; Brandt, M. (1995) **FEEDING VALUE OF BARLEY PLANTS AS RELATED TO STAGE OF MATURITY .2. IN VIVO DIGESTIBILITY AND VOLUNTARY INTAKE OF SILAGE.** *Acta Agriculturae Scandinavica Section A-Animal Science. 45(3):153-158.* English. [AGR RES CTR INST ANIM PROD SF-31600 JOKIOINEN FINLAND].

The aim of this study was to evaluate the energetic feeding potential of whole-crop barley silage as related to maturation in order to determine an optimum maturity stage to harvest. Barley was harvested in transition to dough stage (TD), middle/end of dough stage (MED) and yellow ripeness (YR), and ensiled. Digestibility of dietary organic matter (OM) by sheep fed at maintenance decreased by 3.5% as a result of maturation (silage mean 67%). In contrast, voluntary intake of OM increased by 5.5% from TD to MED (diet mean 28.5 g kg(-1) body weight). The energetic feeding potential, calculated as intake of digestible OM, was not affected by stage of maturity. The main neutral cell wall sugars were beta-glucose (23%) and xylose (12%) followed by arabinose (2%). The digestibilities of all cell wall fractions except beta-glucose decreased with advancing maturity. The strongest effect was observed for mannose followed by arabinose, galactose and xylose. It is recommended to harvest barley for whole-crop silage at MED. [References: 33].

5052 Mannerkorpi, P.; Taube, F. (1995) **FEEDING VALUE OF BARLEY PLANTS AS RELATED TO STAGE OF MATURITY .1. MORPHOLOGICAL AND CHEMICAL COMPOSITION AND IN VITRO DIGESTIBILITY.** *Acta Agriculturae Scandinavica Section A-Animal Science. 45(3):147-152.* English. [AGR RES CTR INST ANIM PROD SF-31600 JOKIOINEN FINLAND].

A field study was conducted to determine the effects of stage of maturity on the yield, morphological composition and nutritive value of whole barley plants and their ear, internodial leaf blade, leaf sheath and stem fractions in order to determine an optimum stage of maturity to harvest. Organic matter digestibility and crude protein content decreased rapidly until grain filling at maturity code 55 (range of study, 2-digit codes 37 to 91) and then remained fairly constant. The yield of digestible organic matter increased with increasing stage of maturity (2nd degree polynomial function, $P < 0.001$). The study at three stages of maturity (code 83, 86 and 91) showed an increase in the ear fraction (48 to 57% plant dry matter, DM) and a decrease in plant remainder fraction (whole plant without ear, NOEAR) (52 to 43%) due to maturation. However, within NOEAR the leaf sheath fraction remained unchanged and both the leaf blade and stem fractions decreased. Generally, the highest nutritive value was measured for leaf blade and sheath in the uppermost internode, but for stem in either the upper most internode or lowest internode. The most distinct maturation effects were observed in the upper leaf blades. Nutrient translocation in context with changes in internodial nutrient concentration during maturation is discussed. The present results indicate, that whole-crop barley should be harvested at yellow ripeness (code 91). [References: 20].

5053 Stewart, D.; Wilson, HM.; Hendra, PJ.; Morrison, IM. (1995) **FOURIER-TRANSFORM INFRARED AND RAMAN SPECTROSCOPIC STUDY OF BIOCHEMICAL AND CHEMICAL TREATMENTS OF OAK WOOD (QUERCUS RUBRA) AND BARLEY (HORDEUM VULGARE) STRAW.** *Journal of Agricultural & Food Chemistry. 43(8):2219-2225.* English. [SCOTTISH *CROP RES INST* IND CORPS UNIT DUNDEE DD2 5DA SCOTLAND].

FT-IR and Raman spectroscopies were used to investigate the changes in composition and structure of oak wood and barley straw that had been subject to chemical and biochemical treatments. The samples were also analyzed gravimetrically for residual neutral sugar composition and lignin and uronic acid content. The spectroscopic techniques provided complementary information. Changes in the relative proportions of crystalline and amorphous cellulose accompanying (bio)chemical treatment were best reflected in the Raman and DRIFT spectra, respectively. Delignification of both tissues produces bands in the Raman spectra consistent with the lignin oxidation. Treatment of both types of raw material with aqueous acid produced highly colored residues resulting in Raman spectra of limited use due to problems with fluorescence. However, the DRIFT spectra of these tissues did not suffer this problem and provided information on the behavior of lignin (hydrolysis and repolymerization) and the noncellulosic polysaccharides (hydrolysis) in acid conditions. The decreased fluorescence in the Raman spectra of barley straw after alkali extraction is suggested to be due to the removal of the covalently bound cinnamic acids. [References: 54].

5054 Vaculova, K. (Zemedelsky Vyzkumny Ustav, Kromeriz (Czech Republic)) (1995) **[Nutritive value of cereal grain for monogastric animals]. Krmna hodnota zrna obilovin pro monogastry.** *Obilnarske Listy (Czech Republic) v. 3(1) p. 11-12.* 2 graphs, 2 tables. Czech. (AGRIS 95-125170).

Q55 FEED ADDITIVES

5055 Kasapovic, S. (Poljoprivredni fakultet, Novi Sad (Yugoslavia). Institut za stocarstvo); Cobic, T.; Antov, G.; Oracic, F. (1994) **[Use of molasses as an additive in ensiling of green barley and peas and oats mixture]. Koriscenje melase kao aditiva kod siliranja zelenog jecma i mesavine graska sa ovsem.** *Savremena poljoprivreda (Yugoslavia) v. 42(5) p. 129-137.* 7 tables; 9 ref. Serbian. (AGRIS 95-125225).

Addition of molasses has been performed in ensiling of green barley and mixture of peas and oats. In relation to the green mass, there occurred the lowering of NEL and NEM in the silages studied. Apart from the lowering of NEL and NEM there was a lowering of crude digestible proteins in the mixture of peas and oats too. Molasses, as an additive for ensiling, favourably affected the quality of silage, according to Flieg, and caused decrease of contents of butyric acid, ammonia N and pH. Barley silages had higher losses of nutrients, except the digestible crude proteins, than those of peas and oats silages, and the addition of molasses lowered the losses of nutrient.

S20 PHYSIOLOGY OF HUMAN NUTRITION

5056 Granfeldt, Y. (Lund Univ. (Sweden). Kemiska Inst.) (1994) **Food factors affecting metabolic responses to cereal products.** Lund Univ. (Sweden). Lund Univ. Bibliography: p. 47-55. A dissertation bound with a collection of 6 repints. 55 p. LUTKDH/TKIN--94/1009-SE. English. (AGRIS 95-105819).

S30 DIET AND DIET-RELATED DISEASES

5057 Aman, P.; Pettersson, D.; Zhang, JX.; Tidehag, P.; Hallmans, G. (1995) **STARCH AND DIETARY FIBER COMPONENTS ARE EXCRETED AND DEGRADED TO VARIABLE EXTENTS IN ILEOSTOMY SUBJECTS CONSUMING MIXED DIETS WITH WHEAT OR OAT-BRAN BREAD.** *Journal of Nutrition. 125(9):2341-2347.* English. [SWEDISH UNIV AGR SCI DEPT FOOD SCI S-75007 UPPSALA SWEDEN].

The study was conducted to determine if the excretion of starch and dietary fiber components varies in ileostomy subjects consuming diets high or low in dietary fiber. Excretion of starch, enzyme-resistant starch and dietary fiber components was studied in nine human subjects with ileostomies, who consumed (in a crossover design) a wheat bread-based diet (daily intake 274 g starch, 2.4 g enzyme-resistant starch and 14.4 g total dietary fiber) and a high fiber diet based on oat-bran bread (daily intake 243 g starch, 2.7 g enzyme-resistant starch and 40.2 g total dietary fiber). Food and excreta were collected on d 3 and 17. No significant differences in excretion of starch, enzyme-resistant starch or dietary fiber components were found on these 2 d in each dietary period. When subjects consumed the wheat bread-based diet they excreted (mean +/-SD) 3.3 +/- 1.7 g starch and 2.4 +/- 0.4 g enzyme-resistant starch daily, whereas when consuming the oat bran-based diet they excreted 4.5 +/- 3.1 g starch and 2.5 +/- 0.4 g enzyme-resistant starch. During both dietary periods subjects excreted significantly greater amounts of certain dietary fiber polysaccharide residues (fucose, galactose and uronic acid) than they ingested. This indicates a contribution of endogenous and/or microbial material to the dietary fiber value in ileostomy effluents. However, significantly less excretion of some dietary fiber polysaccharide residues, especially glucose residues, during the oat-bran bread-based dietary period was also noted. This was presumably caused by a degradation of mixed-linked (1, 3), (1, 4)-beta-D-glucans. [References: 30].

5058 Hill, M.J. (European Cancer Prevention Organization, 41 London Street, Andover, Hampshire SP10 2NJ (United Kingdom)) (1994) **Dietary anticarcinogens and cancer.** *Epidemiology of diet and cancer. Hill, M.J.;*

Giacosa, A.; Caygill, C.P.J. (eds.) p. 347-451. Ellis Horwood Limited. 21 ref. English. (AGRIS 95-106000).

5059 McIntosh, G.H.; Jorgensen, L.; Royle, P. (CSIRO Division of Human Nutrition, Kintore Avenue, Adelaide, S.A. 5000 (Australia)) (1993) **Insoluble dietary fibre rich fractions from barley protect rats from intestinal cancer.** *Food and cancer prevention: chemical and biological aspects. Waldron, K.W.; Johnson, I.T.; Fenwick, G.R. (eds.) p. 362-363.* Royal Society of Chemistry (RSC). 1 ref. English. (AGRIS 95-105996).

5060 Sherman, L.R.; Zimmerman, M.R. (1993) **Ergotism and its effects on society and religion.** *Journal of nutritional immunology (USA) v. 2(3) p. 127-136.* references. English. (AGRIS 95-126065).

U10 MATHEMATICAL AND STATISTICAL METHODS

5061 Recio, B. (Universidad Politecnica de Madrid (Espana)); Rubio, F. (1994) **A global crop production decision support system for wheat in Navarra.** Investigacion Agraria. Produccion y Proteccion Vegetales (Espana) p. 61-71. INIA. 1 tab. p. 61-71. English. (AGRIS 95-126713).

U30 RESEARCH METHODS

5062 Hoisington, D.; Gonzalez de Leon, D. (Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). Biotechnology Program) (1994) **An overview of applied biotechnology research at CIMMYT.** *The subtropical, midaltitude, and highland maize subprogram. Bjarnason, M. (ed.) (Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico, DF (Mexico). Maize Program) p. 82-84.* CIMMYT. English. (AGRIS 95-106562).

5063 Kiniry, JR.; Major, DJ.; Izaurralde, RC.; Williams, JR.; Gassman, PW.; Morrison, M.; Bergentine, R.; Zentner, RP. (1995) **EPIC MODEL PARAMETERS FOR CEREAL, OILSEED, AND FORAGE CROPS IN THE NORTHERN GREAT PLAINS REGION.** *Canadian Journal of Plant Science. 75(3):679-688.* English. [USDA ARS TEMPLE, TX 76503 USA].

The EPIC computer simulation model has potential for assessing agricultural management scenarios in the northern Great Plains region of the United States and western Canada. The objectives of this study were to develop parameters for economically important crop and forage species grown in these regions and to determine whether EPIC could use these parameters to reasonably simulate yields. Parameters for leaf-area development, temperature responses, biomass growth and partitioning, and nutrient concentrations were derived from data in the literature for spring canola, wheat, barley, maize and six forage species. Because of the growing importance of canola in Canada and the United States, much emphasis was placed on deriving its parameters. With these inputs, EPIC reasonably simulated forage and crop yields in six locations and canola yields in four locations. The model should provide reasonable simulations for a wide range of applications throughout these regions. [References: 58].

U40 SURVEYING METHODS

5064 Hamar, D.; Ferencz, C.; Lichtenberger, J.; Tarcsai, G.; Ferenczarkos, I. (1995) **FIELD ESTIMATION FOR CORN AND WHEAT IN THE HUNGARIAN GREAT PLAIN USING SATELLITE REMOTE SENSING DATA.** *Novenytermeles. 44(2):147-160.* Hungarian. [LORAND EOTVOS UNIV HUNGARIAN ACAD SCI GEOPHYS RES GRP LUDOVIKA TER 2 H-1083 BUDAPEST HUNGARY].

Models to forecast crop yields using remotely sensed satellite data are intensively studied worldwide. After reviewing the experience gained by other researchers in this field, we selected procedures which might be suitable for the estimation of corn and wheat yields in Hungary. In order to study the relationship between various remotely sensed spectral data (and their combinations) and the actually measured final yields we investigeted archived agricultural and Landsat MSS spectral data for 1984. A linear relation has been sought and found between the yield data for 47 corn and 55 wheat fields in Hajdu-Bihar county and various weighed and summed spectral quantities. Among the vegetation indices derived from satellite data and corrected for atmospheric effects the most promising were the spectral indicies sensitive to the green biomass. The latter, summed over a certain period in the growing season, exhibited a correlation coefficient of 66-93 percent, depending on the crop and the period of summation. Using the best models we performed regional yield estimation studies. Taking half of the crop fields used in the study we determined the yield estimation model and by its use we estimated the overall crop production for the other half of the fields. The error of the overall corn production estimated by this way turned to be less than 2 percent. The model developed for winter wheat proved to be sensitive to wheat variety.

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