Saville

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OAT NEWSLETTER

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Sponsored by the National Oat Conference

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OAT NEWSLETTER

Volume 34

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April 1984

Sponsored by the National Oat Conference

Marr D. Simons, Editor

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I. NOTES

NEWSLETTER ANNOUNCEMENTS AND INSTRUCTIONS

Persons interested in oat improvement, production, marketing, or utilization are invited to contribute to the Oat Newsletter. Previous issues may be used as a guide, but remember that the Newsletter is not a formal publication, and therefore that manuscripts suitable or planned for formal publication are not desired.

Specifically, but not exclusively, we would like to have:

1. Notes on acreage, production, varieties, diseases, etc., especially if they represent changing or unusual situations.

2. Information on new or tentative oat cultivars with descriptions. We want to include an adequate cultivar description, including disease reactions and full pedigree if possible.

3. Articles of sufficient interest to be used as feature articles.

4. Descriptions of new equipment and techniques you have found useful.

Material may be submitted at any time during the year. Please send all contributions and correspondence to:

Marr D. Simons
Dept. of Plant Pathology, ISU
Ames, Iowa 50011, USA

Please Do Not Cite The Oat Newsletter in Published Bibliographies

Citation of articles or reports in the Newsletter is a cause for concern. The policy of the Newsletter, as laid down by the oat workers themselves, is that this letter is to serve as an informal means of communication and exchange of views and materials between those engaged in oat improvement and utilization. Material that fits a normal journal pattern is not wanted. Each year's call for material emphasizes this point. Oat workers do not want a newsletter that would in any way discourage informality, the expression of opinions, preliminary reports, and so forth.

Certain agencies require approval of material before it is published. Their criteria for approval of material that goes into the Newsletter are different from criteria for published material. Abuse of this informal relationship by secondary citation could well choke off the submission of information. One suggestion that may help: If there is material in the Newsletter that is needed for an article, contact the author. If he is willing, cite him rather than the Newsletter. This can be handled by the phrase "personal communication."

AMERICAN OAT WORKERS' CONFERENCE COMMITTEE, 1982-85

Executive Committee

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R. A. Forsberg, Past Chairman
H. G. Marshall, Secretary
M. D. Simons, Editor, Oat Newsletter

Representatives

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M. S. McMullen, Central Region, U.S.A.
F. C. Collins, Southern
D. M. Wesenberg, Western
H. G. Marshall, U.S. Dept. Agriculture
J. P. Dubuc, Eastern Canada
R.I.H. McKenzie, Western Canada
V. D. Burrows, Agriculture Canada
M. Navarro-Franco, Mexico
G. E. Shaner, Representative at large
C. F. Murphy, Representative at large
S. H. Weaver, Representative at large

WASHINGTON, D. C. VISIT OF THE NATIONAL OATS IMPROVEMENT COUNCIL

D. J. Schrickel
The Quaker Oats Company
Chicago, Illinois

During the week of February 6, 1984, the Council visited Washington, D.C. to inform members of the U.S. Senate and House of Representatives of the need for Oats Research and the National Germplasm System.

The Council also met with administrators of the Agricultural Research Service, U.S.D.A. to assure their recognition of the needs of oats researchers and the milling oats industry.

REPORT OF THE QUAKER OATS COMPANY SPONSORED OATS RESEARCH

S. H. Weaver
The Quaker Oats Company
Chicago, Illinois

The primary objectives of the Grain Research and Development Department are 1) to insure the availability of raw commodities (primarily oats and white corn) for purchase and 2) to make crop production estimates in terms of quantity and quality. The F'85 oats research budget will be about $375,000. These research funds enable research scientists at twelve U.S. universities to breed oats and develop graduate level research projects.

If these research funds were not available, only four universities would have oats research programs. Perhaps some of the higher yielding varieties available to farmers today would not have been developed at all. Thus far, adequate acreage of oats are planted to supply the food and feed markets. The objective of Quaker is to stimulate and fund this research to develop new varieties, train graduate students, and increase the basic knowledge required to advance plant breeding programs.

NORTH CENTRAL OAT WORKERS FIELD DAY

Oat workers at Winnipeg, Manitoba, Canada hosted the 1983 Field Day on August 4 and 5. About 30 people from the North-Central United States and the Prairie Provinces of Canada attended. The meeting included a tour of oat research plots at Winnipeg and informal discussions of various facets of oat improvement.

SECOND INTERNATIONAL OAT RESEARCH WORKSHOP

The First International Oat Research Workshop was held at Pennsylvania State University in 1982, and at that time it was decided that a Second International Workshop would be held at Aberystwyth, Wales, U.K., in 1985. The workshop will be held at University College of Wales, Aberystwyth, July 15-18, 1985. The organizers, Dudley Lawes and Hugh Thomas, are planning a program with format similar to the meeting held at Pennsylvania State, but hope to have more time for discussion. Lodging and meals will be available at the University Halls of Residence, and costs to participants should be relatively low. Anyone who is interested in this Workshop, and has not submitted a statement of such interest, should contact either Dudley Lawes or Hugh Thomas at the Welsh Plant Breeding Station, Plas Gogerddan, Aberystwyth, Dyfed, U.K.

1984 MEETING OF NCR-15 COMMITTEE

Michael S. McMullen, Chairman
Gregory E. Shaner, Secretary pro tem

The 1984 meeting of the NCR-15 Committee was held at Ames, Iowa, February 6-7. The session on Monday, February 6 was devoted to reports of oats research and other activities related to oats improvement. The topics are shown below. Abstracts appear under appropriate headings elsewhere in the Newsletter.

Opening remarks - M. McMullen
Welcome - John P. Mahlstede, Director, Iowa Experiment Station

Increasing cereal yield with genes from wild species. K. J. Frey, Iowa State University.

Performance of backcross-derived lines from Avena fatua. J. B. Stevens and M. A. Brinkman, University of Wisconsin

Comparisons of the yield and protein production of oats (A. sativa) with other Avena species, barley (Hordeum vulgare) and wheat (Triticum aestivum). R. W. Welch, Welsh Plant Breeding Station, Aberystwyth, U.K.

Current status of virulence in the crown rust population in relation to available resistance in oats. M. D. Simons and L. J. Michel, USDA-ARS and Iowa State University.

The combination of multiple crown rust resistance genes from Avena sterilis in single cultivated-type lines of oats. L. J. Michel and M. D. Simons, USDA-ARS and Iowa State University.

Gene pyramiding in hexaploid oats. R. A. Forsberg, University of Wisconsin.

Evaluation and introgression of some wild oats genes and cytoplasms. H. Rines, USDA-ARS and University of Minnesota.

Stem rust resistance in the UMOPN, UEOPN, and IOPN. P. Rothman, USDA-ARS and University of Minnesota.

Review of recurrent selection program - lessons learned. D. D. Stuthman, University of Minnesota.

Microcomputer software package for plant breeding and agronomy. R. Freed, Michigan State University.

International Oats Nursery. M. A. Brinkman, University of Wisconsin.

Discussion of hulless oats improvement. D. J. Schrickel, The Quaker Oats Company.

Oats improvement program. B. Roskens, The Quaker Oats Company.

A guide to quality oat production. L. L. Hardman and D. D. Stuthman, University of Minnesota.

Report of the Quaker Oats Company-sponsored oats research. S. H. Weaver, The Quaker Oats Company.

Report of Washington, D.C. visitation sessions. D. J. Schrickel, The Quaker Oats Company.

Support for travel to the International Oats Workers Conference, Wales. K. J. Frey, Iowa State University.

Status of oats germplasm enhancement program. D. D. Stuthman, University of Minnesota.

UMOPN and UEOPN. H. Rines, USDA-ARS and University of Minnesota

Following the Monday meeting session, the conference participants were provided an excellent banquet, which was followed by an enlightening and entertaining illustrated lecture on the ethnobotany of rice, given by Dr. T. T. Chang of the International Rice Research Institute.

The business meeting of the NCR-15 Committee was held on Tuesday, February 7. Chairman McMullen presided.

There was a general discussion about gene deployment for control of rusts of oats. Marr Simons reviewed the theoretical basis for this control strategy. Texas, Iowa, and Manitoba have been cooperating in this scheme for several years and it was suggested that it was appropriate for members of NCR-15 to discuss the feasibility of applying this strategy over a broader area. While there seemed to be general agreement as to the worthiness of the strategy, there were some reservations about the practicality of its application. Deployment based on genes by Pc designation might be unduly restrictive to the release of new oat varieties because of the extra work required to determine the genetic control of new sources of resistance that a breeder might have used and whether these genes are unique. Deployment based on resistance sources might overcome this restriction. Moreover, there may be useful genes that show additive or modifying effects, and that do not lend themselves to the Pc designation because they do not exert a clear enough effect alone, that would be very difficult to uniquely deploy. It was also observed that this incompleteness in our knowledge of crown rust resistance is not likely to be quickly remedied because there are so few oat workers, and most of these have breeding and research responsibilities in addition to crown rust resistance. Finally it was observed that the notorious ability of Puccinia coronata to overcome resistance may abate as breeders draw on a larger pool of resistance genes. Many years ago virtually all oat breeders in North America were working with the same one or two genes, but this has changed greatly as more germplasm from Avena sterilis and other Avena species has found its way into various breeding programs. Finally, Matt Moore observed that slow-rusting might profitably be employed for control of crown rust.

State Reports

Illinois - Five acres of 75-5860 were multiplied last year, but because of mixture, the crop was discarded. This year a new increase will be made from 200 lb of reserve seed. This line has good resistance to crown rust and smut and fair resistance to BYD. It yields as well as Ogle, but is earlier. It has white kernels, is awnless, has good test weight, and low protein. It is short, but does not stand well, which would be the only reason for not releasing it. The other possible release is 75-1056, which has good resistance to crown rust and better resistance to BYD than 75-5860. It is susceptible to smut. It is higher in protein than 75-5860, but lower in test weight. It has Ogle maturity.

Indiana - Indiana is considering release of 72288B1-3-4-3, which has been in the UMOPN for the past 3 years. It would be a replacement for Noble with better crown rust resistance, derived from the X434-1-1 parent. Oat acreage in Indiana increased dramatically in 1983 and led to a shortage of seed. Most of these oats were sown on PIK acreage however, and were not harvested.

Iowa - A new multiline named Webster is being released. It has a Lang background (two backcrosses) and contains at least nine different genes for crown rust resistance, eight from A. sterilis and one from A. sativa. In the absence of crown rust it yields about the same as lang, but is 1 lb heavier in test weight, a valuable consideration for Iowa oat producers. Foundation seed will be produced in the spring of 1984. Limited quantities of breeders' seed will be available for testing. The variety stands very well, despite being 9 inches taller than Stout.

Michigan - Heritage and Ogle are widely grown. Three lines, each about 75% Heritage, are being evaluated.

Minnesota - A February 1985 release is being contemplated for 79229, derived from a Lyon/Dal cross. It yields 2-3 bu/A better than Lyon, but not as well as Ogle (what does?), and is late maturing. It has high protein, good test weight, and is resistant to smut and crown rust. Line 80116, which has been evaluated in the UEOPN, is being considered for release in February 1986. It contains 50% Noble and is very early. It has good yielding ability, excellent straw strength and is resistant to smut. Crown rust reactions are variable but generally good except in the Wisconsin buckthorn nursery. It may be attractive for alfalfa establishment, but should be a good grain producer in its own right.

Nebraska - Nebraska has had no oats breeding program for several years. Ogle and Larry are the leading varieties. IL 75-5860 has performed well, especially with respect to test weight, which is an important consideration for Nebraska oats producers.

North Dakota - There were 1.26 million acres of oats produced in 1983. Leading varieties were Otana, Kelsey, Fidler, and Moore. Line 77-61-311 was released as Pierce in 1983; 78376 will be released as Steele in 1984. Steele carries Pg13, Pc38, and Pc39, it is earlier than Fidler and has better test weight.

South Dakota - The SD 74358-06 line will be released this spring with the name 'Kelly'. This line was derived from a Dal/Nodaway 70 cross and has been tested in UEOPN. It is essentially an improved Nodaway 70 being early, tall, white hulled, and having high test weight. Crown rust resistance and straw strength are better than in Nodaway 70.

Wisconsin - Line X4024-7 has been released as Centennial. It will be grown on farms for the first time this spring BYD is a serious problem in Wisconsin and Marsh Brinkman is devoting considerable effort to the problem. From 80- to 90 thousand acres of oats were cut for silage this past year. Silage composed of oats and peas seems to be a very nutritious feed for dairy cattle. Marsh Brinkman requested that anyone with hulless oats submit them to him for testing in the International Oat Nursery.

Manitoba - The final increase of Dumont will be made this year. There are 100,000 bushels available from the 1983 production. Dumont should become a major variety in Manitoba and replace Fidler. It carries Pc38 and Pc39, which in combination give complete protection against the known races of P. coronata in North America. In accordance with the gene deployment plan discussed earlier, these genes should be reserved for use in the northern third of the Puccinia path.

Quaker Oats - Quaker is interested in conducting a milling test on any oat line contemplated for release. Five pound samples of grain can be sent to the following address for evaluation. Results of the test will be sent to the breeder.

John Stuart Research Labs
617 West Main Street
Barrington, IL 60010
Attn: Mr. Marvin Lenz

Darrell Wesenberg multipled 25 lines of hulless oats from China at Aberdeen last year. Seed for testing can be obtained from him.

Report of the Resolutions Committee
Resolution:

Whereas the NCR-15 Oat Workers Conference was convened at Iowa State University on February 6 and 7, 1984, and,

Whereas the hosts for the Conference were Iowa State University, Ken Frey, Marr Simons and their staffs and,

Whereas the conference attendees were highly pleased and gratified by their cordial treatment,

Therefore be it resolved that the NCR-15 Oat Workers Conference express their thanks to their hosts and enter this resolution into the minutes of the business meeting this 7th day of February 1984.

Charles Brown and Don Schrickel, Resolutions Committee

Charles Brown said that he had received inquiries from a Canadian company concerning rights to license Ogle oats in Canada, presumably on an exclusive basis. Ogle is not a protected variety, and Charlie wondered if anyone present at the meeting could offer any helpful guidance in this matter. None was offered.

Field Day

The summer field day will be held in Ames, Iowa on or about July 1, 1984. It will be a one-day meeting.

Election of Officers

The nomination committee put forward the name of Marshall Brinkman for the office of secretary of NCR-15. The nomination was approved unanimously. The current secretary, Dale Reeves, automatically assumes the chair of NCR-15.

Administrative Report

Administrative advisor Warren Sahs mentioned that the FY 85 budget would include an increase of 33 million dollars for the USDA Competitive Grants program. Most of this increase would be specified for biotechnology research.

Oats Monograph

Howard Rines reported on the progress of the Oats Monograph Feasibility Committee of the American Society of Agronomy. The original monograph was published in 1961. The committee concluded that there has been enough new information published on oats to warrant a revision. Although the market for an oats monograph is not large, the committee believes it is large enough to justify publication. The committee is now in the process of identifying editors and authors. If any member of NCR-15 has suggestions regarding this project, send them to Howard for possible inclusion in the committee's report to ASA.

This report concluded the business meeting of NCR-15.

AVAILABILITY OF COMPLETE SETS OF CEREAL NEWSLETTERS

Dr. Irvin M. Atkins has complete sets of the newsletters for oats, barley, and wheat. He is no longer active in cereal breeding, and will "sell, give, or loan these newsletters to some deserving individual or organization". Anyone who is interested should contact Dr. Atkins at 521A West 15th Street, Hereford, TX 79045.

II. CONTRIBUTIONS FROM THE UNITED STATES

The Quaker Oats Company
Oats Improvement Program
by
A. Bruce Roskens

The Oats Improvement Program is beginning its 21st year, and Quaker is very proud of its success story. Ever since its inception, the objective of this program has been to encourage the profitable production of milling quality oats by FFA members and producers in their communities.

The main goal has always been up-to-date education of profitable milling oats production through new variety promotion, management suggestions, and marketing ideas. The management skills we promote are: adapted varieties, good cultural practices, adequate fertility, and use of pesticides when needed.

This past year, we had 695 students enter from 111 schools in North Dakota, South Dakota, Minnesota and Iowa. Poor yields, as well as fewer acres, reduced our cash award prizes from over $8,300 in 1982 to $6,681 in 1983, but the educational value remained high as evidenced by our high completion percentage.

A vital part of the program is the summer project visits. Representatives from Quaker try to personally visit each project and visit with the project participants. This enables the student to learn more about Quaker and ask questions about oats production. Quaker gains by seeing first-hand the condition and potential of the crop.

An important part of these visits, of course, is the chance to visit with the student's parents and to learn as well as exchange oats production information from them. These are the people who are producing the oats in our major drawing area, and it is important ot maintain clear and open communcations with them.

Our main concern, certainly, is with the best quality grain possible, but we also discuss other factors of oats production, including straw production, which is very important to the livestock producer. On many farms, this is a prime on-farm use of the oats crop.

We cannot buy all of the oats the students produce due to transportation costs and distances involved. However, we do want to see the producer and student get top returns to that they continue to produce oats in the future. In the fall, we host several banquets throughout the four-state regaion, honoring all the cash award winners, their parents, and their vo-ag instructors. The price and thanks that these young people exhibit when they receive their cash award and plaques is very rewarding to everyone. Our program is not only a step in the education of the student in oats production, but also in the training of the student in taking price in themselves and their work.

Along with the cash awards, plaques and presentations, Quaker awards a $1,000 scholardship to one student in each of the four states who completed at least two years of the contest and who is a high school senior planning on entering college and majoring in some area of agriculture. Although Quaker probably does not achieve an immediate pay-back in terms of products sold or grain purchased, we feel that this program is one of the best vehicles available to attain some very real goals. For instance, the varieties of milling oats developed by the breeders and institutions receive considerable publicity and exposure to prime oats producers through this program.

We feel that a program such as this is the best way to get new technology working in the country.

OATS IN FOREIGN TRADE

Donald J. Schrickel

From one to one and a half million metric tonnes of oats are exported/imported throughout the world each year. The trade for the years 1977 through 1981 for selected countries is shown below:

OATS - FOREIGN TRADE
SELECTED COUNTRIES

IMPORTS

	1977	1978	1979	1980	1981
			(thousand metric tonnes)		
Japan	169.3	142.7	207.0	177.4	113.8
Belgium	75.3	65.0	71.4	60.0	52.5
E. Germany	6.1	106.0	200.0	111.0	37.0
W. Germany	337.8	293.6	109.4	107.2	83.9
Italy	152.1	143.2	118.0	118.3	57.5
Poland	67.6	126.0	110.0	125.1	39.8
United Kingdom	43.7	20.7	66.3	24.7	8.0
USSR	24.0	13.0	108.7	258.0	239.0
Total	875.9	910.2	990.8	981.7	631.5
All Others	497.5	443.6	456.4	345.5	337.5
World	1373.4	1353.8	1447.2	1327.2	969.0

EXPORTS

	1977	1978	1979	1980	1981
			(thousand metric tonnes)		
Canada	324.4	83.4	62.7	220.2	81.4
United States	127.9	167.0	35.2	75.7	94.7
Argentina	178.8	337.4	82.9	61.9	126.5
France	100.9	226.2	351.6	291.7	186.5
E. Germany	40.0	95.0	122.4	125.0	121.0
Holland	79.6	27.8	65.8	39.1	31.5
Sweden	4.5	185.1	290.8	282.3	274.5
Australia	364.3	217.8	289.5	472.3	195.7
Total	1220.4	1339.7	1300.9	1568.2	1111.8
All Others	326.4	102.5	63.0	48.5	72.4
World	1546.8	1442.2	1363.9	1616.7	1184.2

One would expect the total imports and exports to balance each year, but due to reporting periods not being standard and growing seasons varying, there are some differences.

It is interesting to note that East Germany is both a rather large importer and exporter. My observation would be that they might import from the West and export to Russia. In 1983-84, I know of oats imported into the United States from Sweden, Finland, and Canada. This seems rather unusual but obviously U.S.A. was the best market for these countries.

NEW INTEREST IN HULL-LESS OATS

D. J. Schrickel
The Quaker Oats Company
Chicago, Illinois

Hull-less (naked oats) are of interest to the livestock feeders because of higher energy than conventional oats (with hulls). The milling industry generally prefers conventional oats because they store better and groats are protected from contamination. However, a new interest is now being expressed by the milling industry if these undesirable characteristics can be overcome.

CEREAL PROTEIN QUALITY: FUNCTIONAL VS/AND NUTRITIONAL CHARACTERISTICS

O. K. Chung and Y. Pomeranz
U.S. Grain Marketing Research Laboratory, ARS, USDA
Manhattan, Kansas, U.S.A.

Proteins in cereals can be evaluated from the standpoint of nutritional value and functional properties. Both protein contents and quality affect that evaluation. An increase in protein contents is associated with an increase in nutritional value, even when that increase is accompanied by a decrease in biological value, change in protein distribution within the kernel, and reduction in protein contents in refined milled products. From a functional standpoint, high protein contents is generally desirable in foods consumed with no or little milling, i.e. oat groats or corn meal, or their processing products, or in production of leavened bread, or alimentary pastes, or in specialty products in which sensory attributes are protein-dependent. Low protein is desirable in malting barleys and in production of pastry. Effects of low and high protein contents on functional properties can be modified by changing protein composition.

Reference: Cereal Foods World 28:543. 1983.

GRAIN STRUCTURE AND END-USE PROPERTIES

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Practical implications of grain structure relate to every step from grain development and production through marketing to processing, utilization, and consumption. The structure and adherence of the hulls may contribute to protection of grain during germination or malting and protection against insect infestations. Germ retention during threshing and separation during processing depend on the germ structure and location in the kernel. The subaleurone and central endosperm layers differ in cell size, shape, and structure and in composition, especially with regard to protein contents and quality. The main factors in grain hardness are the intrinsic hardness of the main components, the strength of interaction within the cell, and the interaction of individual cells to produce overall grain structure.

Differences in grain structure are expressed in differences in composition, gradients of components in grain tissues, and end-use properties. Those differences have important nutritional implications. New microscopic methods to determine grain structure, composition, and end-use properties have the potential of contributing to improved nutritional quality and utilization of cereals by modifying-restructuring grain morphology through classical plant breeding and genetic engineering.

Reference: Food Microstructure, Vol. 1. 1982. pp. 107-124.

ERGOSTEROL, ERGOSTA-4,6,8(14),22-TETRAEN-3-ONE, ERGOSTEROL PEROXIDE, AND CHITIN IN ERGOTY BARLEY, RYE, AND OTHER GRASSES

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Ergosterol, ergosta-4,6,8(14),22-tetraen-3-one (ETO), ergosterol peroxide (EP), and chitin contents in ergot sclerotia ranged from 204 to 827, 0.74 to 5.6, 41 to 152, and 8210 to 9020 µg/g, respectively, in cereal grains and grasses. Ergosterol and chitin contents of ergot sclerotia were high compared to those of ergot-free grain, and removal of ergot sclerotia from grain kernels leaves behind only background levels of ergosterol. Ergot contamination increased the ergosterol content significantly more than the chitin content of the grain. Maximum ergot contamination allowed by U.S. Grain Standards is 0.1% by weight in some grains (barley and oats) and 0.3% in others (rye and wheat). Only at or above the 0.3% allowed ergot level would increases in ergosterol contents become significant. Ergosterol, ETO, EP, and chitin are components of other fungi besides Claviceps spp.

Reference: J. Agr. Food Chem. 31:1036-1038. 1983.

Evaluation and Introgression of Genes and Cytoplasms from Wild Oats

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Methods are being developed for identifying, evaluating, and introgressing wild oat genes and cytoplasms which have potential value for cultivated oat improvement.

Lines of Avena fatua previously found to possess moderately high tolerance to barley yellow dwarf virus (BYDV) (Rines et al., Crop Sci. 20:63, 1980) were crossed to A. sativa cultivars that also had moderate tolerance to BYDV. To limit the numbers of progeny that needed to be screened for BYD reaction, F_2 plants were first screened for desirable maturity date, plant height, and seed type. The selected 5% of the total F_2 progeny were advanced by single seed descent and F_3 progeny lines screened for BYDV tolerance. A wide array of BYD reaction types from highly tolerant to highly intolerant were identified. This transgressive segregation indicates that A. fatua may contain BYDV tolerance genes not found in cultivated oats. Luby and Stuthman (Crop Sci. 23:1047, 1983) reported that in eight A. sativa x A. fatua crosses progeny means for grain yield were related to grain yield of the A. fatua parent. Based on these findings, we screened a series of BYDV tolerant A. fatua lines for grain yield as an additional step in selecting three A. fatua lines to be used as parents in crosses.

A series of alien cytoplasmic substitution lines were constructed by backcrossing four genetically diverse A. sativa cultivars six times into five A. fatua and three A. sterilis cytoplasms. These lines will be analyzed for possible nuclear-cytoplasm interaction effects on agronomic performance. In comparisons of electrophoretic gel patterns of restriction enzyme digests of mitochondrial DNA isolated from various oat cultivars and Avena species, two oat cultivars which may have A. sterilis cytoplasms had bands different from the band pattern common among four other cultivars and two A. fatua lines.

Performance of Backcross Lines Derived from *Avena fatua*

J. B. Stevens and M. A. Brinkman

University of Wisconsin

Sixty-four BC_nF_6 lines derived from *A. fatua* X *A. sativa* crosses were evaluated in a three-replicate experiment at Madison in 1983. Lines included in the experiment had been developed from nine crosses among three *A. sativa* and four *A. fatua* parents. The *A. fatua* parents had been chosen on the basis of their grain yield and kernel quality, and also on the basis of performance of their progenies in simple crosses with *A. sativa*. Backcross lines were carried through the F_4 generation by panicle selection. In 1982, BC_nF_5 rows were cut for testing as rod-row plots in 1983.

Agronomic and grain quality traits were evaluated in 1983. There were several lines that performed as well as or better than their recurrent parent. Unfortunately, lack of crown rust resistance is a major deficiency of most of the lines derived from *A. fatua*, so the nursery was sprayed at heading with Bayleton. The experiment will be repeated at Madison and Arlington, Wisconsin in 1984.

RECURRENT SELECTION -- LESSONS LEARNED

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University of Minnesota and USDA-ARS

Our recurrent selection program was initiated in 1968 by intermating twelve oat genotypes. The criteria for parental selection were yield potential and diversity of phenotype and pedigree. Our ultimate goal was to develop high yielding germ plasm, and to collect relevant procedural information during the process. Progeny are advanced from F2 to F4 by the single seed descent method and ten lines per cross are evaluated in the F6 generation using hill plots. Selection is first practiced among cross (best one-third) and then within selected crosses (highest yielding sib). A circulant partial diallel is used to produce 63 crosses from 21 parents to initiate the next cycle.

In the summer and fall of 1984 we will complete the third cycle and initiate the fourth. A comparison of C0 and C3 parents indicates a yield improvement of 10%, which is 3.3% per cycle, or about 1.1% per year. Components of yield continue to vary with the season with the largest and most consistent increases occuring in kernel number. Heading has been delayed, but the grain filling period has not changed. Advanced cycle progeny are taller. Total plant dry weight has been increased over 15% and nearly every plant part measured has increased in size. There has been a small increase in the linear vegetative growth rate and a somewhat larger increase in the grain growth rate, thereby increasing the partitioning coefficient slightly. Harvest index has declined about 1%.

These results indicate that single trait recurrent selection can be effective for increasing grain yield. However, increases in heading date and plant height require that these two traits receive secondary selection pressure. In this gene pool it appears that further grain yield gains will first require increases in total plant phytomass because of the declining harvest index during the three cycles of selection.

FLUORESCENCE IN OATS

Dale Reeves and John van de Crommert

This study was conducted to determine the environmental influence, if any, on the fluorescent characteristic of oat seed and to determine the usefulness of the oat fluorescence test in detecting cultivar purity.

Six cultivars were grown under greenhouse and field conditions. When grown under field conditions, they produced seed with the same type fluorescence as the seed source, however, the quality of fluorescent color was less than greenhouse grown seed. The reduced quality of fluorescence is attributed to weathering.

Crosses were made between 'Noble' and 'Lancer' oats to determine the genetic control of the fluorescent trait. The resulting 3:1 ratio indicated fluorescence is dominant and non-fluorescence is a simple recessive trait.

Tests were run on 13 midseason oats grown at 13 locations and 6 early oats from 11 locations. Factors recorded for each variety and location included seeds per 25 grams, fluorescent seeds per 25 grams, non-fluorescent seeds per 25 grams, yield, test weight, longitude, latitude, altitude, moisture, and temperature. Seeds per 25 grams was an excellent indicator of environmental effects on seed production. The fluorescent trait was found to be an excellent means of determining cultivar purity if total true-to-type seeds per 25 grams was compared to total seeds per 25 grams. The number of true-to-type seeds per 25 grams had correlations of 0.99 with total seeds per 25 grams for all pure lines. All non-pure samples tested fell outside the confidence limits. This indicates the excellent reliability of the fluorescence test if conducted in this manner.

ONE PERSON PLOT COMBINE HARVEST SYSTEMS

C. F. Konzak, M. A. Davis, M. R. Wilson

As in 1982 and 1983, the entire WSU spring wheat research program plot harvest of approximately 20,000 plots plus about 500 spring barley program plots was completed using harvest and data acquisition systems (see Crop Sci 23:1205-1208) adapted to three plot combines each operated by only one person. The greatly increased efficiency enabled completion of our yield plot harvest earlier than would otherwise have been possible in both years. It was our intent already in 1982 to be able to process and receive analysed data before leaving the test site. The required software developments to achieve that goal were completed in 1983. We also purchased deawn bars for insertion in the combine concaves to improve threshing and thus obtain cleaner grain samples. A production version of the combine also was brought about in 1983 in order that the main components for the system might be commercially available. The commercially available equipment has better engineered structural components for the system and some design improvements. Electronic balances and data terminals or computers for data acquisition should be selected for their protection against environmental hazards and sensitivity to vibration. Most analytical laboratory balances would not be suitable for the application, nor would data terminals or computers using magnetic tapes or with keyboards and other components unprotected from dust. Some further refinements of the system are in progress.

Leaf and Stem Rust Resistance and BYDV Tolerance in the South American Oat Nursery

M. A. Brinkman and H. L. Shands

The objective of the South American oat program is to develop oat cultivars suitable for production in South American countries. The program is coordinated jointly by Texas A and M University and the University of Wisconsin, with guidance and financial support provided by the Quaker Oats Company.

Probably the most visible part of the South American materials is the Test Line nursery. In recent years the Test Line nursery has consisted of 300-400 entries, many of which can be considered pure lines.

When grown in Wisconsin, the Test Lines have generally had excellent resistance to the rusts, particularly crown rust. In recent years, approximately two-thirds of the Test Lines have been resistant to crown rust, whereas most of the Midwestern check varieties have been moderately susceptible to susceptible. The Test Lines have not been as resistant to crown and stem rust in South America, particularly in Brazil and Uruguay where rust pressure is high and new races of rust develop with alarming frequency. Nevertheless, lines with the 1563 CRcpx source of crown and stem rust resistance are maintaining a high type of resistance throughout South America. The 1563 CRcpx lines tend to be late maturing, but not tall, when grown at Madison.

Several dozen of the Test Lines have had good tolerance to BYDV in recent tests. Two Coker lines, Coker 81-32 and Coker 82-33, have had especially good tolerance ratings and are two of a dozen lines that have been used extensively in crosses at Wisconsin. Most of these dozen lines have been midseason to late and have had good resistance to crown rust when grown in Wisconsin.

Stem Rust Resistance without Prejudice?

Paul G. Rothman, USDA and the Univ. of Minnesota

The first evidence of "adult plant" type of resistance to oat stem rust was reported in CI 3034. Seedlings of CI 3034 were susceptible to all races of stem rust except for those races avirulent on Pg 1 which CI 3034 is known to possess. This adult plant resistance was effective against all races tested. The close association of the yellow-green plant color and rust reaction has limited its use to some extent in oat stem rust improvement.

A second "adult plant" type of oat stem rust resistance has surfaced in the cross Obee/Midsouth. Obee is an octoploid selection from the inter-specific cross Saia BCF (4X)//Japanese strigosa (4X)/Avena strigosa glabrescens 660 (4X)/3/Fla. 500 (6X). Midsouth (CI 6977) is a susceptible cultivar.

The F_1 plant was 75% fertile. Early generation screening of advancing lines, while showing a high degree of sterile florets, segregated for stem rust resistance in the field and in greenhouse seedling tests. It was initially disconcerting to discover that many of the field-resistant progenies harvested were fully susceptible when tested as seedlings to the same stem rust races.

Six F_7 progenies especially prone to this erratic behavior were chosen for study. Individual panicles harvested in 1976 were planted as panicle rows in 1977. The nursery was inoculated with races NA-26 and NA-27 which represents the total virulence known in the natural stem rust population. Only the resistant panicle rows were harvested and tested as seedlings to these same races. All lines were seedling susceptible. The lines were returned to the field the following year and with the nursery again inoculated with races NA-26 and NA-27 all lines were resistant.

Seedling tests were expanded to include races NA-17 and NA-30. A single line segregated for resistance/susceptibility to NA-17, NA-26 and NA-27 and four lines segregated with race NA-17 but all remaining lines were susceptible as seedlings.

Susceptible seedlings inoculated with race NA-30 were grown out and reinoculated in the greenhouse as adult plants. Lines tracing back to three of the 6 F_7 progenies were all resistant as adults, lines from two segregated and all lines of one were susceptible both in the seedling and adult stages to race NA-30.

The Obee/Midsouth lines have normal green color.

Stem Rust Resistance in the Uniform Nurseries

Paul G. Rothman, - Cereal Rust Laboratory

Eight diverse sources of oat stem rust are now available for resistance to race NA 27. Not all the sources offer protection to all known races, however.

Seedling tests, using specific races of stem rust with known virulence or avirulence for the known genes, identified the entries in the nurseries.

Sources of resistance are:

1)	Pg13	5)	Obee
2)	Pg15	6)	Amagalon
3	Pg16	7)	Delredsa
4)	Pga	8)	CI 3034

1983 Uniform Early Oat Performance Nursery
No entry had resistance to race NA 27

1983 Uniform Midseason Oat Performance Nursery
Entries with the Pg13 source:

12	W 78286	32	ND 78394
13	W 78296	33	ND 78406
31	ND 78376		

1984 International Oat Rust Nursery
Entries with the Pg15 source:

34	Rdy Pg15

Entries with the Pg16 source:

35	Rdy Pg16

Entries with the Pg13 source:

33	Rdy Pg13.	150	ND 784060	154	W 78296
89	ND 78376	151	Fidler	156	W 80474
149	ND 78349	153	W 78286	157	W 80588

Entries with the Pga source:

24	MN 805068	49	MN 818524	87	ND 1376
25	MN 806559	70	T 9861	88	ND 1387
26	MN 805301	71	T 9872	145	X 4467
36	Rdy Pga	82	X 4247	147	ND 811363
43	MN 711029	83	X 4457	148	ND 811386
44	MN 711262	84	X 4474	155	W 80135
46	MN 791708	85	ND 1356		
47	MN 790886	86	ND 1368		

Entries with the Obee source:

31	MN 805628	52	MN 813260
50	MN 813330	114	MN 6099

Entries with the Delredsa source:

23	MN 799821	49	MN 818524
24	MN 805068		

Entries with the Amagalon source:

27	MN 8284	51	MN 813162
28	MN 8251	114	MN 6099
29	MN 803670		

Entries with the CI 3034 source:

22	MN 806464	42	MN 7266
41	MN 72066		

CURRENT STATUS OF VIRULENCE IN THE CROWN RUST POPULATION IN RELATION TO AVAILABLE RESISTANCE IN OATS

M. D. Simons and L. J. Michel
USDA-ARS, and Iowa State University

Twenty-four lines of oats representing different genes for specific resistance to crown rust were used to assay the virulence of the crown rust population in the US in 1981, 1982, and 1983. Most of the genes originated in strains of *Avena sterilis* from the Middle East. A total of about 280 crown rust isolates collected from major oat growing areas of the country were tested in 1981; about 500 were tested in 1982; and about 265 were tested in 1983. The synthetic Amagolon (derived from a cross between *A. magna* x *A. longiglumis*) was tested only in 1983, but was highly resistant to all crown rust isolates. IA 547 was also resistant to all isolates in 1983, but was susceptible to a few in 1982. None of the other lines were resistant to all isolates, but IA Y345, IA 681, Ascencao, IA H441, CAN Pc39, TX 80, C6757, and IA H617 were resistant to over 95% of the isolates. Lines resistant to 90 to 95% of the isolates included IA 561, IA X421, CAN Pc 38, Coker 234, and IA H555. Field trials in Iowa and Wisconsin showed that lines appearing resistant in the greenhouse were generally highly resistant in the field as older plants.

COMBINATION OF MULTIPLE CROWN RUST RESISTANCE GENES FROM *AVENA STERILIS* IN SINGLE CULTIVATED TYPE LINES OF OATS

L. J. Michel and M. D. Simons
USDA-ARS, and Iowa State University

Various strategies are used in breeding for resistance to crown rust. The single gene strategy has been in use the longest and is probably the most commonly used. Single genes often become ineffective as the pathogen changes. Multilines are the strategy being used in Iowa, along with regional gene deployment. We made three crosses to combine or pyramid two sources of resistance into a single line and will release them as germplasm lines. The primary reason for release of the three lines is improved resistance to crown rust. The parents of these lines were used in our annual crown rust survey for 15 to 25 years. It was observed that certain combinations of resistance genes would improve their crown rust resistance and extend the useful life of these genes. These lines may be useful as parents to produce commercial cultivars. All are entries in the 1984 International Oat Rust Nursery. None of these lines have resistance to all isolates of crown rust but in each case have a crown rust rating superior to either parent.

IA H676 is an F_3 derived line from the cross IA H382/Ascencao. The female parent is derived from *A. sterilis* and carries a dominant gene designated Pc-36. The male parent carries a dominant gene designated Pc-14 and a partially dominant gene Pc-2. The F_2 progeny were tested with 2 races of rust; one race virulent to IA H382 but not Ascencao; the other race virulent to Ascencao but not IA H382. The plants resistant to both races were grown to maturity and the F_3 seed was space planted in the field. Further testing and selection was practiced.

IA H677 is an F_3 derived line from the cross IA X421/IA H382. The female parent is derived from *A. sterilis* and carries a dominant gene designated Pc-52. The male parent was described in the previous cross. The F_2 progeny were tested as described in the preceding cross.

IA H681 is an F_4 derived line from the cross $Lang^3$ x IA H441/$Lang^3$ x IA X434. IA H681 carries genes Pc-51 and Pc-53 plus an uncatalogued gene.

The Rust of Oats in the United States in 1983.

A. P. Roelfs, D. L. Long and D. H. Casper.
Cereal Rust Laboratory

In 1983, the first traces of oat stem rust were found in a commercial field in south Texas on March 20. In the south Texas, Beeville nursery, the first stem rust was found in mid-April, which is four weeks later than the 40-year mean (1941-1980). Stem rust was not detected in the northern spring oat growing area until early July which is one week later than normal. Because of the late infection, the disease potential was less than normal and this was further limited in late July by very hot temperatures that hastened crop maturity. Therefore, losses were light throughout the northern oat growing area. Had the inoculum arrived earlier, considerable losses could have occurred. In contrast, under similar environmental conditions, wheat stem rust built up rapidly even though nearly all cultivars were moderately resistant.

The most prevalent race of oat stem rust in 1983 (992 isolates from 484 collections), was NA-27 making up 88% of all isolates (Table 1). NA-27 has been the most common race since 1965. As in the previous 2 years, NA-16 and NA-5 were the next two most identified races (7% and 4% respectively). Race NA-16 was also found in low levels in the Great Plains. NA-5 was the only race identified from collections made west of the Rockies and also occurred in Texas and Illinois. NA-5 has often been found in Texas. NA-24 was only identified from collections made in New York state.

In 1983, oat crown rust was lighter than normal throughout the southern U.S. In the upper midwest crown rust was light except for some fields in southern Minnesota, central Iowa, and southeast South Dakota and a few fields in close proximity to buckthorn bushes. In all cases losses were light.

Table 1. Physiological races of *Puccinia graminis* f. sp. *avenae* identified from oats in 1983

State	Source of collection	Number of collections	Number of isolates	Percent of isolates of each race NA-1	NA-5	NA-16	NA-24	NA-27
California	Nursery	2	5		100			
Florida	Nursery	1	3					100
Iowa	Field	3	9					100
	Nursery	27	66			3		97
Idaho	Nursery	4	11		100			
Illinois	Field	1	3					100
	Nursery	11	28		14			86
Indiana	Nursery	1	3					100
Minnesota	Field	36	84			4		96
	Nursery	20	51			4		96
	Wild oats	15	27			22		78
Missouri	Field	1	3					100
Mississippi	Nursery	1	3					100
Montana	Field	1	3					100
North Dakota	Field	9	24					100
	Nursery	11	31					100
	Wild oats	45	67	4		3		92
New York	Nursery	1	2				100	
South Dakota	Field	11	26					100
	Nursery	7	16			12		88
Texas	Field	2	6			17		83
	Nursery	193	500		5	10		86
	Wild oats	2	6					100
Virginia	Nursery	1	2					100
Wisconsin	Field	1	0					100
	Nursery	6	13					100

Table 1. (cont.)

States	Source of collection	Number of collections	Number of isolates	Percent of isolates of each race NA-1	NA-5	NA-16	NA-24	NA-27
	Total	416	995	*	4	7	*	88
USA Total 1982	Total	364	1000	0	4	6	0	89
Mexico	Nursery	1	0					

* Less than 0.6%

STATUS OF INTERNATIONAL OAT RUST NURSERY PROGRAM

by J. G. Moseman
USDA, ARS

The International Oat Rust Nursery Program is conducted for all individuals interested in enhancing the rust resistance of oat cultivars. Individuals can become cooperators by submitting entries to be tested, or by growing the nursery to determine the reactions of the entries to the pathogenic strains of rust at their locations. Cooperators, who grow the nurseries, are encouraged to select entries from the nurseries for their research. However, the cooperator should inform the coordinator or the individual who submitted the entry, if they wish to release a cultivar in which an entry is a parent. By contacting the coordinator or the individual who submitted the entry, arrangements can be made to adquately recognize the individual who submitted the entry.

The following is the status of the program as of February 15, 1984. Thanks to D. (Dan) L. Harmon, who recently assumed the responsibility for computerizing the data for the reports in addition to managing the seed, and to J. R. (Bob) Tomerlin, for his technical assistance, considerable progress is being made in preparing the nursery reports. The final report on the 1982 nursery has been computerized and is being reproduced. The report should be sent to the cooperators in early March. Many cooperators have sent in their data on the 1983 nursery. We plan to assemble the report on the data on that nursery by July 1. Seed for the 1984 nursery with 164 entries has been sent to all cooperators. The seed for the 1985 nursery is being assembled and will be increased in Aberdeen, Idaho.

Since Barley Yellow Dwarf Virus (BYDV) has been a very important disease on oats world-wide, entries which Dr. H. Jedlinsky, USDA, ARS at University of Illinois found to be resistant in the 1982 and 1983 IORN, will be included in the 1985 IORN. We will also include some entries which Dr. C. M. Brown at University of Illinois has developed that are BYDV and leaf rust resistant in good agronomic types.

If you have any questions or if you would like to become a cooperator in the International Oat Rust Nursery Program, please let me know.

III. CONTRIBUTIONS FROM COUNTRIES OTHER THAN THE UNITED STATES

NEW SOUTH WALES OAT CROP 1982-83

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Department of Agriculture
New South Wales, Australia

The area sown to oats is estimated at 570,000 hectares. 180,000 hectares were harvested for a grain production of 158,000 tonnes with a yield of 0.88 t/ha.

Because of a very severe drought which persisted almost throughout the whole season, less than one third of the total area sown was harvested for grain (compared to over half of the area in a normal season). Oat crops provided much needed grazing during the winter and spring and many were completely grazed out. Oat grain was in very short supply resulting in very high prices being offered (up to $200 per tonne).

Conditions for the 1983-84 crop are much more favourable. It is expected that about 900,000 hectares will be sown to oats, almost equal to the record area sown in 1981-82 (909,000 ha).

No new varieties were registered during the year.

OATS IN MANITOBA - 1983

R.I.H. McKenzie, D.E. Harder, C.C. Gill, J. Chong and P.D. Brown
Agriculture Canada, Winnipeg, Manitoba

The summer of 1983 was the hottest at Winnipeg since records were first kept 111 years ago. Combined with below normal rainfall in July and August this put a lot of stress on the Manitoba oat crop particularly between heading and maturity. According to Statistics Canada the area in Manitoba sown to oats was down 8% in 1983 to 243,000 hectares and yield per hectare was down from 2.35 tonnes in 1982 to 1.80 tonnes this year. Many growers reported very low test weights as a result of the heat. Fidler was sown on 59% of the area planted to oats in 1983, up from 36% in 1982. Harmon (at 21%) and Hudson (at 18%) occupied most of the remaining area. Considerable damage occurred on rust susceptible varieties due to the cumulative effect of rust and moisture stress. The new rust resistant variety Dumont should occupy a significant area in 1984.

Ariane Plourde is continuing with her project on the effect of lemma color on grain quality. The rust and moisture stress affected some of her material which she hopes to grow again in 1984.

The Oat Rusts

Oat stem rust and oat crown rust developed early in Manitoba. Both rusts were widespread throughout the province by early August. In southeastern Manitoba late fields of susceptible oats were severely affected by both rusts and sustained heavy losses. The cultivar Fidler, which comprised 59% of the area seeded to oats remained highly resistant to both rusts.

There were no major changes in the prevalence of races of oat stem rust in 1983. Race NA27 continued to predominate in western Canada, but at a lower level than in 1982 (80% in 1983, 96% in 1982). In eastern Canada, the main race was NA25, which comprised 42% of the isolates.

In Manitoba and Saskatchewan there were no major changes in races of crown rust in 1983. The new race of crown rust with the Pc-gene avirulence/virulence formula 38, 45, 48, 50, 56, 58, 60, 61, 62, 63, 64, 67, 68/ 35, 39, 40, 46, 59 isolated from a Pc-39 trap nursery at Brandon in 1982, that attacks Fidler, did not re-appear in the 1983 survey. A race of crown rust (race 264) new to Ontario was isolated several times in the Ottawa area. It has the Pc-gene avirulence/virulence formula 35, 38, 50, 56, 58, 59, 61, 62, 63, 64, 67, 68/ 39, 40, 45, 46, 48, 54, 55, 60 and attacks Woodstock, a new cultivar released to Ontario growers in 1983. Like Fidler, gene Pc-39 is the major resistance factor in Woodstock, but Fidler has additional resistance that offers some protection to this race. It remains to be seen how widespread this new Ontario race will become in 1984.

Barley yellow dwarf virus in Manitoba - 1983

This was a year when aphid vectors of barley yellow dwarf virus were sparse. A low-level jet stream which prevailed from June 9-13, probably accounted for the initial entry of the aphids and for the economic damage that resulted, in certain areas of Manitoba. For instance, sweeps with an insect net between Haywood and Treherne, averaged 40-50 aphids per 100 sweeps. These aphids consisted almost exclusively of the English grain aphid and the cherry oat aphid, in a ration approximately 2:1. Later, on about July 20, a second migration into the Red River Valley occurred, and sweeping indicated a ratio of 3 cherry-oat aphids to 1 English grain aphid.

By this time, however, above normal temperatures and adequate moisture, caused a rapid increase in the crop growth-rate, thus rendering the crops less palatable to the aphids. Although crops were seeded later west of the Red River Valley, no economic damage occurred. Aster yellows mycoplasma was present only in trace amounts.

Twenty isolates from different places in the Red River Valley, were characterized according to aphid transmission with 5 species of aphids, and all proved to be of the R. padi-nonspecific strain (PAV-like).

Personnel Changes

Dr. John Martens has left our group to take over the responsibility for the wheat rust research at Winnipeg.

Dr. James Chong has joined our group to work on oat crown rust while Dr. Don Harder has taken over responsibility for oat stem rust research.

Dr. Steve Haber will work with Dr. Cliff Gill on BYD research. Steve recently obtained his Ph.D. at the University of Illinois.

QUEBEC

Barley yellow dwarf virus resistance in oats

A. Comeau, J.-P. Dubuc and C.-A. St-Pierre

Growth conditions in 1983 were not optimal in our trials due to late seeding and severe drought. However, the identification of BYDV-resistant oat cultivars was still relatively easy. Illinois cultivar Ogle was one of the best. In Quebec germplasm, Q.O. 215.19 and Q.O. 232.89 displayed high resistance. In the International Oat Rust Nursery from USDA, Il 1833, Il 5681, Il 4844, T 1832, ND 78376 were resistant. In the Texas A & M-Quaker International Oat Breeding Project 83, WIS 82SA237, 82AB1428, 82AB2177, 82AB2240, 82AB2244, 82AB2245, 82AB2248 and 82AB2230 showed significant BYDV resistance.

We have developed a technique that would allow us to select winterhardy BYDV-resistant oats under artificial winter protection. The protection is a polyethylene tunnel without any air conditioning except passive ventilation, and an insulating layer deposited over the plants during the coldest period.

More information about our trials can be obtained in the report no. 5, trials on the resistance of cereals to barley yellow dwarf virus (BYDV), available from André Comeau, Station de Recherches, Agriculture Canada, 2560, boul. Hochelaga, Sainte-Foy (Québec) Canada G1V 2J3

Oats and Oat Breeding in Saskatchewan 1983

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Acreage

Oat acreage continues to drop in the Province, being 1.1 million acres in 1983 compared to 1.4 million in 1984. Production was down more than anticipated due to the extreme heat late in the growing season. This heat had a dramatic effect on kernel quality and as expected good quality oats were even harder to find than usual.

Varieties

Harmon continues to be the most popular variety at 47% of the acreage, however Kelsey at 10% is now third behind the rapidly moving new high yielding variety Cascade. Cascade occupied 4.0% of the acreage in 1981, ballooned to 10.5% in 1982 and reached 14.5% in 1983. Two other very new varieties, Calibre and Dumont, will likely follow suit over the next four or five years.

Oat Breeding and Research Program

We wish to acknowledge the support of the Quaker Oats Co. of Canada which allows us to carry on our modest oat research effort in the Crop Development Centre.

Our highlight for 1983 was the receipt of a licence for and the release of the variety Calibre. Calibre, described in more detail later in this newsletter, combines high yield potential and excellent kernel quality in a variety well adapted to the non oat-rust areas of western Canada. In combination with the other new varieties Cascade and Dumont we feel that we now have new standards of excellence for oats in our region.

The development of Calibre has kept us on line with our objective of developing high yielding, high test weight, thin hulled varieties. Although we will continue our efforts in these areas we now are concentrating on improving the maturity, kernel plumpness and smut resistance of new materials.

OAT PRODUCTION AND BREEDING IN HUNGARY

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The acreage of oats in Hungary is 40,000 ha, that is, as much as 0.7 to 0.9% of the total areable land. This is a small increase compared to the 1970's. Total production has shown a proportionately greater increase, and average yields are now above 2.4 t/ha. This is due both to recently introduced varieties and an improvement in cultural practices.

Almost all oats produced in Hungary is fed to animals, with only an insignificant amount being used directly for human consumption.

Only spring varieties are now commercially produced. These include Leanda, Perona (from the Netherlands), Solidor (from GDR), and Szegedi korai (an early variety developed in Hungary).

Oats have been bred in Hungary at the Cereal Research Institute since 1970. The main objectives of our breeding program are as follows: to breed intensive, adaptable varieties with good nutritional value and high resistance to diseases.

The first concrete result of this work was the official registration of "Szegedi korai", which ripens 10 to 12 days earlier than the standard Leanda; its standing ability and grain quality are better than those of Leanda. The variety was selected from an F_3 "bulk" population originating from the crosses of genotypes with "continental character".

Now "GK-3", a 3 year-old variety candidate (from a Nestor x Astor cross) is being tested in the official state trials in 7 locations. The variety candidates "GK-4" and "GK-5" will be first tested in 1984 in the official state trials.

We are engaged in the breeding of naked oats as well, for which the demand is increasing more and more. The basic material is "Taplani csupasz", an early, naked variety, crossed with "sativa"-type varieties. In this way we are tryping to breed naked lines with higher productivity.

We can report only a moderate initial success in the breeding of winter oats, as only a few genotypes can tolerate the cold winters in Middle-Europe. On the basis of several years' observations and experiments the lines with the best winter hardiness seem to originate from the crossings of Dubois, Checota, Windsor, C.I. 7300, Ujszegedi (a local variety), and T-2 (a US dwarf line).

I would like to use this opportunity to request that other readers of the Oat Newsletter send me genotypes, first of all, with good frost resistance and winter hardiness, which can be used as crossing partners. In exchange I shall send seed samples of my selected basic materials.

CHROMOSOMAL ASSOCIATIONS IN AVENA SATIVA VAR. 'JHO 801' x A. MAGNA HYBRID

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An experimental variety of Avena sativa 'JHO-801' was crossed with A. magna using the tetraploid species as the pollen parent, in March 1981. JHO-801, derived through pedigree selection from a cross between Kent and I.G. 68-2643, was selected as one of the parents because of its bold, plump seeds and very high percentage of fertile florets. The F_1 plants were grown in winter 1981-82 and the meiotic chromosome associations from the pollen mother cells at diakinesis were studied. The range and mean values for the number of univalents, bivalents, trivalents, and quadrivalents are given in Table 1.

Table 1. Chromosome associations in Avena sativa (JHO 801) x A. magna hybrid.

Type of associations	Mean	Range
Univalents	4.6	1-7
Bivalents	11.3	9-13
Trivalents	0.7	0-3
Quadrivalents	1.4	0-3

Differences in the meiotic behaviour of the pentaploid hybrids developed by using different A. sativa genotypes are apparent from the earlier studies. Sadanaga et al. (1968) utilized three A. sativa varieties viz., 'Egdolon', 'Eta' and 'Carolee' in crosses with A. magna. The frequency of the univalents observed in the PMC's of the three F_1 hybrids obtained was 14.2, 10.6 and 9.64, respectively. In the present study the univalent frequency was very low, i.e., only 4.6. The mean frequency of bivalents was appreciably higher, i.e., 11.3 whereas it was 6.92, 8.1 and 8.58 when 'Egdolon', 'Eta' and 'Carolee', respectively, were used as the A. sativa parents (Sadanaga et al. 1968) and 7.77 to 8.65 when A. sterilis or other A. sativa types were used (Rajhathy and Sadasivaiah, 1969; Ladizinsky, 1969).

The low frequency of univalents and high rate of bivalent formation between chromosomes of A. magna and A. sativa var. 'JHO-801' show that the genotype of 'JHO-801' has a higher chance of gene transfer by crossing over from A. magna to A. sativa.

EFFECT OF NITROGEN AND PHOSPHORUS ON THE YIELD AND CHEMICAL COMPOSITION OF OAT FORAGE IRRIGATED WITH SALINE WATER

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The response of oats to nitrogen and phosphorus fertilization was studied earlier (Das and Taneja, 1981) and under normal irrigation conditions for the production of quality forage. The purpose of the present study was to determine the effect of saline irrigation water. An experiment was laid out in a randomized block design with HFO-114 oats drilled in rows spaced 25 cm apart, using a seeding rate of 100 Kg/ha. The crop was sown in November. Nitrogen rates were 0, 40, 80 and 120 Kg/ha, applied as urea in two splits, half at sowing and remaining half at the time of first irrigation. Phosphorus rates were 0, 30 and 60 Kg P_2O_5/ha, applied in the form of single super phosphate treatment.

The soil of the experimental field was sandy loam in texture, low in available nitrogen (180 to 205 Kg N/ha) and medium in available phosphorus (17.5 to 20.0 Kg P_2O_5/ha), having ECe and pH value of 0.34 m mhos/cm and 7.9, respectively. Two post-sowing irrigations of 8.0 cm water each were applied. The irrigation water contained 51.6, 8.5, 27.5, 0.6, 6.6, 60.0 and 18.7 meq/liter of Na^+, CA^{++}, Mg^{++}, Co_3^{--}, HCo_3^-, CI^- and SO_4^{--} ions, respectively, and had pH and electricial conductivity 8.3 and 9.4 m mhos/cm, respectively. The crop was harvested at 50% flowering stage. The results for crude protein, *in vitro* dry matter digestiblity, neutral detergent fiber and dry matter yields are presented in Table 1.

Crude protein percentage increased with additional nitrogen up to 80 Kg N/ha. *In vitro* dry matter digestibility also increased when nitrogen level was increased from 40 to 80 Kg N/ha. There was a continuous decrease in neutral detergent fiber with the increase in the dose of nitrogen fertilization. The negative relationship between neutral detergent fiber and digestiblity is well known. However, the results obtained in the present study are at variance to those reported earlier (Das *et al.*, 1974; Das and Taneja, 1981) where nitrogen application increased neutral detergent fiber and consequently decreased the *in vitro* dry matter digestibility. This indicates that the contents of saline irrigation water influence the quality of oat forage, but the dry matter yield, although increased significantly with the application of nitrogen, is drastically reduced in comparison to the crop grown with normal irrigation water (Das and Taneja, 1981).

A slight decrease in neutral detergent fiber and consequently an increase in *in vitro* dry matter digestibility was observed when 30 Kg P_2O_5/ha was applied. However dry matter yield increased significantly with the phosphorus application.

Table 1. Chemical composition and yield of oat forage.

Treatment	CP%	IVDMD%	NDF%	DM yield (q/ha)
N (Kg/ha)				
0	2.91	54.93	70.4	41.1
40	4.37	54.66	67.8	59.9
80	6.27	58.13	66.5	70.5
120	6.26	58.06	65.2	71.7
S.E.				1.32
C.D. (5%)				3.87
P_2O_5 (Kg/ha)				
0	4.92	56.60	68.4	56.6
30	4.86	57.20	66.4	61.1
60	5.08	56.55	67.5	64.7
S.E.				1.14
C.D. (5%)				3.35

CP = Crude protein, IVDMD = In vitro dry matter digestiblity,
NDF = Neutral detergent fiber, DM = Dry matter

TRANSGRESSIVE SEGREGATION IN OATS

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A strong emphasis on breeding oats for increased green and dry matter yields, along with other desirable traits, continues at this University. An 8 x 8 diallel F_2 among parents Rapida (R), Montezuma (M), Indio (I), Orbit (O), Portal (P), Bingham (B), Burt (Bu) and Kent (K) was studied for plant height, tiller number and green forage yield. Among the parents, 'Kent' is one of the cultivar best adapted to Indian conditions. The other parents used in the diallel mating are unadapted and show a varying expression of the above traits. The 28 F_2's along with 8 parents were studied on an individual plant basis in randomized complete block design with three replications. Each F_2 was planted in 3 rows and parents in one row/plot/replication. Within the row seeds were planted at intervals of 10 cm.

It was interesting to note that these F_2's showed an overwhelming percentage of positive and negative transgressive segregates for plant height, tiller number, and green or dry matter yields (Table 1). For plant height, Bu X K produced the highest percentage of individuals showing transgressive segregation (all in the positive direction) followed by the R x Bu F_2's. Twelve crosses showed 10% or more transgressive segregants in the positive direction. The I x O F_2 showed the maximum number of transgressive segregants in the negative direction. The M x K F_2 had the lowest % of transgressive segregants.

With regard to tiller number, the O X Bu F_2 gave the highest number of individuals showing transgressive segregants on the whole, followed by I x O F_2. The F_2's of crosses R x M and R X B did not show any transgressive segregants in the negative direction. All the positive transgressive segregants were below 5%.

The percentage of individuals showing transgressive segregation for green forage yield (GFY) was highest in the cross R x I followed by O x B. Seventeen other F_2's yielded individuals showing transgressive segregants in positive directions. Taking into account both positive and negative directions, the F_2 R x I followed by O x B produced the highest percentage of transgressive segregants. The F_2's of R x K and M x K did not possess any individual showing transgressive segregation in either direction.

The frequency of transgressive segregates for tiller number, green forage yield, and dry matter yield in the 8 x 8 diallel F_2 thus indicated that certain plant types with increased yield can be recovered easily. However, a portion of the transgressive segregation behaviour may be partly due to environmental factors and partly due to accumulation of favourable gene complexes from the parents. Further selection in these crosses has indicated that near-homozygous lines can be obtained with increased yield as advancing generations have not indicated any sort of deterioration in performance.

Table 1. Transgressive segregants (%) for plant height (PH), tiller number (TN), and green forage yield (GFY) in an 8 x 8 F_2 diallel.

Cross	% of individuals showing transgressive segregants					
	PH		TN		GFY	
	(+)	(-)	(+)	(-)	(+)	(-)
R x M	8.78		1.35		6.76	
R x I	9.00		3.00		20.00	
R x O	17.97		0.78	9.36	6.25	3.13
R x P	4.00		2.00	2.00	7.00	
R x B	28.76			10.95	2.55	
R x Bu	36.89		3.27	5.74	11.48	
R x K	18.50					
M x I	0.76		3.78			
M x O	0.76		0.76	0.76	3.03	
M x P	0.30	1.25	2.50	5.63		
M x B	0.67			4.00	1.33	
M x Bu	5.36		4.46	3.57	2.68	
I x O	1.41	7.04	0.70	12.68	4.22	2.11
I x P	12.00		0.66	18.00	3.33	4.67
I x B	4.24		1.69	2.54	3.39	1.69
I x Bu	6.67		0.83	10.80	8.33	3.33
I x K	2.84	1.14				7.38
O x P	17.31	2.88	0.96	4.81		
O x B	20.27		4.05	1.35	12.16	
O x Bu	29.77	1.53	4.58	9.92	10.69	
O x K	6.47	0.59				
P x B	2.08	2.08	4.16		4.17	
P x Bu	25.58			32.55	1.55	9.30
P x K	31.17					
B x BU	7.41		1.85	1.85	1.85	3.70
B x K	14.57	0.66				1.85
Bu x K	53.09					9.88

AN INTEGRATED BREEDING METHODOLOGY FOR OATS

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The single seed descent method (SSD), originally proposed by Goulden (1941) and outlined by Brim (1966) for carrying out selection in antogamous crops, is followed by many oat breeders. This method involves advancement of segregating generations of a cross by taking a single seed from each plant of F_2 to develop the F_3 and so on up to F_5. After F_5, the progenies from single seeds are line-tested for performance. This method is advantageous over the conventional pedigree method as less time, space and record keeping are required and at the same time, a wide spectrum of variation among genotypes is maintained until selection in F_5 or F_6 is practiced.

Jensen (1970) suggested a diallel selective mating system (DSM) which is comprised of (1) making a parental diallel series (2) intermating the F_1 hybrids to produce an F_1 diallel series (3) line selection from both series after 3 or 4 generations of mass selection (4) developing a number of selective mating series from selected F_2 plants of the F_1 diallel series and so on. This is a dynamic breeding method as it broadens the genetic base and allows continuous infusion of germplasm in the ongoing crossing programme at any stage.

A screening honeycomb design (SHD) was proposed by Fasoulas and Tsaftaris (1975) which was based on the evaluation of genotypes in such a way so as to accomplish maximum environmental control and minimize the masking effect of soil heterogeneity. In this design each of the equidistant plants is surrounded by a ring of five random genotypes plus the check. The yield of a particular plant can be compared with the average yield of a check triangle and of the six immediate neighbours.

Considering the dynamism of the DSM system, simplicity of the SSD method and the apparent superiority of the SHD in identifying superior genotypes, an integrated breeding methodology has been developed to be undertaken this year on the oat breeding project at the Indian Grassland and Fodder Research Institute, Jhansi, India. The schematic approach of this method is presented in Fig. 1.

The programme has been initiated with a diallel involving four parental lines (say A, B, C & D). The F_2 progenies of the six F_1 hybrids will be bulked and a SSD approach will be followed up to F_5. The F_5 plants descending from F_4 single seeds will be evaluated in a SHD utilizing the best cultivar as the check, followed by testing of F_6 lines originating from selected F_5 plants in three-row replicated trials (Column 1).

Two F_1's of the four-parental diallel will be involved in a multiple cross (A x B) x (C x D) and at the same time, infusion of some new lines (say E & F) will also be done. From bulked F_2 of these multiple crosses, some plants will be selected to make up the first selective mating series and at

the same time the advancement of the F_2 generation to F_3, F_4 and F_5 will be made by SSD followed by F_5 evaluation in SHD and F_6 line testing in replicated trials (Column 2 and 3).

The F_1's from column 3 will be utilized in development of second selective mating series and infusion of new parental lines (say G & H) will be taken up as in column 2. The same procedure of selection using SSD and SHD will be followed (column 4) and so on (column 5, 6 ....).

Thus the above procedure will help in meeting the short-term as well as the long-term goals of any small grain crop improvement program owing to the dynamism of the DSM system of mating, simplicity of the SSD method of selection and ability of SHD to minimize the masking effect of environment while testing genotypes. We believe that this scheme will prove useful in many oat breeding programmes.

EVALUATION OF EXPERIMENTAL STRAINS OF OATS

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With the increasing importance of the dairy industry in different parts of the country, cultivation of oats is increasing gradually with varying emphasis on green forage including pastures. Therefore, we have been stressing the development of superior cultivars, with emphasis on yield and resistance to crown rust. In the varietal development program several divergent sources of germplasm are being utilized in creating new and improved cultivars.

An advanced trial of experimental strains was conducted during the winter of 1983 and evaluated for days-to-50%-heading, plant height, green forage yield, and field reaction to crown rust. Out of 33 progenies evaluated along with the check variety ('Kent'), 11 progenies produced higher yields than 'Kent' (Table 1). Maximum green forage yield (84.7 t/ha) was obtained from the progeny OX 12-16-9-1. Other high yielding lines were OX 105-2-2-1 and OX 105-11-1-4. Some of the progenies with higher green matter yield had about the same number of days-to-50% heading, whereas in certain lines such as OX 105-11-1-4, heading was later by 8 days. It was observed that all the lines showed field resistance to crown rust. Observations have shown that these lines are suited to multicut conditions because their regrowth is quite uniform and fast. Therefore, for proper distribution of green fodder during the season these lines may prove to be useful to the farmers. Some of these high performing lines are to be included in the national oat varietal trial.

Table 1. Performance of certain experimental strains of oats during winter, 1983.

Lines	Days to 50% heading	Plant height (cm)	GFY (t/ha)	Crown rust reaction
OX 105-2-2-1	107	142	83.3	R
-2-2-3	108	136	79.5	R
-9-4-5	107	156	81.4	R
-9-4-3	103	150	75.7	R
-11-1-4	116	130	83.3	R
OX 138-8-2-3	105	120	79.5	R
OX 184-18-4-2	106	135	79.5	R
OX 12-10-10-4	110	136	81.9	R
-10-13-4	114	126	76.4	R
-10-13-5	109	127	77.8	R
-16-9-1	109	142	84.7	R
Kent (check)	108	128	73.8	MR
C.D.	-	-	2.5	-

GFY = Green forage yield
R = Resistant
MR = Moderately resistant

SPONTANEOUS OCCURENCE OF THREE-STYLE PISTILS IN *AVENA SATIVA* L.

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In the genus *Avena*, the ovary characteristically bears at its apex two whitish feathery stigmas on very short styles. However, while emasculating the florets of various *A. sativa* genotypes grown in the 1981-82 crossing block, the florets of one plant were found to possess three styles and stigmas.

Seed from this plant was grown during winter 1982-83 along with the normal parental line. This mutant of spontaneous origin did not differ from the parental line for various morphological traits except the number of styles and stigmas. All plants in the progeny of this mutant were also found to possess flowers with three styles and stigmas. The penetrance, expressivity and the nature of inheritance of this character are under investigation.

A FINAL CONCEPT OF THE CAUSE OF INTERSPECIFIC CROSS-INCOMPATIBILITY

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A hypothesis of polar-nuclei activation was recently proposed to explain the abortion of interspecific hybridizations (Nishiyama and Yabuno 1978, 1979). According to the hypothesis, the major cause was defective development of the endosperm which was originally due to an unbalanced interaction between the polar nuclei and the male nucleus in duble fertilization, or the polar nuclei being abnormally activated by the male nucleus. The degree of activation of the polar nuclei was shown by an activation index (AI%) which was calculated from the following formula; AI%=AV/2RV x 100. AV showed the activating value (intensity) of a male gamete and it was named the response value (RV) in the female gamete. The response value of the polar nuclei, consisting of two nuclei, should be shown 2RV. Table 1 represents a list of AVs(RVs) of 16 species of Avena, estimated in our extensive crossing experiments (Nishiyama and Yabuno 1978, 1979, Nishiyama in press).

Interspecific crosses with about 20% to 80% of AI were found to be compatible but those with below about 20% or above 80% of AI were incompatible, 50% being the normal activation index under which normal seeds were produced.

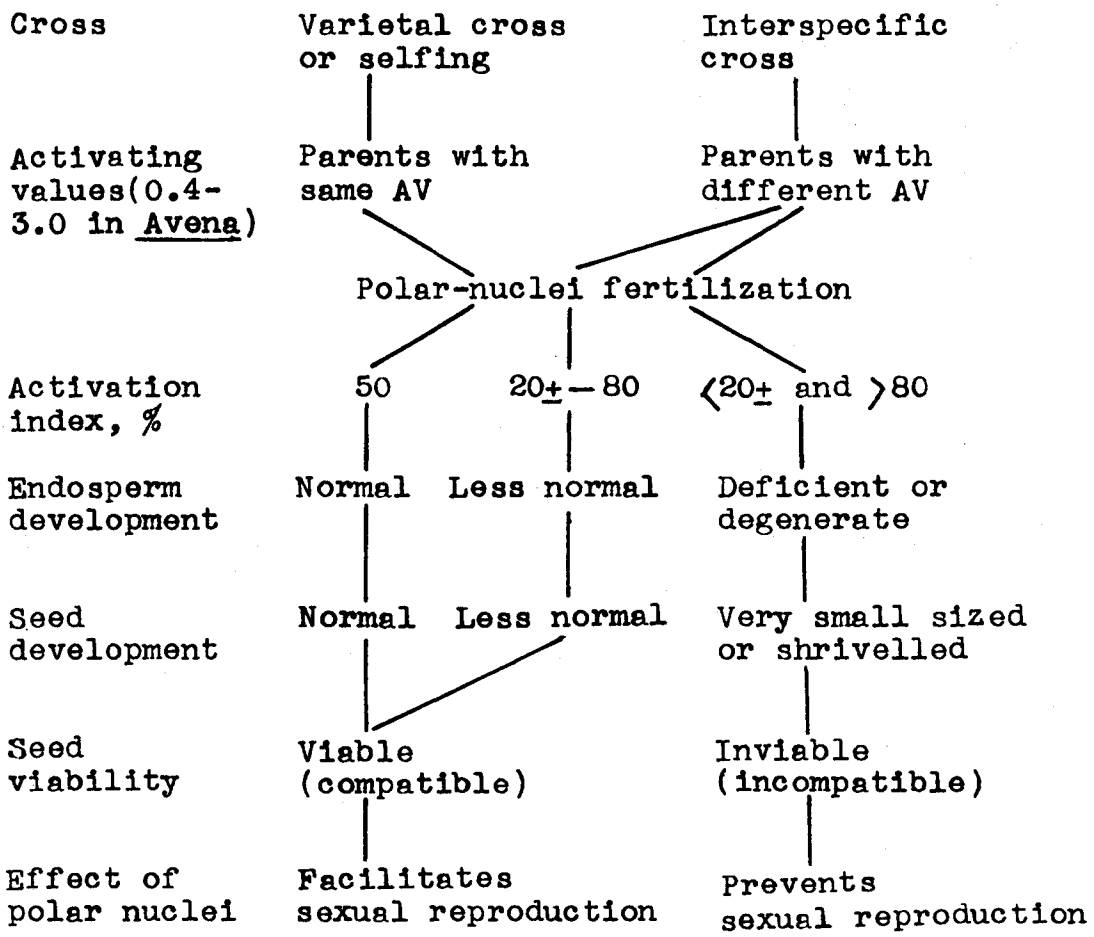
In view of the embryological development of seeds, these facts can be briefly summarized as shown in Table 2. That is, the polar nuclei can play two roles: one is facilitating formation of the endosperm tissue for nutrition of embryos or young seedlings, and the other is preventing endosperm formation to suspend the sexual reproduction if an unexpected fertilization should be taken place. Plant species can be of unmixed breed by such an autonomic sexual disturbance of the polar nuclei in case of distant hybridizations.

Table 1. AV(RV) of *Avena* species

Species	Genome in gamete	AV(RV)
1. *A.strigosa*	A_s	1.0
2. *A.hirtula*	A_s	0.9
3. *A.pilosa*	C_p	0.5
4. *A.clauda*	C_p	0.45
5. *A.ventricosa*	C_v	0.4
6. *A.prostrata*	^tA_p	0.8
7. *A.damacena*	^tA_d	0.95
8. *A.canariensis*	^tA_c	0.8
9. *A.longiglumis*	^tA_l	1.7
10. *A.barbata*	A_sB	1.9
11. *A.magna*	AC	1.5*
12. *A.murphyi*	A?	1.4
13. *A.byzantina* cv Kanota	ACD	2.7
14. *A.sativa*	ACD	2.8
15. *A.fatua*	ACD	2.9
16. *A.sterilis*	ACD	3.0

* Correction of the former 1.6(Nishiyama and Yabuno 1978, 1979)

Table 2. Interspecific crossability controlled by two reversible actions of the polar nuclei in double fertilization.



OAT CULTIVARS IN MEXICO

Carlos Alberto Jiménez G., and Uriel Maldonado A.

INIA, Mexico

The exact date of introduction of oats to Mexico is unknown. It is believed that in the early XVI Century the spaniards introduced oats to feed their horses.

The early oats introduction was supposed to come thru the area of Veracruz, from where they were moved into the high plateau and to the North of the country up to Southern USA. There are some evidences in all those places of oat grains that have been found in the adobe bricks of the old spanish homes established in Baja California, Mexico, and California USA.

It is believed that all those early introductions were mixtures of different types and species (Coffman, 1977).

Oats have been planted in Mexico since that time, though only in very small areas. Commercial planting starts when the Menonites groups arrived to Chihuahua comming from Canada (1922). They brought with them the first known commercial variety called BURT or TEXAS from USA (1928).

Oat breeding in Mexico

In the early 40's the Office for the Office for Specials Studies (SAG, México-Rockefeller Foundation) started the introduction of different varieties mainly from the University of Minnesota and Texas U.S.A.

Oats breeding started in the summer of 1962 at the Experimental Field of Chapingo, Mexico, based on the Pedigree Method of Breeding. By 1967, the first two varieties were released.

They were sisters lines called Chihuahua and Cuauhtémoc, derived from the cross AB-177xPutnam 61.

In Table 1 are shown all the most important oat varieties released by the National Institute for Agriculture Research that have been or are still used for production commercial.

Oat program goals from 1960 to 1983

1. Introduction and pure line selection of commercial oat varieties in the early 60's.

2. High fertilization percentages in hand made polinations in early 70's.

3. Released of the first early Mexican oat variety, GUELATAO (90-105 days to maturity).

4. First oat commercial variety with a high degree of stem rust resistance to Races 6AF, 31 or NA-27, Diamante R-31 (1974).

5. Released of the second stem rust resistant (Race Na-27) commercial variety TULANCINGO, with at least 500 kg/ha higher yield

than Diamante R-31 (1979).

6. A complementary approach to the Pedigree Selectin method giving the program an opportunity to get some promising genotypes which other world have been lost: "GRAVIMETRIC MASS SELECTION" (1976).

7. Released to the farmers of fifteen oat commercial varieties to be used for feed or in human compsumtion (1960-1983).

TABLE 1. OATS COMMERCIAL VARIETIES IN MEXICO

Variety	Released year	Pedigree	Breeding Method	Source	Actual Use
Nodaway	1962	CI-7272	Introduction and pure line selection	Missouri, U.S.A.	Forage
AB-177	1964	CI-7149	Introduction and pure line selection	Georgia, U.S.A.	"
SAIA	1964	CI-7010	Introduction	Brasil	"
Opalo	1964	CI-7399	Introduction and pure line selection	Minnesota, U.S.A y Chapingo, Méx.	Forage and grain
Putnam 61	1965	CI-7531	" "	Indiana, U.S.A.	Forage
Perla	1967	AB-177xPutnam 61	Pedigree Method (hybridization and selection)	Chapingo, Méx.	Forage and grain
Cuauhtémoc	1967	"	"	"	"
Guelatao	1972	Curt-Nodaway[3]	"	"	"
Huamantla	1974	3034-Tippecanoe/ENA	"	"	"
Páramo	1974	AB-177[2]-CurtxCurt-Nodaway AB-177[2]	"	"	"
Diamante R31	1974	1955-A-39-3-2 Curt/Impala/ ENA	"	"	"
Tarahumara	1974	7114-ChihuahuaxCurt-Nodaway[3]/Toko	"	"	"

Cont. ...

Variety	Released year	Pedigree	Breeding Method	Source	Actual Use
Gema	1978	(ArkansasxNo.58-AB-177/ CurtxNodaway)Faun1	Pedigree Method (hybrization and selection)	Chapingo, Méx.	Forage
Tulancingo	1979	3034-Tippecanoe/Curtx Opalo-Curt/Cuauhtemoc	"	"	Forage and grain

All the varieties are spring habit

IMPROVEMENT OF OATS IN MOROCCO

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St. Paul, Minnesota

In Morocco oats are a minor crop compared to barley, durum, and breadwheat. Barley is the most important forage crop. Only one oat cultivar, AV 153, is in multiplication for distribution to farmers, and it is highly susceptible to BYDV and lodging. Starting in 1980 materials in the International Oat Breeding Program supported by the Quaker Oats Co. were received from Texas A&M for evaluation. Other materials were received directly from other universities. Table 1 presents data on the most promising genotypes and cultivars after two to three years of observation. All of these entries are superior to AV 153 in grain yield, although this superiority has not been quantified. From the segregating material supplied, selections from the crosses IL 75-1011 x 4470-2 and C76-20 2x BC1A x C234 have appeared to be the most promising. Also oat lines from Missouri and the Coker Co. have looked very promising. From the 1982 Quaker Oat experimental Nursery, 52 selections were made including several new Coker lines (81-32, 82-31, and 82-27) and Missouri lines Mo 07233 and 07091. The most promising genotypes are being evaluated in Portugal and So. Spain.

Oat lines from California were similar to AV 412 in earliness (heading between 21 and 35 days after March 1) and disease susceptiblity. Curt, Montezuma, Kanota, Ventura, Sierra, Indio, and Cayuse were scored 4 for crown rust, and 3-4 for powdery mildew and Septoria. Notable for their susceptibility to BYDV were the following Wisconsin lines: X3967-2, X4040-4-1, X4022-2, X4024-7, X4027-11, X4029-3, X4032-1-1-2, X4033-6, X4041-1, and X4047-3.

A very small breeding program has been started in cooperation with Dr. Deon Stuthman at the U. of Minnesota. Rapid gains in grain productivity seem likely given the low productivity level, disease susceptibility, and straw weakness of AV 153.

Table 1. Agronomic and disease notes on oat lines grown in Morocco (1980-83).

Cultivar or genotype	Agronomic Appearance[2]	Range in Days to Heading[3]	Height, cm	Septoria (0-5)	Crown Rust (0-5)	Powdery Mildew (0-5)	BYDV (0-9)
TAM 0-312		34-45	89	3	0	4	4
Tx Cortez	*	27-33	103	3	2	4	2
Mo 06767	**	28-33	106	3	1	3	-
Mo 06967	**	28-33	106	3	3	3	-
Mo 06195	*	33-44	107	3	3	3	-
Mo 06425	**	35-42	102	3	1	3	-
Coker 79-27	**	39-42	120	3	0	tr	0
Coker 1217	***	23-32	105	4	0	2	3
Coker 79-21	***	37-39	89	3	2	0	0
Coker 79-17	***	37-48	85	3	2	3	2
Nora	*	32	103	2	3	3	-
IL 77-2588	*	33-39	107	2	1	2	-
79Sa487-78Sa21	*	24-35	112	4	0	3	0
79Ab258-75C7059	***	31-37	114	4	2	3	3
79Ab330-79Bol3082	**	31-34	107	3	0	2	5
79Ab286-79Bol3008	**	22-32	106	4	2	1	4
79Ab481-3-78A7-17	*	22-32	113	4	0	3	0
79Ab485-78A7-19	***	27-32	100	3	0	0	2
79Ab307-79Bol3028	***	27-33	94	3	0	3	-
79Ab293-79Bol3015	***	22-32	113	4	3	3	2
79Ab265-70Ab216	**	29-35	103	4	2	0	3
Swan	***	25-32	109	3	4	4	-
AV 412 (check)[1]		21-28	-	4	5	3	7
AV 153 (check)[1]		45-48	118	-	-	-	8

1. one year's observation
2. visual score (zero through 3 stars)
3. from March 1.

BREEDING OATS FOR GRAIN IN PORTUGAL

Francisco Bagulho, Jose Coutinho and Benvindo Macas;
Department of Cereals - National Plant Breeding Station,
Elvas, Portugal

About 180 thousand hectares are annually devoted to oat grain production in Portugal. However, a precise estimate is difficult to obtain because much of the grain is fed on the farm.

In spite of strong fluctuation related to the price system, national oat production has reached the goal of 90,000 metric tons, during the last few years. On the other hand, we are dealing with a crop that is improving only very slowly in our country. In fact, the traditional system consists of growing oats after wheat with a minimum utilization of recommended technology and the yields/ha are low indeed.

At the National Plant Breeding Station, we have been breeding oats for a long time, and this research has produced some interesting varieties that are well adapted to our conditions. The first phase of this work was done in the 1940's with the release of six varieties selected from Argentinian germplasm. A second phase, mainly in the 1970's, is represented by the introduction of the Australian varieties Avon and later by the release of the first cultivar produced by artificial hybridization at Elvas: S. Mateus. Even today Avon and S. Mateus are the most widely grown cultivars in Portugal. The third phase, still in progress, consists of producing crosses based on Avon and selecting the best progenies. The first cultivars from this program, S. Romao and Santo Aleixo have been submitted for approval to the National Varieties Catalog. These two oats contain between 25 and 50% of Avon germplasm and have shown some improvement in relation to it (Table 1 and 2).

Table 1. Names and pedigrees of new Portuguese oat varieties.

Name	Pedigree
S. Mateus	S. Mamede x (S. Francisco x Glenn Innes)
S. Romao	S. Mamede x (S. Francisco x Glenn Innes) x Avon
Santo Aleixo	Avon x Carrtuja

The most important goals of our breeding program are the increase of grain productivity and yield stability. Accordingly, selection has been oriented essentially towards the vegetative cycle (genotypes with a short "heading - maturity" period), reduction in plant height, resistance to lodging, spikelet fertility, resistance to shattering, resistance to the most common diseases (Puccinia coronata, Erysiphe graminis and BYDV), hectoliter weight and one thousand kernel weight.

Table 2. Average yields of the varieties S. Romao, Santo Aleixo and Avon at one location (Elvas) during three years (1979-1981), and at 8 locations during two years (1981 - 1983).

Varieties	ELVAS Yield kg/ha	%	Days to Heading	Days to Maturity	Height (cm)	Hectoliter weight (kg/hl)	8 other locations Yield kg/ha	%
Avon (check)	3333	100	138	191	109	43.84	2555	100
S. Romao	3601	108	137	188	117	46.60	2790	109
Santo Aleixo	3356	101	138	190	112	45.22	2661	104

HYBRIDS INVOLVING A. MACROSTACHYA

J. M. Leggett
Welsh Plant Breeding Station, Aberystwyth, U.K.

The autotetraploid oat Avenae macrostachya ($2n = 4x = 28$) is the only perennial oat species known. Apart from its perenniality this oat has been reported to be resistant/tolerant to BYDV and to possess considerable winter hardiness. In an effort to transfer these characters into the cultivated oat, and to ascertain its cytogenetic status hybrids involving A. sativa and the tetraploid A. murphyi have been produced.

The mean chromosome pairing at metaphase I of meiosis in the tetraploid hybrid was 0.33 III, 7.74 II and 11.58 I, whilst the mean chromosome pairing in the pentaploid hybrid was 0.035 IV, 0.24 III, 9.367 II and 15.41 I. Because of the autotetraploid nature of the A. macrostachya parent, most of the bivalents formed in both of the hybrids would result from the pairing homologous chromosomes derived from the autotetraploid. The multivalent configurations observed must be due either to homoeologous chromosome pairing or to translocation differences between the species since no multivalents greater than quadrivalents were observed in the A. macrostachya parent.

The formation of multivalents indicates that there is some residual homology between the species although the strength of the relationship may be confounded by the preferential pairing of the chromosomes from the A. macrostachya parent.

The germplasm of A. macrostachya could be invaluable to breeding programmes if it can be successfully incorporated into the cultivated oat. The hybrid A. sativa x A. macrostachya reported here is the first step towards such an end, but as the F_1 hybrid is sterile, the problems associated with achieving such a transfer are considerable.

Comparisons of the yield and protein production of oats (*A. sativa*) with *Avena* species, barley (*H. vulgare*) and wheat (*T. aestivum*)

Robert W. Welch
Welsh Plant Breeding Station
Aberystwyth, Dyfed, U.K.

Inter-specific comparisons will provide information on many aspects of crop production including, (i) the validity of extrapolating data from one species to another, (ii) the relative merits of particular components of yield or quality which may prove useful as selection criteria and (iii) the potential benefits of inter-specific hybridization.

Comparative evaluation of ten wild oat species and two European oat varieties in two environments showed that all the wild species were higher in grain protein percentage than *A. sativa* and also that some of the wild species were equivalent to *A. sativa* for nitrogen assimilation, total crop production, total protein production and grain (though not groat) yield.

A single comparison of fifteen modern European varieties of oats, barley and wheat showed that although total yields were similar in the three species, oats had a lower grain yield. Oats also had the lowest grain protein yield and total protein yield but its grain protein percentage was similar to wheat and exceeded that of barley. The higher grain protein percentage of wheat was associated with a lower straw protein percentage, indicative of increased nitrogen remobilization, while oats had a similar straw protein percentage to barley. These results indicate that protein production in oats could be increased by selecting for both higher total nitrogen uptake and for improved partitioning of the protein to the grain.

Indiana

Purdue University. H. W. Ohm, F. L. Patterson, J. M. Hertel (Breeding, Genetics), J. E. Foster (Entomology), G. E. Shaner (Pathology), R. M. Lister (Virology), K. M. Day and O. W. Luetkemeier (Variety Testing), and C. L. Harms (Extension).

Production: The acreage of oats harvested for grain in Indiana was 80,000 in 1983 which was down from the 95,000 acres harvested in 1982 as reported by the Indiana Crop and Livestock Reporting Service. However, the total acreage seeded was 380,000 up from the 130,000 acres seeded in 1982. This large increase was possibly due to the Government PIK program.

The warm temperatures and dry field conditions of early March allowed 40% of the oat planting to be completed in Indiana before cool, wet conditions returned in late March. The oat planting was completed in early May.

Barley yellow dwarf virus (BYDV) was again abundant throughout Indiana and our nurseries. The cool and wet conditions of April contributed to the development of downy mildew in some of our nurseries. We were pleased to find that many of our lines have a good level of resistance to this disease.

Research: Oats breeding research at Purdue involves combining resistance to BYDV and crown rust into high yielding types. Our latest release, Porter, was available for seeding by farmers in the spring of 1983. Porter is a late maturing oat with good resistance to BYDV and crown rust.

We are continuing a recurrent selection program combining 8 winter oat lines (sent to us by Dr. M. E. McDaniel, Texas) and 8 spring oat lines. After the fourth cycle of intercrossing this spring in the greenhouse we will begin a recurrent selection scheme for resistance to BYDV and crown rust and for various agronomic characters.

Research into resistance to BYDV and properties of the virus continued in our program.

The movement of the virus through oat and wheat plants was reported by Lori Carrigan, a former graduate student at Purdue, now a corn breeder for Pioneer Hi-Bred Inc., in a paper taken from part of her Ph.D. thesis. This work demonstrated that the virus is transmitted through the entire plant in less than 24 hours. This rapid rate of transmission is consistent in both susceptible and resistant oat and wheat plants. The resistance mechanism in oats and wheat must not involve a restriction of virus movement.

The reaction of diverse sources of resistance (tolerance) in oats, wheat, and barley to infection with the BYDV isolates RPV and PAV was the subject of David Baltenberger's M.S. thesis study. A significant cultivar x isolate interaction was found in the barley cultivar CM and the wheat line P68130A4-146. This significant interaction was also observed in several oat and wheat lines in our BYD hill plot nursery. This suggests that a researcher screening for resistance to BYDV should test against each major isolate present in that area.

Our three years of investigations of the epidemiology of barley yellow dwarf virus (BYDV) in Indiana by graduate student David Clement indicate a complex "open" rather than "closed" system. Overall, PAV-like isolates

were the most prevalent. A major source of BYDV is from aphids moving from distant crops, in wind currents, especially in the spring. Transmission from grasses seems likely to occur sporadically through the season, but may contribute most significantly in the fall. Aphid populations in the fall probably include components from distant and from local sources, including corn, whenever appropriate population build-up occurs. 1983 was exceptional in that aphid activity at the Purdue Agronomy Farm was reduced and late in onset. June samplings of wheat showed no increase in BYDV incidence over March samplings (27%). However, spring infection occurred in oats, for 44% of June oat samples were infected.

Completion of Mani Skaria's graduate research experiments with paired resistant and susceptible wheat, oat and barley cultivars, reported on last year, confirmed that some genetically-controlled symptomatic resistances to barley yellow dwarf virus are associated with reduced virus build-up in infected plants. ELISA measurement of virus content and symptomatic effects is both cultivar- and virus-specific, stressing the importance of considering virus type in breeding for resistance.

During the period 1982 - 1983, we have tested a total of 80 symptomatic oat samples by ELISA, including samples from Indiana, Illinois, Iowa, Minnesota, Wisconsin, Michigan, Ohio, New York, the Dakotas and Oregon. Of these, 52 were rated positive for BYDV. Most contained PAV-like isolates.

Personnel: Judy Hertel joined our project in August of 1983 as a Professional Agronomist. Judy has a M.S. degree and her duties consist of the day-to-day planning of the oats and wheat breeding programs. David Baltenberger completed his M.S. degree in December and will be staying with our project for a Ph.D.

Publications:

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2. Carrigan, L. L., H. W. Ohm, and J. E. Foster. 1983. Barley yellow dwarf virus translocation in wheat and oats. Crop Science 23:611-612.

3. Ohm, H. W., F. L. Patterson, J. E. Foster, G. E. Shaner, J. J. Roberts, and K. M. Day. 1983. Porter Spring Oat. Station Bulletin 402. Agr. Exp. Stn., Purdue University.

4. Clement, D., R. M. Lister, and J. E. Foster. 1983. Occurrence and spread of barley yellow dwarf virus in Indiana. Phytopathology 73:790 (Abstr.).

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6. Skaria, M., R. M. Lister, J. E. Foster and G. E. Shaner. 1983. Barley yellow dwarf virus content as in index of symptomatic resistance in cereals. Phytopathology 73:793 (Abstr.).

7. Lister, R. M., D. Clement, M. Skaria and J. E. Foster. 1984. Biological differences between barley yellow dwarf viruses in relation to their epidemiology and host reactions. Proc. CIMMYT Workshop on barley yellow dwarf virus, Dec. 1983. (In press).

8. Clement, D., M. Skaria and R. M.Lister. 1984. Screening survey samples for the presence of barley yellow viruses. Proc. CIMMYT Workshop on barley yellow dwarf virus, Dec. 1983. (In press).

IOWA

K. J. Frey, M. D. Simons, R. K. Skrdla,
L. J. Michel, and G. A. Patrick

Several million acres of oats were sown in Iowa in 1983, but only 800,000 acres were harvested for grain. Mean yield was 50 bu/A, so total production in Iowa was about 40 million bushels. Oats were sown late in 1983. There was adequate moisture in most areas during plant development and grain filling, but maturity was delayed by the late planting. High temperatures in mid-July caused premature ripening before grain filling was complete, thus reduced test weights. Neither crown rust nor yellow dwarf virus was of any importance to oat production in Iowa in 1983.

In an earlier paper (Frey, K. J. 1977. Z. Pflanzenztg. 78:185-215), it was suggested that the usually reported negative correlation between grain yield and grain-protein content of cereals probably was due in most cases to a deficiency of available nitrogen in the soils where the experiments were conducted. With deficient availability of soil N, Frey found a strong correlation, whereas with abundant soil N, the two traits were uncorrelated. As a follow up on this report, Dr. Karen Kuenzel did an extensive study to determine if the strength of association between grain yield and grain-protein content of oats would vary with germplasm source. Four oat lines derived from Avena sterilis introgression that were very high in yield were mated with seven oat lines with high grain-protein percentage. From the 28 possible matings, five showed no association between grain yield and grain-protein content. The other 23 showed the usual negative association. From these five matings with zero correlation, five segregates were selected that had high protein yield per ha due to genetic variability in both components of protein yield, i.e., groat-protein percentage and grain yield. From the other 23 matings with negative relationship, five segregates were selected that had high protein yield due to high grain yield only. These two sets of parents were used to spawn separate populations for increasing protein yield per ha. A third population was begun by intercrossing the two groups of parents and selection will be for protein yield per ha only in this population. This study with three populations is now in the second cycle of recurrent selection

Several years ago, a study was begun to determine the yield characteristics of lines of oats selected under disruptive and nondisruptive selection strategies. In the nondisruptive selection regimes, oat lines were selected in three successive cycles under either continuous low- or continuous high-productivity conditions. For the disruptive selection strategies, selection was alternated between high- and low-productivity environments in successive cycles. Three or four cycles of selection were applied to four populations of oat lines with a selection intensity of 50% in each cycle. All selection regimes resulted in significant gains in grain yield. When averaged over populations, means for increases in yield, responses to improved environment, and stabilities were approximately equal for the disruptive and nondisruptive strategies. However, the gain in yield from selection was related to the number of high-productivity environments in a given regime: A high-productivity environment was worth ca 50% more than a low-productivity one for magnitude of gain from selection. Further, the response index also was related to the number of high-productivity environments in a selection regime, but stability of selected oat lines was unchanged by any selection strategy.

Several changes have occurred in the ISU oat project personnel during 1983. Darrell Cox, Stan Cox, and Carrie Young finished their Ph.D. degrees, and Deb Colville finished her M.S. Dr. Darrell Cox is now a wheat breeder at North Dakota State University, Dr. Stan Cox is a USDA wheat breeder at Kansas State University, and Dr. Carrie Young is a bean breeder at the Sacramento Valley Milling Company in Chico, California. Deb is continuing graduate study in Crop Production at Purdue University. New faces on the small grain project are Chris Branson from Australia, who is studying for a Ph.D. degree, and Mary Evans from Alaska, who is studying for an M.S. degree.

MARYLAND

D. J. Sammons
University of Maryland

Maryland farmers harvested a total of 16,000 acres of oats in 1983, somewhat fewer than in the past several years. Statewide, oat yields averaged 56 bu/a for a total state harvest of 896,000 bushels. Oats are a relatively minor crop in Maryland. The involvement of the small grain breeding program with this crop is limited to variety testing. The geographical location of Maryland makes it a transitional state in terms of oat production. There are risks in the production of both winter and spring oats in the state. Winter oats are risky in most areas of the state except on the Eastern Shore because of the danger of winter kill. Spring oats are generally most successful in the western region of the state, but only if they are planted early enough (March) to mature grain before the excessive heat of early summer.

The results of the 1983 Spring Oat Variety Trial for Maryland are summarized in the accompanying table. Yields in the 1983 tests were generally excellent. The highest yields were observed for Ogle (128.7 bu/a) and Lang (116.4 bu/a). Test weights for most entries were good to excellent, with many over 34 lb/bu. With the exception of Ogle, Otee, Clintford, and Lang, no lodging was observed in the trial. Head dates ranged from June 4 - 12, and plant heights at maturity ranged from 24 - 40 inches. The 1983 growing season was cool and wet, with record rainfall between March and mid-June. The cool temperatures and rainfall provided generally excellent growing conditions for oats. The test plots matured normally, and were harvested on July 13. Diseases were generally not a problem in 1983, and infestations of cereal leaf beetle (Oulema melanopus) were generally light.

Performance of spring oats for several characteristics, Clarksville, Maryland, 1983.

Entry	Yield (bu/a)	Test Wt. (lb/bu)	Lodging (%)	Head Date	Height (in)
*Ogle	128.7	32	12	June 9	36
*Otee	99.5	34	50	June 8	37
Clintford	71.1	35	18	June 8	33
*Lang	116.4	37	13	June 4	35
*Larry	103.2	35	0	June 4	33
*Noble	98.9	33	0	June 8	36
Dal	99.6	31	0	June 12	37
Mariner	85.5	31	0	June 11	40
Pennlo	102.1	34	0	June 4	28
Porter	104.3	34	0	June 11	37
Centennial	100.0	32	0	June 6	38
Bates	111.8	36	0	June 4	38
PA 7967-11690	94.0	32	0	June 8	33
PA 7967-11498	90.2	36	0	June 4	32
PA 7967-6689	97.9	34	0	June 8	31
PA 8098-13020	98.4	37	0	June 8	34
PA 7967-3145	85.3	38	0	June 6	36
PA 7967-11603	101.6	37	0	June 6	32
PA 7967-11654	91.5	32	0	June 8	24
PA 8098-10452	96.7	29	0	June 8	30
PA 8098-13900	78.9	33	0	June 12	34

Location: Agronomy Forage Research Farm
Soil Type: Manor Silt Loam
Planting Date: March 16, 1983
Harvest Date: July 13, 1983
Fertility: 50 lbs. N/A, 66 lb P_2O_5/A, 66 lbs. K_2O/A.

*Recommended or promising variety in Maryland

MINNESOTA

D.D. Stuthman, H.W. Rines, P.G. Rothman, L.L. Hardman, and R.D. Wilcoxson

Production

Oat production in Minnesota in 1983 was 77 million bushels, the lowest since 1934. A combination of the PIK program and very unfavorable grain filling conditions contributed to the reduced production. One and one third million acres produced an average of 57 bu/A, both values considerably below those for 1982. For much of the state, planting was delayed. June weather was nearly perfect for oat growth, but it was followed by a very hot and stormy July. These conditions produced considerable lodging and poorly filled grain.

Bird control

At St. Paul we are continuing the hawk flying to disperse birds from our plot acres. This past summer we added another dimension to these efforts. Wrapping tape was strung on wooden stakes about 100-200 feet apart, positioning them around and through areas to be protected. The tape proved to be quite effective as long as there were alternative areas where the birds could feed.

Personnel

Tom Payne finished his M.S. program and is now pursuing a Ph.D. with Dr. John Schmidt at the University of Nebraska. Most of the results of Tom's research are summarized in the abstract entitled "Recurrent Selection -- Lessons Learned" which appears in another section of this Newsletter.

Dr. L.L. Hardman has assumed the oat extension responsibilities in the Agronomy and Plant Genetics Department. His first major project was to take lead responsibility in writing "A Guide to Quality Oat Production." Although the initial effort is mainly written for Minnesota and surrounding states, we desire a wide distribution. We also are interested in your comments and reactions. Please contact Dr. Hardman for a copy.

Ms. Teresa Gruber joined our program last summer and is pursuing a M.S. degree. She has a B.S. from Nebraska and will be investigating combining the Minnesota type crown rust resistance with the OT 207 dwarf gene and the peduncle extender gene.

Mr. Abdelfidel Ez-Zarzari from the University of Minnesota-Morocco program is also studying with us. His research interest is combining leaf rust and powdery mildew resistance with adaptation to Moroccan conditions. The final selection will be made in Morocco.

MISSOURI

Dale Sechler, Paul Rowoth (Columbia)
and C. Hoenschell (Mt. Vernon)

Production: The 1983 harvested oat acreage decreased by 31% from 1982. Acreage has been declining slightly but is very closely related to soil conditions for seeding in very early spring. Growers know that, unless oats are seeded very early, the growing season in Missouri will be too short for the production of acceptable grain yield and quality. In 1983, 110,000 acres were seeded but only 54,000 were harvested for grain at a yield of 46 bu/acre. Almost continuous early spring rainfall resulted in soil conditions that were not favorable for seeding in many areas of the state. Many of the oats seeded, as usual, were cut for hay.

Diseases: Barley yellow dwarf virus was the most damaging disease of oats statewide. Aphid populations were very high and oat plants were infected at an early stage of development. Crown rust was prevalent statewide and was damaging also. Stem rust came in too late to cause extensive damage but was much more severe than normal.

Varieties: The Ogle variety again produced the highest yield of named varieties in statewide trials. While it is relatively late in maturity, high temperatures during grainfill were not a problem and superiority in BYD resistance was very advantageous. The winter oat program at Missouri has been discontinued. Small quantities of seed of 18 of the more winter hardy lines will be sent to any interested breeders.

NEBRASKA

John W. Schmidt and Thomas S. Payne
University of Nebraska

The 1983 harvested oat acreage of 310,000 acres was the lowest since 1881. Average yield per acre was 44 bushels, down from the record 58 bu/a in 1982. High temperatures in early July accounted in part for the reduced yield. In outstate tests, Ogle continued as the top yielding cultivar with 90 bu/a, followed by IL 75-5860 with 82 and Bates with 80 bu/a. IL 75-5860 has averaged at least two pounds higher in bushel weight than Ogle and for this reason is of interest to Nebraska growers. Ogle and Larry are first and second in number of acres of registered and certified seed production.

As has been the case the last few years, we had considerable stem rust at Mead. The infection was due to naturally-occurring inoculum. Late seeding may be contributing to the disease incidence but we appear to have had more stem rust than most of the cooperators that are growing the uniform oat yield nurseries. Resistance conferred by Pg 13 was effective in 1983.

New York

M. E. Sorrells, G. C. Bergstrom, and W. F. Mai

1982 Spring Oat Production: The 1983 oat crop for New York State averaged 57 B/A, 8 B/A below 1982. The reduction in yield was due to heavy rains in April and very dry conditions the rest of the summer. This resulted in delayed planting, poor emergence, and drought stress. Ogle has been very popular and should surpass Astro in 1984. Porter has received a lot of attention and is expected to be grown on a substantial acreage this year.

Diseases: Diseases did not have major impacts on the yield of spring oats in 1983. This can be attributed to the unusually hot and dry conditions which persisted from June through harvest. Barley yellow dwarf virus symptoms were noted in some locations but the disease was not widespread due to greatly reduced migrant aphid populations. This was particularly fortunate since there was BYDV infection in fall (1982)-planted winter wheat. Crown rust was present at the lowest levels in recent years. There was a single outbreak of stem rust (identified as race NA-24 by A. Roelfs) in Oneida County on the variety Ogle. Loose smut was observed but was a minor problem. Sooty molds were observed as a secondary problem on some poorly filled panicles.

Saia Oats as an Orchard Cover Crop: In New York State, preplant soil treatment with nematicides and broad-spectrum chemicals on orchard sites with a replant problem caused by lesion nematodes, *Pratylenchus penetans*, has resulted in substantially increased yields of apples and cherries and grower profits. Recent regulatory action following the discovery of residues in underground water has placed severe restrictions on the use of soil-applied chemicals. Therefore, alternative strategies are urgently needed. In 1983, W. F. Mai conducted research to compare the influence of growing lesion nematode resistant and susceptible orchard cover crops on nematode populations and growth of apple seedlings. The effects on lesion nematode populations and growth of apple seedlings of a nematode-susceptible oat cultivar (Astro) and a nematode-resistant oat cultivar (Saia) were compared. The nematode population build-up on Astro oats was four times that on Saia oats. The average shoot weight of apple seedlings following Saia oats was more than twice that of seedlings following Astro oats.

Introgression of Tetraploid and Diploid Avena Species: Fifteen amphiploids from 4x·6x crosses have been selected and are currently being intermated to form an octoploid gene pool for further selection. Obtaining new 2x·6x hybrids has been difficult. Out of more than 5,000 crosses, we have obtained the following four hybrids: *A. longiglumis*/Porter, *A. longiglumis*/Korwood (2), *A. longiglumis*/Aurora-11. In preliminary field trials, 2x·6x octoploids obtained from H. Thomas and M. Legget were compared to current cultivars and to parental lines. Over 2 years, the *A. longiglumis* and the *A. canariensis* octoploids averaged about 10% below the mean yields of the cultivars. We are attempting to refine our wide crossing techniques to improve the frequency of obtaining hybrids and plan to continue field testing the amphiploids.

Development of Screening Techniques for Improvement of Oat Milling Quality: Edward Souza recently joined our project to work on using mechanical screening methods to raise the percentage of genotypes in a population that have desirable milling quality. We will be using both segregating populations and F_5 populations to determine the effect of the following treatments: separation by seed size, aspiration, gravity separation, and abrasion + gravity separation. Kernel size and milling characteristics will be determined for the populations before and after treatment and in the progenies.

Publications:

Brown, K. D., M. E. Sorrells, and W. R. Coffman. 1983. A method for classification and evaluation of testing environments. Crop Sci. 23:889-893.

Cooper, D. C. and M. E. Sorrells. 1983. Greenhouse screening and field evaluation of two oat populations segregating for barley yellow dwarf virus resistance. Cereal Res. Comm. In Press.

Cooper, D. C. and M. E. Sorrells. 1983. Field reaction of eight oat (A. sativa) lines to the PAV isolate of barley yellow dwarf virus. Cereal Res. Comm. 11:99-105.

NORTH CAROLINA

Ronald E. Jarrett

Growing Season

The 1982-83 growing season was characterized by above normal rainfall and below normal temperatures. Planting was delayed in some areas of the state. Topdressing of oats and application of herbicides for weed control were delayed because of wet field conditions. Late spring frosts were responsible for some injury to oats. Conditions for harvesting were poor because of frequent showers.

Production

There were 150,000 acres of oats planted in North Carolina. One-half of the acreage was grown for cover crops, hay, silage, etc. while the remaining 75,000 acres (12.2% decrease from 1982) were grown and harvested for grain. Most of the acreage was planted with the varieties Brooks and Coker 716. Production was 4.2 million bushels, a 12.5% decrease from 1982. The average yield per acre was 49 bushels as compared to 52 bushels per acre in 1982. The value of grain production was $6.7 million while the total value of the entire crop was approximately $13.4 million.

Problem Areas

One of the main problems with oats continues to be winter hardiness particularly in western North Carolina (Piedmont and Mountains). The main diseases are barley yellow dwarf virus (BYDV) and crown rust. The cereal leaf beetle is increasing and spreading over the entire state. Damage from the cereal leaf beetle has not been very critical thus far. In addition, interest in wheat is at an all time high level and this situation competes heavily and prevents any major increases in oat acreages.

NORTH DAKOTA

Michael S. McMullen

Production:

According to the North Dakota Crop and Livestock reporting service 1,260,000 acres of oats were harvested during the 1983 crop year. The average yield was 50.5 bu/A resulting total grain production of 62,630,000 bu. All areas of production in the state underwent heat stress during July.

Varieties:

A variety survey conducted by the N.D. Crop and Livestock reporting service found that Otana is the leading variety in N.D. with 21 percent of all oat acreage in the state. It is followed by Kelsey (16.4%), Fidler (13.1%) and Moore (12.0%). Fidler occupied the greatest acreage in the northeast and north central districts while Moore occupied the greatest acreage in the east central and southeast districts.

Diseases:

Few disease problems were observed in commercial fields. Barley yellow dwarf virus infection was severe in some late planted fields in the central part of the state. A nursery planted May 15 near Fargo had heavy natural infection of stem and crown rust so that yields of susceptible lines were greatly reduced.

Breeding Program:

ND77-61-311 was named 'Pierce' and released for the 1983 crop season. ND78376 was named 'Steele' and released for 1984.

OKLAHOMA

E.L. Smith, H. Pass, and J.A. Webster

Production. The state oat yields and acreage are subject to considerable year to year fluctuation. In 1983, a total of 150,000 acres were seeded but only 80,000 acres were harvested for grain with a production of 3,920,000 bushels. The yield was 49.0 bushels per acre. Harvested area was down 10,000 acres while the average grain yield rose by 11.0 bushels/ acre from the past year.

Performance of breeding lines. A number oat lines along with appropriate check varieties were evaluated in a performance nursery test at two locations in Oklahoma, in 1983. Nine lines in the trial produced better yields than the best yielding check variety, Okay. Among those lines, five has Nora as one of their parents. OK64201-63/Nora selections were especially noteworthy. Chilocco, Okay, and Nora are the popular varieties in Oklahoma.

Breeding objectives. The development of oats with resistance to greenbugs remains one of the major breeding objectives. Segregating populations were screened for resistance to biotype E, the newest biotype of the greenbug. In addition to greenbug resistance, emphasis is being placed on winterhardiness and test weight. There are perhaps half a million horses in the state and there appears to be a growing market for heavy oats for horse feed. Improvement of test weight is being given consideration.

Personnel. Hartwill (Bill) Pass, Assistant Professor of Agronomy retired July 1, 1983, after 35 years of dedicated service at Oklahoma State University, Bill was involved in plant breeding and testing programs and for many years had leadership of the oat breeding program. He participated in the development of a number of varieties of oats, wheat, and barley. Thanks Bill, for a job well done (E. Smith).

SOUTH DAKOTA

D. L. Reeves and Lon Hall

Production: The oat acreage in 1983 was the smallest since 1939 with only 2,000,000 acres planted. The state averaged 48 bushels per acre with a total production of 79,200,000 bushels. The 1980 and 1981 years had less production but larger acreages. Several factors combined to give South Dakota one of its poorer oat years. Planting was delayed due to excess soil moisture and slow drying in much of the state. By May 1, 23% of the oats was planted while the 10 year average for that date is 69%. Similar figures are 50%, 82% and 73%, 91% for May 8 and 16 respectively.

Moisture was generally good to surplus until about July. High temperatures were a problem in mid summer as the weather became warm and dry and continued that way through harvest. As a result, much of the oats produced had very poor weights with reports of 25 lb. per bushel not being uncommon.

There were two good things about the 1983 oat season. Harvesting weather was ideal being warm and dry and crown rust was a very minor problem.

Research: Jack Ingemansen has completed the second year of sampling farm-stored oats. A higher percentage of bins were infested with insects this year. We assume since farmers knew the grain quality was poor, they were less concerned about bin sanitation therefore, more insects were present. Bins with false floors and quansets often had large insect populations.

We are getting an increasing number of requests from farmers for "race horse oats". These are high test weight with white hulls and preferably a large kernel. As a result, we emphasize white hulls and high test weights in our breeding program.

The South Dakota selection SD 743358-06 has been named "Kelly" and will be released to Certified Seed growers for planting in 1984. A description of the variety is in the selection of this Oat Newsletter that describes new oat cultivars.

TEXAS

M.E. McDaniel, J.H. Gardenhire, L.R. Nelson, K. B. Porter,
Earl Burnett, Lucas Reyes, Jim Mulkey, E.C. Gilmore,
David Worrall, and Charles Erickson

Production: The 1983 seeded acreage of oats in Texas was 1,400,000 acres, which represented a modest increase of 8% over the 1982 crop. Oats was the only major crop in Texas for which the 1983 seeded acreage was larger than that for the 1982 crop; the planted acreage of other major Texas crops decreased from 4% for wheat to 60% for soybeans in response to the payment in kind (PIK) program. This program was announced too late to significantly influence the seeded acreage of wheat in Texas; however, Texas growers subsequently plowed up, baled, or grazed out over 41% of the planted acreage to enter the PIK program. As usual, Murphy's Law operated effectively; the 1983 average wheat yield in Texas set an all time high of 35 bushels per acre, 5 bushels above the previous record. The 1983 Texas wheat production of 161 million bushels was the second highest on record (1866-1983); total production was 12% above that of 1982 despite a 23% decrease in harvested acreage from the previous year.

The 1983 Texas oat yield average also was the highest on record (1866-1983); the state average of 48 bushels per acre from 500,000 acres harvested broke the previous average yield record of 46 bushels per acre set in 1981. Rust diseases (both crown rust and stem rust) were unusually light throughout the state. At Beeville, the crown rust susceptible varieties Florida 501, Bob, and Nora ranked 1st, 2nd, and 4th among 15 commercially available oat varieties, producing 102, 101, and 99 bushels per acre with test weights of 37-38 pounds per bushel. This is in stark contrast to the 1982 Beeville test results, in which Bob and Nora were killed by crown rust prior to heading, and Florida 501 produced only 9 bushels per acre, compared to 30-40 bushel yields for resistant varieties. The 1982 results are typical at Beeville; susceptible varieties usually produce no grain at this location. It is almost unbelievable that they ever would "top" the test at this location. The variety Bob ranked first among oat entries in an irrigated test at Uvalde, producing 202 bushels per acre and a 41 pound test weight. This represents a yield record for this location, and the high test weight provides evidence that the rust diseases caused little or no damage. The oat production picture for the 1984 Texas crop will be very different than that for 1983. Although the 1984 seeded acreage increased to 1,500,000 acres, all-time record cold temperatures (both minimum temperatures and duration of sub-freezing weather) during the Christmas season killed or severely damaged most of Texas oat crop north of Austin. We will have little to "brag" about for 1984, and the seeded oat acreage in Texas for 1985 almost certainly will decrease drastically.

Research: We continued to see disturbing levels of stem rust virulence on both Coker and Texas experimental lines having resistance derived from C.I. 9221 although nearly all of these cultures have been identified as race NA27, and no "new" virulence has been detected. The "breakdown" of resistance appears to occur rather late in the season, and may be triggered by high-temperatures, by the approach of physiological maturity, or by "swamping" of the resistance by high inoculum "load" from completely susecptible entries.

For the first time in the U.S., a crown rust culture (College Station nursery collection) has been found to be fully virulent on Coker 234 (and quite likely, virulent on other Coker varieties such as Coker 227, Mesquite, Big Mac, Four twenty two, and H833). According to Dr. Marr Simons, sources of resistance to this culture are rather common. However, the culture represents a real danger in Texas and throughout the South, as the Coker varieties are quite popular, and extensively grown. Our greenbug work is continuing, and we feel that good progress is being made in transferring high-level resistance to biotypes C and E into agronomically acceptable oat lines. Our South American work sponsored by the Quaker Oats Company also is continuing. The "strongest" sources of resistance to the most virulent South American crown rust races appear to be ME1563 (a Canadian Avena sterilis selection) CI8335, and CI8336. Many other sources of resistance to the current U.S. crown rust races are not effective against some of the races prevalent in Brazil and Uruguay.

U T A H

R. S. Albrechtsen
Utah State University

Production. A second consecutive cold, wet spring delayed planting of Utah's oat crop, and resulted in a small reduction in acreage. However, a good supply of irrigation water and an otherwise favorable growing season contributed to a record state-average yield of 68.0 bushels per acre. Utah's oat acreage is small, but has remained quite constant over the last several years. Some acreage is harvested for forage, but most is cut for grain. Essentially all production is under irrigation. Present levels of production are expected to continue. Smut was severe in some nursery entries in 1983, but diseases were generally minimal in commercial fields.

Oat Program. Our oat program is confined largely to the identification of adapted entries in the Uniform Northwestern States Oat Nursery and from other sources.

WISCONSIN

M.A. Brinkman, R.A. Forsberg, R.D. Duerst, E.S. Oplinger
H.L. Shands, D.M. Peterson, P.J. Langston-Unkefer, and K.D. Gilchrist
(Agronomy) and D.C. Arny and C.R. Grau (Plant Pathology)

Wisconsin farmers planted 1,200,000 acres of oats in 1983 and harvested approximately 850,000 acres for grain and straw. The statewide average grain yield was estimated at 52 bu/a, similar to the 1982 average and 7 bu/a lower than the 5-year average for the 1977-1981 growing seasons. Most of the 350,000 acres not harvested for grain and straw were harvested as oatlage at heading. Harvesting oats as oatlage has been increasing in popularity each year. If moisture is adequate, farmers harvest a good crop of alfalfa at the end of the summer if oats were harvested as oatlage. Optimum oatlage quality for dairy cows occurs when oats are harvested in the early to mid boot stage.

Conditions early in the 1983 growing season were excellent in most areas of the state. Planting dates, soil moisture levels, and temperatures during April and May were ideal, so good stands with considerable tillering were established. Unfortunately, the potential for high grain and straw yields was not realized because unusually hot, dry conditions prevailed in June, July, and August.

Wisconsin selection X4024-7 was named Centennial and released to Certified Seed Growers in 1983. Centennial is midseason in maturity, has an attractive plant type, and has excellent resistance to leaf and stem rust. Most of the reports from Certified Seed Growers who planted Centennial in 1983 were encouraging, but there were indications that Centennial does not have particularly good tolerance to heat and drought.

A natural infestation of stem rust occurred in the 1983 nursery at Madison. Analyses of samples submitted to the Cereal Rust Laboratory at St. Paul, Minnesota, indentified the race of rust as NA-27. Most of the varieties in the nursery had excellent resistance to NA-27.

CEREAL CROPS RESEARCH UNIT

The former Oat Quality Laboratory and Barley and Malt Laboratory have been combined to form a larger unit that will carry on the functions of the two former groups plus expand the basic and applied research efforts in barley, oats and other cereal crops. The unit will continue to receive oat groat samples for protein analysis as in the past. The unit currently has three permanent scientists, with another scheduled to join in June. A fifth position is currently being advertised. The unit occupies laboratory and office facilities in the Agronomy Department as well as the USDA-owned Barley and Malt Laboratory at 501 N. Walnut St. Dr. David Peterson is Acting Research Leader.

Current areas of interest in oat research are storage protein characterization and synthesis, cultivar identification by electrophoretic mapping of storage proteins, and fructan synthesis and degradation in

vegetative tissues and developing endosperm. A major new emphasis on starch biosynthesis may relate to oats as well as barley and corn. This project is expected to be initiated in the fall of 1984.

Dr. Rob Welch of the Welsh Plant Breeding Station, Aberzotwyth, U.K. is currently taking a sabbatical leave studying at the Cereal Crops Research Unit. He is attempting to identify hypocholesterolemic factors in oats, in cooperation with Dr. Peterson.

THESIS RESEARCH PROJECTS

Oat Fatty Acid Investigations:

Dr. Russell S. Karow completed his Ph.D. program in August 1983 and accepted a position as Assistant Professor (Cereals Extension Specialist), Oregon State University, Corvallis, Oregon. Manuscripts covering his M.S. research and the methodology section of his Ph.D. research (oat fatty acid inheritance) have been accepted for publication in Crop Science and in Cereal Chemistry, respectively. Manuscripts covering a fatty-acid selection study and lipoxygenase characterization are under review.

Oat Stem Rust Investigations:

Mr. P.D. Brown, who is employed by the Canadian Department of Agriculture at Winnipeg, Manitoba, has completed his Ph.D. research and has submitted his Ph.D. thesis for approval. Mr. Brown has studied the transfer of Pg-16 from tetraploid Avena barbata Pott., D203, to hexaploid A. sativa L. utilizing three different methods and materials -- all involving the use of gamma radiation. Monosomic alien substitution and addition lines and disomic alien addition lines were used.

Oat Crown Rust Investigations:

Mr. Minmin Qin, from mainland China, is studying the transmission of genes for crown rust resistance from the Wisconsin translocation lines to Avena sativa. Meiosis and pollen development in F_1 hybrids between the translocation lines and susceptible A. sativa cultivars will be investigated. Attempts to pyramid similar or nearly similar copies of the same gene into the same line (at different loci) are continuing.

Oat Plant Morphology Study:

Mr. Ronald A. Bunch has initiated a graduate study of the relationship between dry weights of vegetative parts of oat plants and seed test weight and groat percentage. Leaf, culm, panicle, and seed measurements and weights are being obtained for a wide range of plant and seed-quality types.

Performance of Backcross Lines Derived from Avena fatua:

Mr. Jim Stevens is evaluating the agronomic and quality performance of a series of backcross lines derived from Avena fatua for his M.S. research. Recurrent parents were Dal, Stout, and a plump-kerneled line designated X2078-1. Several backcross lines compared quite favorably with their respective recurrent parent. The nursery was grown at Madison in 1983, and will be grown at Madison and Arlington in 1984.

Drought Tolerance in Oats:

Mr. Baldwin Miranda has been evaluating drought tolerance traits in four oat crosses that have Hudson as a common parent in his M.S. research. Traits such as leaf water potential, resistance to transpiration, and stomatal density are being evaluated with respect to agronomic performance in dry and moist environments.

Inheritance of Early Heading:

Miss Doris Sabelka is evaluating the inheritance of earliness in six oat crosses for her M.S. research. The F_2 distributions in crosses with the early heading selection X3530-6-1 indicate partial dominance for earliness. Doris will conclude her field research in 1984.

Dry Matter Accumulation from Heading to Maturity:

Results of a N fertilizer response study conducted in 1979 and 1980 indicated that Stout accumulated signifiantly more dry matter between heading and maturity than Marathon and Lodi when grown in high N conditions. Mr. Abduljabbar Salman has initiated Ph.D. studies that will evaluate progenies of Stout x Marathon and Stout x Lodi crosses for this characteristic. Dry matter accumulation after heading will be related to yield component responses in these crosses.

BULWARK

J. Valentine, D. A. Lewis, B. T. Middleton, E.W.C. Jones
T.E.R. Griffiths and R. B. Clothier

Bulwark, a winter oat variety bred at the Welsh Plant Breeding Station, results from the cross (9799 Cn x Maris Quest) x Peniarth and was produced by the pedigree breeding method.

Bulwark is 12% higher yielding than Peniarth and at least 3% higher yielding than Pennal. It has medium length straw which is stout and thick-walled, conferring good resistance to lodging. The variety is less resistant to mildew, and also less winter-hardy, than Pennal and Peniarth. It is resistant to stem eelworm and tolerant to soil-borne oat mosaic virus.

Bulwark has been added to the National Institute of Agricultural Botany Recommended List of cereals for 1984.

CALIBRE OATS

B.G. Rossnagel and R.S. Bhatty
Crop Development Centre
University of Saskatchewan
Saskatoon, Saskatchewan, Canada

Calibre oats was licenced (Agriculture Canada Licence #2315) and released in Canada in March 1983. Calibre was developed at the Crop Development Centre from the cross Gemini/Clintford originally made by Dr. D. Sampson at the Agriculture Canada Research Station, Ottawa and generously made available to the Crop Development Centre as F_2 bulk seed in 1974.

Thereafter this material was handled by a pedigree breeding method with first testing of the line S7886 in yield trials at Saskatoon in 1978. After further testing it was entered in the 1980-1982 Western Coop Oat Test under the designation OT308.

Calibre is well adapted to the major oat growing regions of Saskatchewan and Alberta, but because of a lack of disease resistance it is not suited to the Oat Rust Area of Manitoba and South-east Saskatchewan.

Calibre has high yield potential, being equal to Cascade. It outyielded Harmon by 12% and Dumont by 3% in three years of Coop testing. However, Calibre differs from Cascade in that it combines superior kernel quality with high yield potential.

Calibre's test weight has consistently been 3.0 kg/hl, (2.2 lb/bu) greater than Cascade and its hull percentage is 3% less. Its kernels are larger than Cascade's, but of similar plumpness. With the exception of plumpness, Calibre's kernel quality is generally superior to that of Dumont.

Calibre is similar to Cascade in height and straw strength. It is 2-3 days later than Cascade but 1-2 days earlier than Dumont.

Calibre consistently shows superior milling quality when compared to Cascade and although the difference is not as striking it is generally better than Dumont as well.

The development of Calibre was greatly aided by the financial support of the Quaker Oats Co. of Canada to the Crop Development Centre Oat research effort.

Commercial supplies of seed should be generally available by 1985.

DOLPHIN

Andrew R. Barr

Dolphin is an early midseason oat released by the South Australian Department of Agriculture. It was selected by A. R. Barr (S. A. Department of Agriculture) and J. D. Oates (Plant Breeding Institute, University of Sydney) from the cross West*OT207 made by A. R. Barr in 1977. OT207 is a mutant developed in Manitoba, Canada which carries the dwarfing gene Dw6. Dolphin is intended to be used for feed grain production in the higher rainfall zones of South Australia.

Dolphin flowers between 2 and 4 days later than West but matures only slightly later than West. It is much shorter than West or Swan - typical heights are West 100 cm, Swan 111 cm, Dolphin 71 cm. The differential in height increases as the crop height increases. Dolphin has shattering resistance superior to any current commercial variety and has outstanding lodging resistance. Early growth is very erect and recovery from grazing is similar to West.

Trials in South Australia in the years 1981 to 1983 indicate that Dolphin has a substantial grain yield advantage over West, Swan and Avon (24, 34 and 18% respectively). It is best adapted to early seeding and the higher rainfall zones of South Australia, i.e., over 450 mm. Despite having a modest yield advantage over current varieties in the lower rainfall zones, the usefulness of Dolphin in these zones is limited by

(1) often being too short in stature for easy harvest
(2) its susceptibility to the cereal cyst nematode, which is widespread in the lower rainfall cereal belt of S.A.

Dolphin ranked eighth overall in the 1983 Series III Interstate Oat Variety trials.

Dolphin has short, wide grain which has very low screening losses. However, its hectolitre weight, grain weight and kernel percentage are inferior to West and Swan. Protein content is intermediate between West and Swan. Animal utilization studies indicate that Dolphin should be suitable for ruminant feeding. Husk colour is mid-brown.

Tests by J. D. Oates indicate that Dolphin probably carries the genes Pg2 and Pg4 and possibly Pg9 conferring resistance to oat stem rust. Seedling tests at Castle Hill with oat crown rust indicate that Dolphin is heterogeneous in its reaction to races 226, 230, 203 and 427 with approximately 80% plants resistant.

However, as an adult plant in field tests in South Australia and at Longerenong in Victoria, Dolphin was resistant to all races encountered in 1983. Dolphin has been tested for reaction to Barley Yellow Dwarf virus by Dr. A. Comeau of Agriculture Canada, Quebec. These tests confirm field observations in South Australia, i.e., Dolphin has a high level of tolerance to this pathogen. Dolphin also appears to be less susceptible to Septoria than Swan. Stem rust, crown rust, Barley Yellow Dwarf virus and Septoria are the most common and damaging diseases of the higher rainfall zones of South Australia. Dolphin should therefore provide growers with good insurance against severe loss due to foliar disease.

ECHIDNA

Andrew R. Barr

Echidna is an early-midseason oat released by the South Australian Department of Agriculture. It was selected by A. R. Barr from the cross West*OT207 made in 1977. OT207 is a mutant developed in Manitoba, Canada which carries the dwarfing gene DW6. Echidna is intended to be used for grain production in the medium-high rainfall zones of South Australia.

Echidna flowers between 2 and 5 days later than West but matures only slightly later than West. It is much shorter than West or Swan - typical heights are: West, 100 cm; Swan, 111 cm; Echidna, 65 cm. The differential in height increases as the crop height increases. Echidna has shattering resistance superior to any current commercial variety and has outstanding lodging resistance. Early growth and recovery from grazing are similar to West.

Trials in South Australia in the years 1981-1983 indicate that Echidna has a substantial grain yield advantage over West, Swan and Avon (32%, 45% and 35% respectively). It is adapted to a wide range of climatic zones and seeding times but its usefulness in low rainfall zones is limited by

(1) often being too short in stature for easy harvest

(2) its susceptibility to the cereal cyst nematode, which is widespread in the lower rainfall cereal belt of S.A.

Echidna ranked first overall in the 1983 Series III Interstate Oat Variety trials.

Quality tests indicate that Echidna should be suitable for both milling and feed pruposes. The grain has excellent kernel percentage, being slightly superior to West and Swan. Its hectolitre weight is also excellent, similar to Swan, while screening losses are intermediate between West and Swan. The grain size is small and is usually similar to or smaller than West. The protein content is lower than West and slightly lower than Swan. Husk colour is cream-pale yellow.

Echidna is moderately resistant to oat stem rust and probably carries, at least, Pg2 and Pg4. It is susceptible to crown rust and septoria. Its tolerance to Barley Yellow Dwarf virus could be described as 'moderate' and is similar to West. Echidna is susceptible to cereal cyst nematode and exhibits little tolerance to this organism.

KELLY OATS

D. L. Reeves and Lon Hall

'Kelly', SD 743358-06, P.I. , is a spring oat (Avena sativa L.) cultivar developed by the South Dakota Agricultural Experiment Station. It was derived from a 'Dal'/'Nodaway 70' cross which was made in 1972. The first selection came from one F_2 plant and was an F_3 row selected for crown rust resistance. This was carried as a bulk until an early F_6 panicle was selected.

Kelly is a tall, early oat heading at the same time as Preston and Nodaway 70 and being the same height as Nodaway 70. Yields have been equal to or better than Nodaway 70 at most locations, but much higher when crown rust is prevalent. Kelly could be considered an improved Nodaway 70. This is due to better crown rust resistance and better straw strength.

Under field conditions Kelly has shown moderate resistance to crown rust. At Brookings, SD, crown rust readings for 1982 and 1983 have been 17, 25, and 22, 55, respectively for Kelly and Nodaway 70. The probable genes for stem rust it has are Pg 2 and 4. Kelly is smut resistant but susceptible to barley yellow dwarf.

The grain is white hulled and has a high test weight. In statewide trials the test weight of Kelly has averaged 0.5, 0.1, and 0.8 pounds above Nodaway 70 for the past three years. In the same trials its average test weight exceeded Preston by 0.9, 1.8, and 1.1 pound per bushel. The groat percentage is good being intermediate between Nodaway 70 and Preston.

Groat protein is moderately high. The three year average in South Dakota has been 19 percent which is one percent above Nodaway 70. Groat oil has averaged 7.5 and 6.7 percent, respectively, in 1982 and 1983 statewide trials. This is 0.8 and 1.0 percent above Nodaway 70 in the same tests.

The variety is named after Clarence "Kelly" Olson, a research technician on the small grains project in South Dakota for many years.

MORTLOCK

R. J. McLean and P. A. Portmann

Mortlock is a mid-season oat cultivar released in 1984 by the Western Australian Department of Agriculture for grain production. It is expected to replace West, Moore and Hill in most agricultural areas of Western Australia.

The cultivar was selected from the cross Elan 6161/3/(66Q01-63) FULMARK/NEWTON//SWAN made in 1972, and was field tested initially as the cross bred 72Q006-29-8, and subsequently as 72Q/145.

Mortlock is a high yielding cultivar which flowers about two days later than West. It is approximately 5% shorter in height than West and shows superior straw strength.

On average over the state Mortlock outyields West by 6% and by 9%, 4% and 5% in the high (>450 mm), medium (325 - 450 mm) and low (<325 mm) rainfall zones. Mortlock maintains its yield advantage over other cultivars through a range of sowing dates and soil types.

Quality tests indicate that Mortlock is an excellent milling quality oat. In comparison with West it has similar husk colour, nitrogen content and groat percentage, and superior hectolitre weight, grain plumpness and groat weight.

Tests at Sydney University have shown Mortlock to contain genes Pg1 and Pg2 for resistance to stem rust. Mortlock is mixed for reaction to crown rust.

RHIANNON

J. E. Jones

Rhiannon was produced from a cross of (Nuprime x Pendrwm) x Mostyn the first naked oat variety produced from the Welsh Plant Breeding Station's spring oat breeding programme. During 1983 it was placed on the United Kingdom National List of spring oat varieties following two years of tests. Its average yield in those 2 years, as a percentage of the National Institute of Agricultural Botany's covered controls in over thirty trials was 79%. This yield equalling the groat yield of these modern control varieties could be a commercial proposition to some growers in this country looking for a high quality home grown feed. This variety also has good mildew resistance with straw height similar to the short controls such as Leanda and Trafalgar, with the straw also being very stiff therefore good resistance to lodging. The spikelet is compact for a naked oat due to the short rachila, also has good seed shattering resistance. The emergence of such a good quality variety in a relatively new breeding programme (first crosses made in 1972) has given us a lot of confidence in the future of naked oats in the United Kingdom.

STEELE

Michael S. McMullen and J. D. Miller

'Steele' spring oat was developed at the North Dakota Agriculture Experiment Station in cooperation with USDA-ARS and released in 1984. It was designated ND78376 during developing and testing.

Steele resulted from a cross of 'RL3038'/'Dal'//'Noble'. RL3038 is a germplasm line with crown rust resistance genes Pc-38 and Pc-39 and stem rust resistance genes Pg-2 and Pg-13. RL3038 was developed at the Agriculture Canada Research Station in Winnipeg and obtained courtesy of Dr. R.I.H. McKenzie. Steele originated as a single F_4 plant selection. Breeder seed originated by bulking approximately 100 F_7 panicle rows.

Steele is protected from crown rust by the resistance genes Pc-38 and Pc-39. It is protected from the prevalent races of stem rust by Pg-2 and Pg-13. It has moderate tolerance to Barley Yellow Dwarf Virus.

Steele has been evaluated in yield trials in North Dakota since 1980. During this period Steele has produced higher grain yield, test weight and grain protein percentage than Fidler. Steele is a midseason oat and heads 4 days earlier than Fidler.

Kernels of Steele are light tan to white with some weak awns which separate during threshing.

Approximately 1200 bushels of Steele are available for sowing in 1984. Steele was named for Steele County in east central North Dakota.

Evaluation of Small Grains Germplasm

L. W. Briggle and D. H. Smith, Jr.[1/]

Systematic evaluation of accessions in the USDA-ARS National Small Grains Collection was initiated in 1983. New funding was obtained specifically for this purpose; however, the present level of support is very limited. If additional funding is not forthcoming soon, the task of evaluating all accessions could take more than 20 years - well into the next century.

Crop Advisory Committees for wheat, barley, oats, and rice each have determined a set of descriptors appropriate for the specific crop species.

A total of 5,000 wheats and 2,500 oats were grown at Aberdeen, Idaho, in 1983 for evaluation. Field data were recorded on such descriptors as number of days from planting to anthesis, plant height, spike (or panicle) type, spike (or panicle) density, straw lodging, straw breakage, awn and glume characteristics. At maturity spikes or panicles were collected from each row prior to harvest. Seed and more precise spike (or panicle) data will be obtained in the laboratory at a later date. Each row was harvested and the grain weight recorded. The bulk grain will be returned to Beltsville for storage and eventual further evaluation (disease and insect resistance, quality factors, etc.)

Approximately 2,000 additional wheats were evaluated at Mesa, Arizona, in 1983 and handled in much the same manner.

About the same number of wheat and oat accessions will be field evaluated in 1984 at the same locations. In addition, we plan to begin evaluation of the barley accessions at Aberdeen, ID, in 1984.

Evaluation for disease and insect resistance was initiated during 1983 and will be expanded as much as possible in 1984. Growth habit (winter or spring types) determination is also underway.

1983		1984	
St. Paul, MN	Wheat & Oat Stem Rust	St. Paul, MN	Wheat & Oat Stem Rust
Manhattan, KS	Wheat Leaf Rust	Manhattan, KS	Wheat Leaf Rust
Ames, IA	Oat Crown Rust	Ames, IA	Oat Crown Rust
Urbana, IL	Oat BYDV	Urbana, IL	Oat BYDV
Lafayette, IN	Wheat Hessian Fly	Lafayette, IN	Wheat Hessian Fly
		Corvallis, OR	Wheat Smuts
Bozeman, MT	Wheat Growth Habit	Bozeman, MT	Barley & Wheat Growth Habit
		Davis, CA	Wheat, Barley, & Oat BYDV

[1/]Research Agronomist and Curator, National Small Grains Collection, Plant Genetics and Germplasm Institute, Beltsville Agricultural Research Center-West, Beltsville, MD 20705

REPORT FROM THE NATIONAL SMALL GRAIN COLLECTION

D.H. SMITH, JR.
CURATOR

Distributions from the collection amounted to approximately 500 individual requests for seed samples of the seven genera of crops held in the NSGC, namely, wheat, barley, oats, rice, rye, triticale, and Aegilops.

During the summer of 1983 we initiated the evaluation of the wheat and oat collections using the descriptors recommended by the respective Crop Advisory Committees. The details of this project and future plans are covered in another report in the newsletter.

Additional cold storage space is under construction for the collection. An insulated building, 20' x 30' has been erected adjacent to the existing buildings housing the collection. The refrigeration and humidity controls are being installed and we should have the use of this space in the near future.

The assignment of accession numbers to new entries in the collection is done by Dr. George White, Principal Plant Introduction Officer. The procedure is to send me the description and 500g of seed and I will send them to Dr. White. The descriptions do not have to be lengthy and usually a copy of the draft of the release statement contains sufficient information for the PIO to document the accession.

Clearance of varietal names is also handled through my office. We check our files for conflicts prior to sending the request to Al Burgoon in the Federal Seed Lab. where he checks his records and contacts the Trademark Division for their recommendation.

OAT PI NUMBERS ASSIGNED IN 1983

PI NO.	Name/Designation	Pedigree	Class	Source
476215	Pierce	Hudson/Dal	Spring	North Dakota
476810	Centennial	Holden/5/Garland/3/6x-amphiploid/ C.I. 6936/2/C.I. 6936/4/ Garland/ 6/Froker/Stormont.	Spring	Wisconsin

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