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OAT NEWSLETTER

Vol. 32

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July 1982

Sponsored by the National Oat Conference

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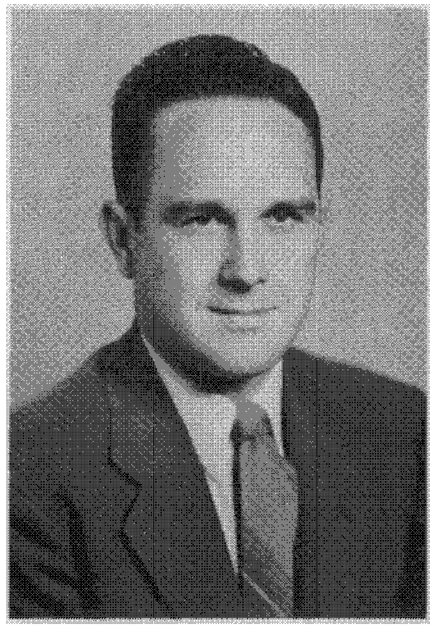
Marr D. Simons, Editor



Dale A. Ray

Dedication in memory

Dr. Dale A. Ray, Professor of Agronomy at Ohio State University, was an active participant in the National Oat Conference for many years. During this time he attained the status of respected, senior colleague and good friend of others in the group. His untimely death at age 58 in November 1981 saddened all who knew him. Thus, it is fitting that this issue of the Oat Newsletter, Volume 32, be dedicated to his memory.

Dr. Ray received his B.S. degree from Purdue University in 1947 and his M.S. from the same university in 1949. He was awarded the Ph.D. degree in Agronomy in 1952 from North Carolina State University. From 1952 to 1956 he served as Assistant Professor of Agronomy and Genetics at West Virginia University, and then moved to Ohio State University, where he served until his death.

At Ohio State, Dr. Ray carried a heavy teaching load with responsibilities in crop breeding and statistics at the graduate and undergraduate levels. His excellence as a teacher, and rapport with students was attested to by their giving him an outstanding faculty award.

The limited time he had available for research was divided between oat and barley breeding. His particular interests were the development of high protein oat cultivars, and the transfer of the high protein trait from *Avena sterilis* to cultivated oats. He was a regular and active participant in both the Northcentral and National Oat Conferences, and his useful and informative contributions to the discussions of these groups was always appreciated.

He was also active in the more general aspects of plant breeding as evidenced by his work with the Ohio Seed Improvement Association. He served for many years on the board of directors of Ohio Foundation Seed, Inc., and on variety release committees. For the last several years of his life he had the opportunity to contribute to the improvement of oats and other crops on a broader basis as Assistant Chairman of the Department of Agronomy at Ohio State.

Dr. Ray was a devoted family man, who lived a full and well-rounded life. He was active in campus and community affairs, and his many friends both within and outside the Oat Conference, greatly regret his passing.

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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."

Minutes of joint meeting of the American Oat Workers' Conference
Committee and the National Oat Improvement Council Committee

University Park, Pa., June 20, 1982

In attendance: R. A. Forsberg, L. W. Briggle, D. Western,
H. Shands, M. D. Simons, P. Johannsen,
C. F. Murphy, R. McKenzie, K. J. Frey, V. Burrows,
D. M. Petersen, D. J. Schrickel, M. E. Sorrels,
M. E. McDaniel, M. Navarro-Franco, G. Shaner,
D. D. Stuthman, H. G. Marshall

Chairman R. A. Forsberg presided. He began by reviewing formation of the National Oat Improvement Council (NOIC) and the Legislative Visitation Committee since the last American Oat Workers' Conference. Two committees were appointed in connection with the First International Oat Research Workshop. The first committee (K. Frey, R. McKenzie, and B. Mattsson) studied the interest in having this Conference. The second committee (Murphy, Chairman, Schrickel, Martens) sought travel funds that might be used to assist foreign participants. Committees for the current meeting were: Nominating Committee (C. Murphy, Chairman, V. Burrows, H. Marshall, D. Schrickel); Committee for Distinguished Service to Oat Improvement Award (D. Petersen, Chairman, D. Stuthman, H. Ohm, M. McDaniel, J. Martens); Resolutions Committee (C. Brown, Chairman, S. Weaver, M. Brinkman); Meeting Site Committee for 1986 AOWC (M. McDaniel, Chairman, Marshall, Burrows).

Chairman Forsberg called for subcommittee reports.

In the absence of D. Wesenberg (travel delay), Chairman Forsberg summarized the activities of the GRIP Oats Technical Advisory Committee and Subcommittee for Improved Utilization of Oat Germplasm (D. Wesenberg, Chairman, R. Forsberg, C. Murphy, D. Schrickel, G. Shaner). Forsberg reported that $100,000 for evaluation of oat germplasm may be in the 1983 USDA budget. The above Committee has developed a germplasm enhancement plan which was sent to Quentin Jones and D. Dewey. The plan covers a 5 year period. The Committee favors state involvement in this work contrary to a plan prepared by Dewey which would involve mostly ARS, USDA effort. Murphy and Stuthman commented in support of strong state involvement and emphasized the importance of rejecting the Dewey plan that evaluation be done primarily at one location by a federal team. Murphy suggested that the group (AOWC) should make a strong statement to that effect. Briggle emphasized that germplasm evaluation should be done by scientists with the most expertise regardless of affiliation. He believes a point has finally been reached where some funding will become available. Stuthman pointed out that there are not enough USDA oat workers to do the germplasm evaluation unless they are redirected.

Pam Johannsen (GRIP) commented on the computer systems that have been developed to handle germplasm resources information. She stated that regional Germplasm Centers will be brought into the system first and the small grains crop will follow. There now are 12 crops with germplasm committees and proposals have been prepared for six crops. Tobacco and tomatoes have received some funds during the current year. She emphasized the need for improved communication channels among germplasm workers and groups.

There was some discussion about problems associated with professional recognition for germplasm evaluation and enhancement (putting useful genes in improved backgrounds).

D. Schrickel reported on activities of the Legislative Visitation Committee during annual visits to Washington, D.C. He stated that congressional members and ARS, USDA administrators now know who we are and seem to be genuinely interested in oat problems. In 1982, Schrickel, R. Forsberg, and C. Murphy all testified before the House Agriculture Committee. Schrickel and Forsberg have testified during each of the past 3 years. Expenses of these visits to Washington are paid by The Milling Oats Improvement Association. Schrickel reported that this Association will be expanded to include other companies involved in the oat grain trade business. They plan to hire a part-time secretary-manager, develop a newsletter, and otherwise expand their activities.

Marshall commented that the Legislative Visitation Committee members have gained valuable experience and some mechanism should be established to control the rate of turnover on this important committee.

Frey was asked to comment on the need for continuation of international meetings of oat workers. He reported that there is a strong interest but funding for travel will be a problem.

No further business developed and the meeting was adjourned by Chairman Forsberg.

Respectfull submitted,

H. G. Marshall

H. G. Marshall
Secretary, AOWC

Minutes of the Business Meeting
American Oat Workers' Conference
and
First International Oat Research Workshop
June 23, 1982

Chairman R. A. Forsberg presided.

Frey reported for the Committee on International Oat Research Workshop (Frey, McKenzie, Mattsson). The Committee received 85 replies in response to a survey of world oat workers. Workers were in favor of such a meeting and the present joint meeting with the American Oat Workers' Conference (AOWC) resulted. Based on the poll, workers favor such a meeting every 4 to 5 years. At the current meeting, the Committee was expanded to include H. L. Shands (USA), W. H. Baier (Germany), and T. Morikawa (Japan). The Committee recommended that a Second International Oat Research Workshop be held at Aberystwyth, UK, in 1986, preferably during the last 2 weeks of July and for a 3 to 4 day period. Frey presented this as a motion. A discussion followed about the timing of the International Workshop relative to the AOWC which has been held every 4 years and normally would also fall in 1986. V. Burrows indicated they would like to have the AOWC meet at Ottawa in 1986 because that is the centennial year for Agriculture Canada.

Marshall suggested that the two groups meet as follows:

International	- 1985, 1988, 1992
AOWC	- 1986, 1990, 1994

After 1992, both groups would meet every 4 years with 2 years between one meeting and the other. Murphy moved that this schedule be adopted and Shands seconded. Brown suggested the group might not want to tie the international meeting to a rigid schedule, and the motion was amended to only provide for meeting in 1985. D. Lawes stated that he would have to check with station administrators regarding 1985 (rather than 1986). Assuming approval, the motion passed with Aberystwyth people selecting the date in July. Muprhy emphasized the value of meeting early enough to see winter as well as spring oats.

The present Committee on International Oat Research Workshop (Frey, Chairman, McKenzie, Mattson, Shands, Baier, and Morikawa) was designated as steering committee for the workshop.

McDaniels reported for the Meeting Site Committee for the 1986 AOWC. Burrows again volunteered Ottawa, Canada, and Wesenberg volunteered Pocatello, Idaho. The group chose Ottawa for the 1986 site.

Election of officers was the next order of business. Murphy reported for the Nominating Committee (Murphy, Chairman, Burrows, Schrickel, Marshall) and gave the following nominations for officers of the AOWC:

Chairman	- D. D. Stuthman, D. Wesenberg
Secretary	- H. G. Marshall
Editor of Newsletter	- M. Simons

The Committee also recommended that the past chairman of the AOWC serve as chairman of the National Oat Improvement Council (NOIC) unless the past chairman is not from the USA. This was adopted by the Conference.

Motion was made (Frey) and passed that Marshall and Simons be retained in present positions.

There were no further nominations for chairman of the AOWC. D. Stuthman was elected Chairman of the Conference.

Chairman Forsberg called for nominations from the floor for three at large members to the American Oat Workers' Conference Committee. Nominees were G. Shaner, C. Murphy, and S. Weaver. These men were elected by acclamation.

Wesenberg reported from the committee for Improved Utilization of Oat Germplasm (Wesenberg, Chairman, Forsberg, Murphy, Schrickel, Shaner). The Committee has developed a list of priority traits for evaluation and selected locations for this work. The plan will be sent to AOWC membership for comments along with a germplasm enhancement plan.

McKenzie reported for the Gene Nomenclature Committee (R. McKenzie, Chairman, J. Martens, I. Nishiyama, H. Thomas, H. Rines, M. Simons, J. Sebesta). About 20 new gene symbols were assigned during the past 4 years. Two groups are working on monosomic stocks in oats. The Committee requested that stocks with identified genes be stored at Colorado or some similar safe place.

Simons reported on the Oat Newsletter. The 1981 Newsletter is being held to include the abstracts from papers at the current meeting. He thanked Quaker Oats Company for sponsoring the Oat Newsletter.

In the absence of Schrickel, who had departed, Forsberg asked Murphy to report on activities of the Legislative Visitation Subcommittee of the NOIC. He emphasized that this Committee has had important impacts on issues like germplasm preservation and retention of the Oat Quality Laboratory.

Weaver reported on the function of the Milling Oats Improvement Association. They recently are attempting to increase the size to include anyone interested in promoting oats.

Briggle reported for the National Program Staff, ARS, USDA. He indicated that the Legislative Visitation Committee has been very effective and helpful through support of ARS programs. He is concerned about pressure from OMB to divert effort from varietal development. There also is pressure on service type programs. The current emphasis is on basic research. Briggle voiced optimism about increased funding for the Small Grains Collection.

Briggle also reported that *Avena sterilis* has been placed on the noxious weed list. Workers will need a permit to use it in their programs. The species can be introduced into the World Collection by going through a routing procedure.

In response to a question from D. Western, Briggle reported that there has been little increase in funding for the National Oat Quality Laboratory. Petersen reported that the Laboratory does about 25,000 samples per year for protein.

Forsberg initiated and led a brief discussion of the pros and cons of dropping C.I. numbers in favor of only P.I. numbers on new entries in the World Collection. Smith reported that there is no plan to renumber old entries that presently have C.I. numbers. Discussion ended without a concensus.

Brinkman read the following resolutions from the Resolutions Committee (Brown, Chairman, Weaver, Brinkman):

> Whereas this has been a most successful First International Oat Research Workshop and American Oat Workers' Conference, and whereas the success of this workshop and conference was due in large part to the excellent facilities, arrangements and coordination provided by our fine hosts:
>
> Therefore, be it RESOLVED that the participants at this conference and workshop express their sincere appreciation to Penn State University, especially the Departments of Agronomy and Plant Pathology and the Keller Conference Center, for being most gracious hosts.
>
> Also, be it RESOLVED that the participants at this workshop and conference convey a special message of appreciation to Dr. Harold Marshall for his contributing many hours towards making this event most worthwhile. Thanks, Harold, for a terrific job.
>
> Whereas many of the participants at this First International Oat Research Workshop came from distant countries from around the world, and whereas their presence at this workshop made it truly international,
>
> Therefore, be it RESOLVED that the participants, particularly those from the United States, commend the participants from these countries for their contributions and enthusiasm in making this an extremely successful international oat workshop.
>
> Whereas the Milling Oats Improvement Association provided beverages for the Sunday evening social gathering, the Quaker Oats Company funded the Tuesday evening steak fry, and Agway, the Beachley-Hardy Seed Company, and Seedway Inc. contributed to morning and afternoon refreshments,
>
> Therefore, be it RESOLVED that the participants of the conference hereby gratefully acknowledge the financial contributions of these organizations.
>
> Whereas Dr. R. A. Forsberg has faithfully served the American Oat Workers' Conference as Chairman, therefore be it RESOLVED that the members of the American Oat Workers' Conference extend a sincere thanks for his fine leadership, counsel, and guidance during the past 4 years.

New Chairman, D. Stuthman, adjourned the meeting at 4:05 pm.

Respectfully submitted,
H. G. Marshall
H. G. Marshall
Secretary, AOWC

Minutes of the Biennial Business Meeting of the
North Central Region Oat Improvement Committee (NCR-15)
June 21, 1982

The 1982 NCR-15 business meeting was held in conjunction with the American Oat Workers Conference and First International Oat Research Workshop at The Pennsylvania State University, University Park, PA. The meeting was called to order at 8:00 a.m. by the chairman, Greg Shaner.

Administrative Advisor Dr. Warren Sahs reported the renewal of NCR-15 was due in 1983 and the new chairman should begin to work on the renewal.

Uniform Nurseries

Dr. Howard Rines discussed distribution of entries in the Uniform Midseason Oat Performance Nursery (UMOPN) and Uniform Early Oat Performance Nurseries (UEOPN) to foreign investigators. Bengt Mattsson indicated he would like to grow the nurseries in Sweden and information from Sweden may be useful to U.S. workers. Ken Frey asked if the UMOPN and UEOPN should be treated any differently than the International Oat Rust Nursery (IORN) as there are no restrictions on use of germplasm from the IORN. Lee Briggle indicated that the IORN is comprised of lines that are usually not advanced enough to be ready for release and that the person entering the line in the IORN realizes that it is an international nursery so that changing the policy of distribution could discourage entry of lines in the UMOPN and UEOPN. Deon Stuthman asked if the person entering the line in the nursery could indicate if it is available for distriution to others. Vern Burrows suggested that assigning C.I. numbers to lines gives permission for distribution to any bònafide researcher. Rines indicated very few lines were assigned C.I. numbers. C. M. Brown suggested that different experiment stations have different restrictions and that setting a precedent with oats may cause problems in other crops which have more restrictions on distribution. Frey suggested a useful compromise may be to send the entry list to foreign investigators so that they may request a line of interest from the originator. R. A. Forsberg felt an observation nursery distributed to foreign investigators would be useful for fostering exchange of information. H. L. Shands indicated that private breeders may not want lines distributed for use as parents. Rines indicated that the amount of seed required for the first year may be critical and limit distribution, but seed from Aberdeen, Idaho may be available for second year distribution. Rines suggested there were enough varied opinions concerning policy change that no formal motion could be made without further study.

Burrows asked if dwarf lines should be handled differently when they occur in the nursery. Harold Marshall indicated his semidwarf lines require special management for optimum production. Breeders with semidwarf lines should exchange among themselves at present.

Oat Quality Laboratory

Deon Stuthman suggested a system of priority is needed for sample submission to the Oat Quality Laboratory. The following system was suggested for determining priority:

1. Each cooperator should divide his samples into priority 1 and
2. First priority samples should not exceed 2500 entries from the breeding program. Non-grain samples are automatically second priority.
3. First priority samples must be submitted by a certain date (December 31).
4. First priority samples will be analyzed by order of receipt. Special requests may be made.
5. Second priority samples will be analyzed by order of receipt after first priority are finished.
6. Ground samples may receive special consideration.
7. A deadline should be set after which samples for a crop year will not be accepted.
8. The Quality Lab should be informed of when and how many samples will be sent from each location so that their labor requirements may be planned accordingly.

C. M. Brown suggested the deadlines should be set early and breeders should be selective of the samples they submit. H. Marshall felt that 2500 entries is too many for first priority samples from a single location.

Stuthman felt that further discussion was needed before a formal motion could be acted upon.

State Reports

Illinois: (C. M. Brown) A small increase of IL75-5860 has been made. It has good crown rust resistance and kernel type, but straw strength may not be adequate. There is some interest in release of this line.

Indiana: (D. Baltenberger) BYDV is prevalent in early planted oats.

Iowa: (K. Frey) Intend to release a new multiline, IA X2, with 10 crown rust genes in the Lang background.

Michigan: (R. Freed) Oat acreage inreased 25% partially due to poor survival of winter wheat. Heritage is performing well and in demand by farmers. BYDV is prevalent.

Minnesota: (D. Stuthman) Purification of MN79229 (Dal/Lyon) is underway. Browning of leaf tips which occurs in this line may be undesirable.

Nebraska: (W. Sahs) The Nebraska program consists of testing lines developed in other states.

North Dakota (M. McMullen) The breeding program is emphasizing stem and crown rust resistance and to a lesser extent BYDV tolerance. Moore is gaining popularity in the east and Otana in the west.

South Dakota: (D. Reeves) An early derivative of a Spear/Kelsey cross is being evaluated for release.

Wisconsin: (R. A. Forsberg) The herbicide 'Glean' was used successfully for weed control in oat nurseries.

Canada: (R. McKenzie) Dumont has been licensed. It provides stem rust resistance (pg 13) and crown rust resistance (Pc38, Pc39) and is expected to replace Harmon. Dumont (W78286) differs from W78296 only in hull color.

(V. Burrows) Two lines have been licensed, Donald (OA366) and Woodstock (OA421-7).

Plans for next meetings:

R. McKenzie extended an invitation to hold the NCR-15 Oat Workers Field Day in Winnipeg during the summer of 1983 on a date yet to be selected according to stage of development of their nurseries.

Election of officers:

M. D. Simons was re-elected editor of the Oat Newsletter

M. McMullen became chairman of NCR-15

Dale Reeves was nominated by K. Frey and seconded by M. D. Simons for Secretary of NCR-15. The nomination was passed by unanimous vote.

Respectfully submitted

M. S. McMullen
Secretary NCR-15

1981 North Central (NCR-15) Oat Workers Field Day

North Central oat workers gatherd at the University of Wisconsin-Madison for their 1981 annual Field Day on July 12-13, 1981. Activities officially began at 7:30 p.m. (July 12) in Lowell Hall where Dr. Deon Stuthman, University of Minnesota, moderated a two hour discussion on "Priorities For Oat Research."

The group toured the Wisconsin oat breeding nurseries on Monday, July 13. The Wisconsin breeding system follows the conventional pedigree method very closely. Both hand and mechanical procedures are employed, with detailed selection based on individual plant and individual line agronomic characteristics and on individual plant and individual panicle seed quality. Crosses are made in both the field and greenhouse, and about 15 percent of the F_1 hybrids are involved in usually one backcross. The F_2 populations are either space-planted by hand (40 seeds per 10-foot row) or tractor planted at 40, 80, or 120 seeding rates per 10-foot row. Individual plants and panicles are harvested from the hand-planted F_2 populations, while panicles to be selected in the tractor-planted F_2 series are tagged for selection during the latter part of the growing season. Some crosses made for protein improvement and crosses among elite agronomic parents are the top priority which are hand-planted in F_2. Seeds from harvested F_2 plants are tractor-planted in single 10-foot F_3 rows. In all generations, individual panicles are threshed separately, and the seeds are planted by hand in 5-foot rows arranged back-to-back with Markton as a rust spreader between the two banks of rows. During the winter, the seeds of each harvested plant or panicle are poured into a small dish and inspected for quality. Roughly, one-half of the panicles selected are retained, leading to approximately 7,000 field head rows per year. Based on phenotype and rust (crown and stem) reaction, 4-6 panicles are harvested from "selected" lines.

The head rows are identified by individual generation up through F_6, thereafter being placed in the "advanced generation" series. Harvesting a line in bulk is usually delayed until F_6 and later, although a few F_5 lines are cut (and also selected).

The main preliminary performance trial is composed of about 100 entries planted systematically in two-row plots, 10-feet long, with three replications. Superior performing lines are advanced to the main performance nursery composed of 100 entries planted in four-row plots, 10-feet long, with four replications using a partially balanced, simple lattice (repeated) design. Superior lines are further evaluated in five other state tests and in the drill-plot test at Arlington. The Uniform Midseason Oat Performance Nursery entries are integrated into the main Madison trial.

Two other supplemental performance trials are conducted at Madison: (1) an early-maturing test which includes the Uniform Early Oat Performance Nursery, and (2) a late maturing test. These latter two tests are composed of replicated four-row plots and are used as supplements to the main nursery trial.

All yield-trial entries and all head rows are scored individually for reaction to crown rust each year. Entries in all preliminary and main yield trials are evaluated for crown rust reaction in three separate tests: (1) in their respective yield trials where infection is mostly natural; (2) in a head row series where the spreader row is inoculated; and (3) in a buckthorn nursery.

Thesis research projects were explained by Mr. Russ Karow (oat fatty acid inheritance) and by Mr. Ben Hable (inheritance of crown rust resistance from oat translocation lines).

Dr. Deane Arny, Department of Plant Pathology, discussed his oat smut screening procedure and a smut inheritance study being conducted by Mr. Don Caine.

Dr. Marshall Brinkman and Dr. H. L. Shands led a tour of their International Oat Germplasm project which is supported by Quaker Oats and is conducted in collaboration with Dr. Milt Mc Danial at Texas A & M. The primary components of the nursery consist of: (1) a series of elite lines that are referred to as "test lines" and are planted in 5-foot rows; (2) a crossing block; (3) a series of F_1's; (4) a series of F_2's planted in 10-foot rows and harvested as bulked F_2's; (5) a series of 10-foot F_3 rows; and (6) several additional series of 5-foot rows that are included because they possess specific traits. Each year agronomic and disease evaluations are made in all components of the nursery. Most of the 1981 crosses made emphasized BYDV and crown rust resistance. In recent years the nursery has had many lines with excellent crown rust resistance.

Dr. Brinkman also pointed out several research projects that are evaluating drought tolerance in oats, the production stability of spring-sown small grains, and the usefulness of _A. fatua_ germplasm in oat breeding.

Submitted by
M. A. Brinkman

Oat Workers in Attendance

Zig Arawinko
Charlie Brown
Doug Brown
Ron Duerst
Sonja Fillingsness
Bob Forsberg
Keith Gilchrist
Ben Hable
Don Harder
Henry Jedlinsky
S. Johnson
Al Jose
Russ Karow
Pat Langston
Joe Lauer
Bill Laskar
Pat Le Mahieu
Mike Mc Mullin
Matt Moore
Jim Nelson
M. Oussible
Dave Peterson
Howard Rines
Paul Rothman
M. Sabik
Don Schrickel
H. L. Shands
Greg Shaner
Steve Simmons
J. Spitzmueller
Jim Stage
Dean Stuthman
Sam Weaver
Bob Wych

AVENA STERILIS ON FEDERAL NOXIOUS WEED LIST

L. W. Briggle

Many research scietists who used *Avena sterilis* over the years in their programs responded to a recent notice that *A. sterilis* may be placed on the Federal Noxious Weed List. In spite of efforts to prevent such action, we have been notified that *A. sterilis* is now on the Federal Noxious Weed List. Regulations covering introduction and use of *A. sterilis* from now on require that a permit be issued by APHIS (Animal and Plant Health Inspection Service of USDA) to anyone growing plants of that species.

The procedure to be followed if a scientist wishes to obtain an introduction of *A. sterilis* from overseas, or even from the Small Grains World Collection at Beltsville, MD, is to contact Mr. Jim Lackey of APHIS to obtain a permit. Mr. Lackey's address and phone number are:

Mr. Jim Lackey
U.S. Department of Agriculture
APHIS, PPQ
Room 630
Federal Center Building
Hyattsville, MD 20782

Phone: (301) 436-8367

AWARD FOR DISTINGUISHED SERVICE TO OAT IMPROVEMENT

At the 1966 meeting of the National Oat Conference in East Lansing, Michigan, a decision was made to honor selected persons for "recognition of their outstanding research contributions and/or meritorious service toward making oats a successful agricultural crop species." (See 1966 Oat Newsletter 17:1-2).

People who were awarded this honor in the past were: I. M. Atkins, R. M. Caldwell, F. A. Coffman, H. K. Hayes, G. K. Middleton, D. E. Western, O. T. Bonnett, M. B. Moore, H. L. Shands, J. E. Grafius, N. F. Jensen, and J. M. Poehlman.

At the 1982 meeting of the American Oat Workers' Conference held at University Park, PA, Chairman Forsberg appointed a committee to nominate candidates, and two people were chosen in accordance with Conference procedures. Photographs and biographies of the two who were selected to receive the award for distinguished service to oat improvement at the 1982 meeting follow.

Nomination of Fred L. Patterson
for the Award for Distinguished
Service to Oat Improvement

Dr. Fred L. Patterson, Lynn Distinguished Professor of Agronomy at Purdue University has been a world renowned leader in the genetic improvement of oats, wheat and barley. Dr. Patterson has contributed primary leadership in the development of 18 oat, 22 soft red winter wheat, and 5 winter barley varieties. Oat varietal milestones include Clintland, Clintford, Stout, and Noble.

Dr. Patterson has succinctly hypothesized and directed avenues of research in many areas of basic genetics and breeding techniques which he then applied in the development of improved genotypes. His areas of research activity have included genetic control of disease and insect resistance, milling and baking quality, and seed protein improvement.

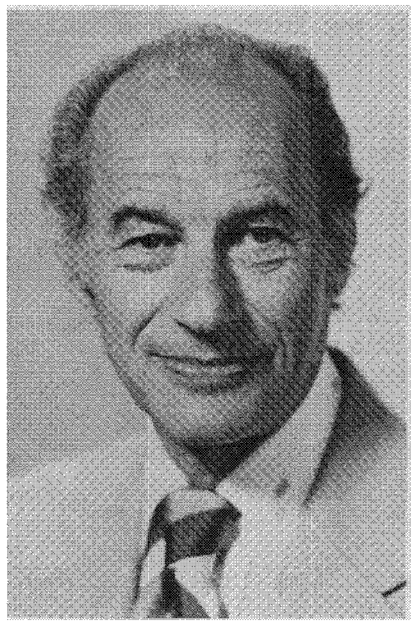
Dr. Patterson is known and respected in agronomic circles throughout the nation. He is the professional model of many who have worked with him. This fame and admiration stem not only from his unique professional competence and contributions, but also from his down-to-earth warmth, friendliness and cooperative spirit.

He is always welcomed as cooperator, counselor, or consultant, because his approach is constructive. He brings to bear on problems the best scientific analysis, reduces tensions, minimizes hostilities, nurtures friendly cooperation, and inspires dedicated effort.

Dr. Patterson has been an outstanding plant breeding teacher. One of his most important contributions and lasting influences will be the awareness and insights of research in general and of the importance of considering the whole plant-environment complex which he instills in his students and colleagues.

Dr. Patterson has received many professional honors and awards including: American Society of Agronomy Agronomic Research Award; DeKalb Crop Science Distinguished Career Award; Honorary Doctor of Science degree, University of Nebraska; President, Crop Science Society of America, and American Society of Agronomy. He has been active on university and national committees.

Dr. Patterson was born April 6, 1916 at Reynolds, Nebraska. He received the B.S. degree from the University of Nebraska, the M.S. degree from Kansas State University, and the Ph.D. degree from the University of Wisconsin. After receiving the Ph.D. degree in 1950, he joined the faculty at Purdue University.



Dr. Tibor Rajhathy was born in Hungary in 1920 and received his B.Sc. (1942), M.Sc. (1943) and D.Sc. (1948) degrees from the Royal Hungarian University of Technical Sciences in Budapest. Following his return from a prisoner of war camp in the U.S.S.R. in 1947, he taught genetics at the University of Agricultural Sciences in Budapest. Between 1950 and 1956 he was Head of the Genetics Department at the Agriculture Research Institute of Hungarian Academy of Sciences. In 1956, Tibor with his wife, two children and parents joined the stream of Hungarian refugees and landed in Canada on December 16. On December 19 he obtained a position of Cytogeneticist with the Cereal Crops Division, Canadian Department of Agriculture.

Tibor first worked on interspecific relationships in Hordeum species which lasted several years and involved an analysis of 55 interspecific Hordeum hybrids. He received international recognition when he was asked to discuss the cytogenetics of barley at the 1st International Barley Genetics Symposium in 1963.

Then Tibor turned his attention to the cytogenetics of *Avena* and described and designated the karyotypes of Avena species for the first time and checked the postulated genome homologies by studying chromosome pairing in interspecific hybrids. He discovered three distinct karyotypes in diploid *Avena* and found that species having different karyotypes are reproductively isolated. He studied the effect of a desynaptic gene in *Avena strigosa* which permitted the establishment of a complete trisomic series in oats. He analyzed and described the phenotypes, karyotypes, meiotic behavior and rust reactions of the complete set of primary trisomics of *A. strigosa*. He also analyzed the karyotype and meiotic behavior of the perennial and outbreeding *A. macrostachya* and obtained evidence for autotetraploidy.

Tibor was a coordinating member of the 1964 Canada Wales Wild Oat species collection trip in the Mediterranean Region and helped describe and classify many of the 2680 samples collected. This collection contained a large number of genotypes resistant to different pathogens, two diploid species *A. clauda* and *A. ventricosa* which were known only by description, and a new tetraploid species *A. magna*.

During his career Tibor published 90 papers and 3 books. Of particular importance to oat workers is his monograph with Hugh Thomas entitled "Cytogenetics of Oats".

In 1967 he was appointed Head of the Cytogenetics Section at the Ottawa Research Station and became Director of the Station in 1978. Tibor has served on many committees and was Director and Treasurer of the Genetics Society of Canada and is Canadian Editor of the Journal of Plant Breeding (West Germany). In 1980, Tibor was made a member of the Royal Society of Canada.

II. AMERICAN OAT WORKERS' CONFERENCE AND FIRST INTERNATIONAL OAT RESEARCH WORKSHOP

PROGRAM
AMERICAN OAT WORKERS' CONFERENCE
and
FIRST INTERNATIONAL OAT RESEARCH WORKSHOP
University Park, Pennsylvania
June 20-23, 1982

June 20

3:15 pm	Meeting of AOW Conference Committee and National Oat Improvement Council, Nittany Lion Inn
6:00-8:00	Registration, Lobby, Nittany Lion Inn
7:00	Social Hour, Fireside Lounge, Nittany Lion Inn

June 21

8:00-10:00	Registration, Lobby, Nittany Lion Inn
SESSION 1	Assembly Room, Nittany Lion Inn Chairman, C. F. Murphy, N. C. State Univ.
8:10	Opening remarks - R. A. Forsberg, Chairman AOWC
8:15	Local arrangements - H. G. Marshall, Secretary AOWC
8:20	Welcome to Penn State - J. L. Starling, Head, Dept. of Agron., PSU
8:30	World oat production - D. J. Schrickel, Quaker Oats Company, USA
8:50	Breeding approaches for increasing cereal crop yields - K. J. Frey, Iowa State Univ., USA
9:40	International oat breeding project - M. E. McDaniel, H. L. Shands, D. J. Schrickel, S. H. Weaver, Texas A&M Univ., Univ. of Wisconsin, Quaker Oats Co., USA
10:00	COFFEE
10:20	Oat breeding in Mexico - Results and advances (1978-82) - M. Navarro, O. Castro, Instituto Nacional de Investigaciones Agricolas, Mexico
10:40	Oat breeding at Aberystwyth - D. A. Lawes, Welsh Plant Breeding Station, UK
11:00	Winter oat breeding at the WPBS, Aberystwyth - J. Valentine, D. A. Lawes, Welsh Plant Breeding Station, UK
11:20	Sixty years of oat breeding - R. D. Wych, D. D. Stuthman, Univ. of Minnesota, USA
11:40	Discussion
SESSION 2	Assembly Room, Nittany Lion Inn Chairman, H. W. Rines, USDA and Univ. of Minnesota, USA
1:20	Establishment of 21 monosomic lines in _Avena byzantina_ C. Koch cv. Kanota - T. Morikawa, Univ. of Osaka Prefecture, Japan
1:40	Wild _Avena_ species as a source of germplasm for oat improvement - J. W. Martens, D. E. Harder, Winnipeg, Canada
2:00	Problems related to the use of wild species in oat improvement - H. Thomas, Welsh Plant Breeding Station, UK

2:20	Interspecific crossability systems of *Avena* in the polar-nuclei activation hypothesis - I. Nishiyama, Kyoto Univ., Japan
2:40	Introgression of wild diploid and tetraploid *Avena* species via octoploids - S. E. Fritz, M. E. Sorrells, Cornell Univ., USA
3:00	COFFEE
3:20	Alteration of crossability in artificial ploids of *Avena* - T. Yabuno, I. Nishiyama, Univ. of Oska Perfecture, Japan
3:50	Phylogeny and domestic differentiation in the genus *Avena* - I. Nishiyama, T. Taira, Kyoto Univ., Japan
4:10	Discussion
SESSION 3	Assembly Room, Nittany Lion Inn Chairman, M. E. Sorrells, Cornell Univ., USA
7:00	Trends in oat cultivar performance in the northwest, 1952-81 D. M. Wesenberg, USDA and Univ. of Idaho, USA
7:20	Application of protoplast and genetic engineering technologies to crop improvement - D. A. Evans, Plant Technology Corp., USA
7:40	Tissue culture and molecular approaches to oat improvement - H. W. Rines, USDA and Univ. of Minnesota, USA
8:00	Discussion
8:15	NCR-15 Meeting

June 22

SESSION 4	Assembly Room, Nittany Lion Inn Chairman, S. H. Weaver, Quaker Oats Co., USA
8:00	Oat milling quality needs - L. R. Young, Quaker Oats Co., USA
8:20	Nutrition of oats - H. B. Lockhart, Quaker Oats Co., USA
8:40	Variation for grain protein content and protein productivity in oat species and varieties - R. W. Welch, Welsh Plant Breeding Station, UK
9:00	Fatty acid inheritance in two high x low linoleic acid oat (*Avena sativa* L.) crosses - R. S. Karow, R. A. Forsberg, Univ. of Wisconsin, USA
9:20	Separation and characterization of oat globulin polypeptides - D. M. Peterson, A. Chris Brinegar, USDA and Univ. of Wisconsin, USA
9:40	Inheritance of BYDV resistance - R.I.H. McKenzie, Agriculture Canada, Winnipeg
10:00	COFFEE
10:20	Evaluation of recurrent selection for grain yield and its effect on correlated traits - J. A. Radtke, D. D. Stuthman, Univ. of Minnesota, USA
10:40	Stem elongation and anatomy of two dwarf oats - F. L. Kolb, H. G. Marshall, Penn State Univ., USA
11:00	Response of oats to nitrogen fertilization - M. A. Brinkman, Y. D. Rho, Univ. of Wisconsin, USA
11:20	Discussion

12:00 LUNCH
1:30 Field trip to Rock Springs Research Center to observe research with oats and other small grains and related equipment and facilities.

5:30 STEAK FEED and PROGRAM at Rock Springs Research Center.

June 23

SESSION 5 Assembly Room, Nittany Lion Inn
J. A. Frank, USDA and Penn State University, USA
8:00 Progress and challenges in development of oats tolerance to BYDV virus - H. Jedlinski, USDA and Univ. of Illinois, USA
8:20 Barley yellow dwarf virus resistance in the genus Avena - A. Comeau, Sainte-Foy, Canada
8:40 Interactions of BYDV strain x source of resistance in oats and barley - D. Baltenberger, Purdue Univ., USA
9:00 Evaluation of sources of resistance in oats to Puccinia coronata by use of a large number of fungus cultures - L. J. Michel, M. D. Simons, USDA and Iowa State Univ., USA
9:20 Promising oat rust resistant combinations from out of the germplasm collection - P. G. Rothman, USDA and Univ. of Minnesota, USA
9:40 Variability of Puccinia coronata avenae in Australia - J. B. Brouwer, Animal Research Institue, Australia
10:00 COFFEE
10:30 Inheritance of crown rust resistance from hexaploid oat translocation lines which obtained resistance from diploid Avena strigosa Schreb. - B. J. Hable, R. A. Forsberg, Univ. of Wisconsin, USA
10:50 Breeding for smut resistance in oats - J. Nielsen, R.I.H. McKenzie, Winnipeg, Canada
11:10 Inheritance of greenbug resistance in oats - M. E. McDaniel, J. H. Gardenhire, T. Tesfaye, Texas A&M Univ., USA
11:30 Discussion
12:00 LUNCH

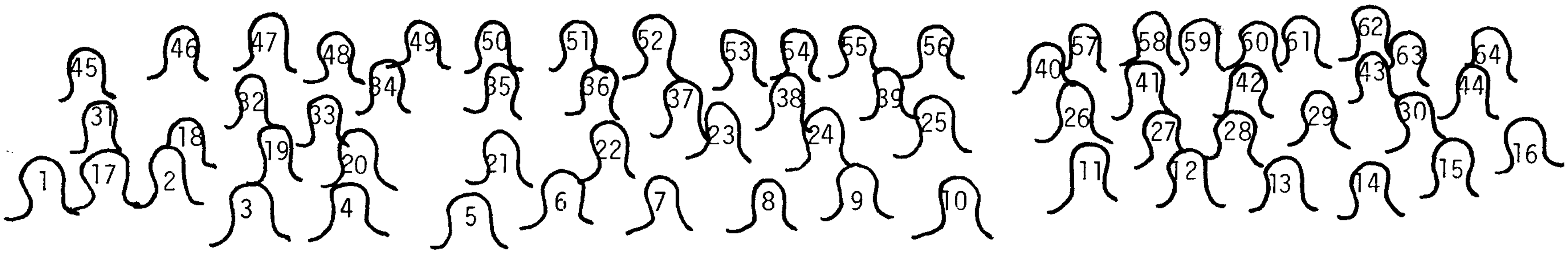
SESSION 6 Assembly Room, Nittany Lion Inn
Chairman, R. A. Forsberg, Univ. of Wisconsin, USA
1:00 Contributions of Internation Oat Rust Nursery (IORN) to oat research - J. G. Moseman, USDA, Beltsville, Md., USA
1:20 Uniform Nursery Discussion - H. W. Rines, D. M. Wesenberg, H. G. Marshall
2:00 BUSINESS MEETING

American Oat Workers' Conference
International Oat Research Workshop

REGISTRANTS AT 1982 OAT CONFERENCE
University Park, PA

Baier, W. H.	Oberlimpurg Plant Breeding Co., Germany
Baltenberger, D.	Purdue University
Bassi, A., Jr.	University of Arkansas
Briggle, L. W.	USDA, Beltsville, Maryland
Brinkman, M.	University of Wisconsin
Brouwer, J. B.	Dept. of Agriculture, Australia
Brown, C. M.	University of Illnois
Brown, D.	Winnipeg, Manitoba, Canada
Burrows, V.	Ottawa, Ontario, Canada
Clark, R. V.	Ottawa Research Station, Canada
Collins, F. C.	University of Arkansas
Comeau, A. I.	Quebec, Canada
Cooper, D. C.	Cornell University
Couture, L.	Quebec, Canada
Dubuc, J. P.	Quebec, Canada
Duerst, R. D.	University of Wisconsin
Dyck, S. P.	National Ag. Res. Institute, Mexico
Evans, D. A.	DNA Plant Technology Corp.
Forsberg, R. A.	University of Wisconsin
Frank, J. A.	USDA, Penn State University
Freed, R.	Michigan State University
Frey, K. J.	Iowa State University
Fritz, S. E.	Cornell University
Gardenhire, J. H.	Texas A&M University
Hagberg, P. A.	Svalof, Sweden
Harder, D. E.	Winnipeg, Manitoba, Canada
Jedlinski, H.	University of Illinois
Johannsen, P. S.	Colorado State University
Johnson, S. S.	University of Minnesota
Karow, R. S.	University of Wisconsin
Klinck, H. R.	MacDonald Campus, Quebec, Canada
Kolb, F. L.	USDA, Penn State University
Lafever, H. N.	Ohio Agric. Research & Development Center
Lawes, D. A.	Welsh Plant Breeding Station, U.K.
Leach, S. S.	USDA, Orono, Maine
Lockhart, H. R.	Quaker Oats Co.
McDaniel, M. E.	Texas A&M University
McEwan, J. M.	Crop Res. Division, New Zealand
McKenzie, R.I.H.	Winnipeg, Manitoba, Canada
McMullen, M. S.	North Dakota State University
Marshall, H. G.	USDA, Penn State University
Mattson, B. J.	Svalof, Sweden
Michel, L. J.	Iowa State University
Moore, M. B.	University of Minnesota
Morikawa, T.	University of Osaka Prefecture, Japan
Moseman, J. G.	USDA, Beltsville, Maryland
Murphy, C. F.	North Carolina State University

Nishiyama, I.	Kyoto, Japan
Navarro-Franco, M.	Inst. Nacionel de Investigacion F.S. Agricolas, Mexico
Nel, H. E.	Embassy of S. Africa, Washington, D.C.
Osman, M.	University of Wisconsin
Peterson, D. M.	University of Wisconsin
Reeves, D. L.	South Dakota State University
Rekunen, M. P.	Hanuuija Plant Breeding Institute, Finland
Rines, H. W.	University of Minnesota
Risius, M. L.	Penn State University
Roberts, G. L.	Ag. Research Station, Australia
Roskens, A. B.	Quaker Oats Company
Rothman, P. G.	USDA, University of Minnesota
Sabelka, D. A.	University of Wisconsin
Sahs, W. W.	University of Nebraska
Schrickel, D. J.	Quaker Oats Company
Shands, H. L.	University of Wisconsin
Shaner, G.	Purdue University
Shugar, L. P.	W. G. Thompson & Sons, Ltd., Ontario, Canada
Simons, M. D.	USDA, Iowa State University
Skelly, J. M.	Penn State University
Skrdla, R. K.	Iowa State University
Smith, D. H.	USDA, Beltsville, Maryland
Sorrells, M. E.	Cornell University
Stuthman, D. D.	University of Minnesota
Thomas, G. G.	Penn State University
Thomas, H.	Welsh Plant Breeding Station, U.K.
Tibelius, C. A.	MacDonald Campus, Quebec, Canada
Weaver, S. H.	Quaker Oats Company
Welch, R. W.	Welsh Plant Breeding Station, U.K.
Wesenberg, D. M.	Aberdeen, Idaho
Western, D. E.	Quaker Oats Company (retired)
Wu, Y. V.	USDA, Peoria, Illinois
Young, L. R.	Quaker Oats Co.



<u>Row 1</u>

1. Kolb, F. L.
2. Forsberg, R. A.
3. Duerst, R. D.
4. Couture, L.
5. Sabelka, Doris
6. Moseman, J. G.
7. Freed, Russell
8. Brown, C. M.
9. Briggle, L. W.
10. Nishiyama, I.
11. Brinkman, M.
12. Frey, K. J.
13. Skrdla, R. K.
14. Morikawa, T. T. M.
15. Johnson, S. S. (?)
16. Rines, H. W.

<u>Row 2</u>

17. Comeau, A. I.
18. Tibelius, Christine
19. Jedlinski, H.
20. Osman, Mohamad
21. Lawes, D. A.
22. Leach, S. S.
23. Weaver, S. H.
24. Schrickel, D. J.
25. Brown, D.
26. Marshall, H. G.
27. Sorrels, M. E.
28. Shugar, L. P.
29. McMullen, M. S.
30. Moore, M. B.

<u>Row 3</u>

31. Dubuc, J. P.
32. McKenzie. R.I.H.
33. McEwan, J. M. (?)
34. Karow, R.
35. Klinck, H. R.
36. Petersen. D. M.
37. Thomas, H.
38. Navarro-Franco, M.
39. Western, D. E.
40. Murphy, C. F.
41. Rothman, P. G.
42. Reeves, D. L.
43. Clark, R. V.
44. Michel, L. J.
45. Risius, M. L.
46. Hagberg, P. A.
47. Welch, R. W.
48. Harder, D. E.
49. Baier, W. H.
50. Frank. J. A.
51. Stuthman, D. D.
52. Cooper, D. C.
53. Baltenberger, P.
54. Simons, M. D.
55. Shaner, G.
56. Wu, Y. V.
57. Dyck, G. P.
58. McDaniel, M. E.
59. Roberts, Glen
60. Smith, D. H.
61. Burrows, V.
62. Wesenberg, D. M.
63. Brouwer, J. B.
64. Shands, H. L.

Prints are available from H. G. Marshall at a cost of $2.00 each.

WORLD OATS PRODUCTION AND USE

Donald J. Schrickel
Quaker Oats Company
Chicago, Illinois

The world production of oats for grain is approximately 50 million metric tonnes. Russia is the largest producer (38% of the total), and is the only major producing country presently increasing its share of the world total. The United States produces about 16% of the world total. Oats are primarily a cool season crop, and a large proportion are grown in the Northern Hemisphere. In many parts of the world, oats are grown for multi-purpose use - i.e., pasture, forage (hay, silage, "green chop"), and grain. The primary use of oats as a grain is for livestock feed. Oats for human food account for 13% of world production of oats for grain.

International Oat Breeding Project

M.E. McDaniel, H.L. Shands, D.J. Schrickel,
and S.H. Weaver

Texas A&M Univ., Univ. of Wisconsin, and
and The Quaker Oats Co., USA.

Initial efforts of the Quaker Oats Company to improve oat varieties for production in Latin American countries were made by Mr. Dallas Western, former Director of Grain Research and Development for Quaker, Chicago. Mr. Western recognized the potential adaptation of winter oat germplasm in Latin America, and developed a cooperative agreement with the Coker's Pedigreed Seed Co. of Hartsville, S.C. to test Coker oat germplasm, particularly in southern Argentina. He also developed a cooperative working relationship with the Klein Seed Co. of Pla, Argentina to increase and distribute new oat varieties.

Dr. H.L. Shands initiated the current breeding project in 1974, under the auspices of the U.S. Agency for International Development in cooperation with the Agronomy Dept. at the Univ. of Wisconsin and the U.S. Dept. of Agriculture. Following maturation of the AID project after two years, the effort was continued with support funds provided by the Quaker Oats Company. Since production hazards such as disease and insect pests frequently cause severe losses in temperate climates, resistance to diseases (crown rust, stem rust, and yellow dwarf virus) and to insects (particularly greenbugs) is being emphasized in this project. The initial research efforts included screening a large oat germplasm collection in areas having high disease and/or insect incidence in South America. Cooperative work subsequently has been extended to several other countries in the Middle East, Africa, and Australia. Currently, the nursery is being grown at 25 locations, 21 of which are outside the U.S.A.

After initial evlaluation of disease reaction and agronomic characteristics of an extensive germplasm collection from the U.S.D.A. World Collection of Oats, nurseries have been distributed to cooperators each year. Both pure-line and segregating (F_3) populations are included as nursery entries. The production and distribution of a large number of early-generation hybrid populations involving diverse germplasm provide a great deal of genetically diverse material for selection at the cooperating stations. Cooperators are making selections with potential adaptation at their individual locations; they also are exchanging selected progenies to determine the range of adaptation, disease reaction, etc., of promising lines. To date, known germplasm exchanges have been made between cooperators in nine countries. Two pure-line selections from the nursery have been increased for immediate release in Brazil, and several other lines are undergoing initial increase for possible release in the near future.

In 1979, M.E. McDaniel, Texas A&M University, became involved in the project. Personnel at the University of Wisconsin (H.L. Shands, Marshall Brinkman, and R.A. Forsberg) are continuing the Quaker-sponsored Wisconsin work. The bulk of the material currently included in the nursery distributed to cooperators is derived from the Texas and Wisconsin oat breeding projects; however, oat lines also have been supplied by breeders from a number of other experiment stations and by the Coker's Pedigreed Seed Co. We greatly appreciate the breeding material supplied by these breeders. We also greatly appreciate the generous help of C.W. Schaller, C.O. Qualset, Linda Prato, and Pam Zwer of the University of California, Davis, and of Andre Comeau, Agriculture Canada, Sainte-Foy, Quebec, in determining field reaction of nursery entries to Barley Yellow Dwarf Virus.

OAT BREEDING IN MEXICO-RESULTS AND ADVANCES (1978-1982)

Manuel Navarro-Franco - Coordinator Barley and Oats
Central Zone

Ovanel Castro-Meléndrez- Oat Breeder

Secretaría de Agricultura y Recursos Hidráulicos
Instituto Nacional de Investigaciones Agrícolas
Campo Agrícola Experimental Valle de México

From 1975 to 1978 the mean annual area planted to oats in Mexico was 206,000 hectares. Only spring oat is cultivated and for the most part under rainfall conditions during the spring-summer season. About 30% of the area planted is harvested for grain and the rest as green forage or hay. The average grain yield per hectare is 1200 kilograms.

Oat breeding has been carried on in Mexico for 22 years. During this time the national program has led to the development of several cultivars which along with the use of improved cultural practices such as fertilization and weed control have allowed to increase 145% the average grain yield per hectare in the main oat growing area of Mexico.

The most important advantages in the cultivars released until 1975, when compared with the local cultivar Burt or Texas, are earliness, stem rust resistance and higher protein and grain yield (Table 1). The variety Burt, known locally as Texas and which was introduced by the Mennonite Immigrants in North Central Mexico, has been cultivated by them since 1924.

Table 1. Advantages of the best cultivars released in Mexico until 1975

CULTIVAR	DAYS TO MATURE	STEM RUST REACTION	PROTEIN %	YIELD AS % OF BURT
PARAMO	84	MR*	21.4	126
DIAMANTE R-31	84	R	25.2	95
BURT (check)	90	S	15.6	100

* MR= Moderately resistant, R= Resistant and S= Susceptible

Tulancingo, the last cultivar released in 1981 besides its good stem rust resistance has consistently outyielded by 33% to Diamante R-31, a variety previously released with high resistance to stem rust (Table 2).

Table 2. Advantages of Tulancingo released in 1981 (4 years at 2 locations)

CULTIVAR	STEM RUST REACTION	AVERAGE KG/HA
TULANCINGO	R*	2,712
DIAMANTE R-31	R	2,025

* R= Resistant

Based on the experimental data from four locations in 1981 two new lines have shown yield gains from 27 to 38% over Tulancingo, along with good stem rust resistance (Table 3).

Table 3. Advantages of two new lines in 1981
(4 locations)

CULTIVAR OR LINE	DAYS TO MATURE	STEM RUST REACTION	AVERAGE KG/HA
Cxo-C/Inca/Cxo-C/ENA	110	R*	3,600
MAL-HUA"S"	106	R	3,300
TULANCINGO	100	R	2,600

* R= RESISTANT

Our major emphasis continues to be the development of oats with the following traits:

a) resistant to stem and crown rusts
b) early
c) high yielding
d) large kernel
e) high test weight
f) increased protein content

Since winter is rather mild in most locations of Mexico, we grow our segregating material in the winter and select under field conditions two generations a year, which allows us to speed the generation advance.

During the last 16 years the Mexican oat breeding program has been functioning as a part of a cooperative research project among the Quaker Oats Company, the Agronomy Department of the University of Minnesota and the U.S. Department of Agriculture Cereal Rust Laboratory.

Consistently in the last 5 years we have been receiving the International Oat Rust Nursery and the nursery of the Quaker Oats Company International oat breeding project and we also consistently have sent back the data and used selections from these groups in our crosses.

In our oat program up to now we do not do basic research.

Spring Oat Breeding at Aberystwyth

D.A. Lawes

Welsh Plant Breeding Station, Aberystwyth

There has been a marked decline in the area sown to oats in the U.K. since 1945 and thus also of the role of the crop in British agriculture. There are many reasons for this but the lack of really good high yielding, reliable varieties has been a contributory factor. Recently the relative importance of the crop has stabilised and, with the proposed new varieties, oats may again form a more important part of the farming system. Due to rationalization within the U.K. Agricultural Research Service the WPBS now has the responsibility for oat breeding and research for the whole of Britain.

In spring oat breeding emphasis is given to improvements in yield, straw strength, early maturity, mildew resistance and grain quality; characters which would make the crop more reliable and economically viable.

Margam was included on the 1977 NIAB Recommended List, this being an extremely early variety was expected to fill an important role, but unfortunately showed unfavourable response to certain herbicides. Orlando achieved NIAB Recommended List status in 1981. Milo,in which hypersensitive and non-hypersensitive resistances to mildew are combined, is at present in National Trials having been accorded 'high-flyer' status.

The need for radical improvement requires the investigation of new sources of variation and the genetic control of attributes. The breeding programme is therefore supported by research studies in the Cytology and Chemistry departments. Variation currently being exploited is from *A. moroccana* (high protein grain), *A. byzantina* and *A. barbata* (mildew resistance) and *A. nuda* (huskless grain).

The methodology of oat breeding is also receiving attention, and the introduction of the approach method of hybridization has vastly increased the effectiveness of the programme.

Winter Oat Breeding at Aberystwyth

J. Valentine
Welsh Plant Breeding Station, Aberystwyth

Winter oat breeding at the Welsh Plant Breeding Station is directed to producing high-yielding commercially acceptable varieties fulfilling existing and future U.K. needs for feed to livestock and humans. Objectives include high yield and adaptability, resistance to lodging, winter-hardiness, resistance to diseases and pests and high milling and feed quality.

Five winter oat varieties have been recommended by the National Institute of Agricultural Botany since 1962. Bulwark and Bardsey are promising high yielding varieties in NIAB trials at present. High yielding lines derived from Cimarron are in advanced breeders' trials. Other lines from the U.S.A. being used in the breeding programme include accessions from Pennsylvania and Kentucky with high winter-hardiness and accessions from Illinois, North Carolina and Indiana with resistance to BYDV. Further improvements in yield and other characteristics are being sought from wild species.Good progress is being made in the breeding of naked oats.

Improvements of the present crude methods of selection for yield in the early stages of pedigree breeding are necessary. Moderate to high levels of efficiency of visual assessment of yield and yield components have been found in winter oats. Differences between assessors in the efficiency of visual assessment of yield were attributed to personal biases mainly directed towards assessment of tillers/row or grains/row. Visual assessment rather than direct measurements is used in the early generations. A conscious effort is made to take into account all yield components when selecting for yield itself, this being the most likely way to break any negative correlations. The differential effects of various stresses often over-ride selection for yield, emphasising the need to select for yield stability as well as yield potential.

Sixty years of oat breeding

R. D. Wych and D. D. Stuthman

Increased crop yields over the past 50 to 100 years have been attributed to new cultivars and to improved cultural and management practices. Documentation of the contribution of plant breeding to oat yield improvement may provide insights into the optimum strategy for attaining further gains. Our objective was to quantify genetic improvements in grain yield, kernel quality, and associated agronomic and physiological traits of oat cultivars grown in Minnesota over the past six decades.

Nine cultivars released since 1923 were grown in field experiments at St. Paul, MN in 1979 to 1981. Mean grain yield over all years ranged from 20.0 q/ha for 'Anthony' to 31.3 q/ha for 'Moore.' Based on the mean yield of 'Gopher,' the total increase since 1923 was 40%. Modern cultivars lodged less than older cultivars, which may contribute to an increase in harvestable grain yield. Cultivars differed in groat percentage, and the four newest cultivars exceeded the five oldest for this trait. The collective improvement in both grain yield and groat percentage resulted in a total increase in groat yield of 44%, slightly higher than that for grain yield. Kernel weight has increased over time, while the number of kernels per unit area has decreased. Modern cultivars thus reflect the emphasis that has often been placed on selection for yield and kernel quality, i.e. plumpness and thinness of hull.

Biological yield, harvest index, total nitrogen (N) content (in groats plus straw), groat N content, and N harvest index (NHI) were all greater in modern cultivars. Higher groat protein yield of modern cultivars was primarily a reflection of the gains in groat yield and improvement in N partitioning, or NHI.

ESTABLISHMENT OF 21 MONOSOMIC LINES IN *AVENA BYZANTINA* C. KOCH CV. KANOTA

T. Morikawa
Laboratory of Genetics and Plant Breeding, College of Agriculture, University of Osaka Prefecture, Sakai, Osaka 591 Japan

All of the 21 possible monosomic lines have been confirmed in *Avena byzantina* C. Koch cv. Kanota. They were chiefly found in progeny of haploid (3x), aneuploid (2n+) and autotriploid (3n) partners of twins, except Mono-21 which was a progeny of a monosmic of Cherokee (*A. sativa*) repeatedly backcrossed with Kanota. Identification of the monosomics was carried out by means of the double monosomic method, marker genes, leaf peroxidase isozymes and karyotype analysis. The monosomics were numbered from Mono-1 to Mono-21 in order from the longest to the shortest monosome. Morphological characters of most monosomics were often hardly distinguishable from those of normal disomics. In the selfed progeny of 4 monosomic lines, Mono-8, -9, -17 and -19, a segregation of nulli, mono and disomics was definitely observed, but no nullisomic was found in the remaining lines. In most cases monosomics occurred in the highest frequency, but showed a wide range from 35.5% to 97.8%.

Wild Avena Species As A Source Of Germplasm For Oat Improvement

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One of the main factors that has limited progress in the improvement of the oat plant has been the lack of needed germplasm. The oat collections that existed until the mid 1960's did not have adequate genetic reserves necessary to breed for resistance to stem (*Puccinia graminis avenae*) and crown (*P. coronata*) rusts. This problem led to new approaches in breeding, including the search for and the utilization of related wild species as sources of germplasm.

The search for resistance to *P. coronata* has been the most successful with more than 25 genes isolated, characterized and described. A number of these genes are being used extensively in breeding programs and some of these currently form the basis of resistance in commercial cultivars. Preliminary screening of additional accessions of hexaploid, tetraploid and diploid species has indicated the occurrence of a wide range of both stem and crown rust resistance that remains to be developed.

The identification of resistance to P. graminis avenae has been more difficult, but significant progress has been made. Gene Pg-13 from A. sterilis in North Africa is one of the most effective genes available, and it has been incorporated into commercial cultivars. Gene Pg-15, a recently described gene from Turkey is also potentially valuable. Further, there is a considerable amount of resistance to P. graminis avenae in the tetraploid species A. barbata and the diploid species A. longiglumis. Considerable progress has been made in transferring some of this resistance to the hexaploid level.

The wild species of Avena also contain an abundance of resistance to other diseases. Resistance to powdery mildew has been transferred from the wild tetraploid A. barbata to A. sativa, tolerance to Barley Yellow Dwarf Virus (BYDV) has been identified in A. fatua, and accessions of a number of species are resistant to smut. Considerable variability in oil and protein content has been identified in these species, promising improvement in agronomic traits.

Genes for resistance to BYDV and to stem rust and genes for higher yield are among the most urgent factors limiting cultivar improvement in Canada. Past experience suggests that at least some of these constraints could be minimized by genes from wild species. The genetic variability in wild Avena has not yet been adequately explored. Plant collecting and evaluation should be continued to ensure the availability of germplasm for future requirements. North Africa and the area surrounding the Black Sea, particularly the western half, have yielded many useful genes, particularly for stem and crown rust resistance, but these areas are still under-explored. These are among the areas that should be included in future collecting expeditions.

PROBLEMS RELATED TO THE USE OF WILD SPECIES IN OAT IMPROVEMENT

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Wild species of Avena ranging from diploids to hexaploids contain a valuable source of variation that would be desirable to introduce into the cultivated oat germplasm. However, the use of wild species is often restricted because of the presence of strong sterility barriers that isolate the wild species from the cultivated oat.

Interspecific hybrids involving wild species and A. sativa can be readily classified into two groups depending on the amount of interspecies chromosome pairing and hence recombination that is achieved. In the first group there is adequate chromosome pairing and gene transfer can be accomplished by a backcrossing programme. In the second group chromosome pairing is limited and gene transfers involve the use of techniques of chromosome manipulation.

Hybrids between A. sativa and the wild hexaploid species A. fatua and A. sterilis belong to the first group and gene transfers have been successfully obtained by backcrossing. These hybrids are also self-fertile since the species have identical genomes and chromosome number. Another hybrid in the high chromosome pairing category is A. maroccana (4x) x A. sativa, but unlike the hexaploid interspecific hybrids the pentaploid hybrid is self-sterile. However, it does have low female fertility and can be backcrossed to A. sativa. The backcross (BC) hybrids show a partial recovery of fertility and revert to the hexaploid chromosome number ± 1 - 3 chromosomes. A study of the progeny of the BC hybrids reveal that there is little restriction on the recombination of specific characters and it is possible to introgress characters of A. maroccana into A. sativa.

The second category of hybrids have low interspecific chromosome pairing and include hybrids between diploid species and the tetraploids of the A. barbata group. The relationship between the chromosomes of the diploid species is nearer to homoeology than homology and consequently there is severe restriction on the recombination of species characters. In the absence of interspecific chromosome pairing gene transfer has been effected by means of an irradiation induced translocation.

In this second group the inability of the alien chromosomes to pair with their homoeologues in A. sativa is a reflection of the genic system that controls bivalent pairing in A. sativa. It is possible to modify this genetic control by the introduction of a genotype of A. longiglumis (2n = 14) which increases homoeologous chromosome pairing. The A. longiglumis genotype can be used to induce the synapsis of alien chromosomes and their corresponding chromosomes in A. sativa and hence recombination. This approach has been successfully followed to obtain gene transfers within this group.

INTERSPECIFIC CROSSABILITY SYSTEM OF AVENA IN THE POLAR-NUCLEI ACTIVATION HYPOTHESIS

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Causal relationships of viable and abortive crosses in Avena were first formulated as an interspecific crossability system on the basis of the polar-nuclei activation hypothesis (Nishiyama and Yabuna 1978, 1979).

In the following study, based on the results of about 40 crosses, with the six Avena species A. clauda, A. prostrata, A. damacena, A. canariensis, A. murphyi and A. byzantina, relative activating values were estimated to be 0.45, 0.8, 0.95, ca. 0.8, 1.4 and 2.7, respectively. The activation index of polar nuclei was computed in every cross. The interrelationship between activation index and crossability (mainly development of hybrid seeds) was found to be in almost complete agreement with the crossability system previously reported. Thus, it appears to be a standard crossability system in the genus Avena and also applicable to other higher plants.

INTRODUCTION OF WILD DIPLOID AND TETRAPLOID AVENA SPECIES VIA OCTOPLOIDS

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Two schemes are being used to develop segregating populations of octoploid oats by crossing diploid and tetraploid species with hexaploid cultivars. Octoploid or near octoploid plants have been recovered from colchicine doubled hybrids. Twelve tetraploids were selected from 250 *A. abyssinica* accessions grown in 1980 and are being studied for agronomic characteristics. Using these tetraploids, approximately thirty pentaploid hybrids were made by crossing with hexaploid cultivars. Partial fertility has been restored in the decaploid plants produced by colchicine treatment. Near octoploid plants are expected to segregate among the decaploid progenies through chromosomal loss. Currently, decaploid progenies of five crosses grown in a pedigree program and two crosses in a bulk-pedigree program are being studied for chromosomal behavior, fertility, harvest index, heading date, and size of leaf guard cells. Somatic and meiotic chromosomal instabilities are common. Fertilities, which are measured as the number of spikelets producing seed divided by the total number of spikelets, ranged from 0-82%. The effects of cross and family were assessed for their contribution to the total variance. Both crosses and families within crosses were found to be highly significant, but the relative magnitudes of the F values suggest that most of the variance is attributed to crosses. In the future, more emphasis should be placed on selection between crosses than among families within crosses.

Five diploid species: *A. hirtula*, *A. pilosa*, *A. canariensis*, *A. longiglumis*, and *A. strigosa* are presently being crossed with hexaploid cultivars in a second scheme for octoploid production. Embryo culture is required to produce tetraploid hybrid seed, from which octoploids will be derived following treatment with colchicine.

ALTERNATION OF CROSSABILITY IN ARTIFICIAL PLOIDS OF AVENA

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Autotetraploids of A. pilosa (AV = activating value = 0.5), A. hirtula (AV = 0.9), A. longiglumis (AV = 1.7) were obtained by treating young seedlings with 0.4% colchicine. Furthermore amphiploid A. hirtula-pilosa was produced by hybridization between the autotetraploids.

They were crossed with their original species and others whose activating values were already known. In most cases alternation of crossability of artificial ploids was definitely observed. Its mechanism is well understood by assuming that doubling of chromosome numbers results in nearly twice the activating value or nearly the sum of both parents' in amphiploids. That is, values of 0.85, 2.1, 3.3 and 1.4 were reasonably assigned to autotetraploid A. pilosa (4x), A. hirtula (4x), A. longiglumis (4x) and amphiploid A. hirtula-pilosa (4x), respectively. However, their crossability system if crossed with other species remained unchanged.

PHYLOGENY AND DOMESTIC DIFFERENTIATION IN THE GENUS AVENA

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The phylogenetic relationships of Avena species were tentatively proposed by Rajhathy and Thomas (1974), and Nishiyama and Yabuno (1975). There are mainly five major groups represented by A. hirtula, A. barbata, A. fatua-sterilis, A. clauda and A. prostrata. In the first three groups the domestic differentiation from the wild type to the cultivated or naked type has occurred.

It is probable that diversity of daily flowering time and activating value in fertilization, including non-pollen-tube growth on the alien stigma as well as genomic divergence including translocations are reproductive isolation barriers, and play an important factor in the domestication of wild forms. The absence of such reproductive barriers within each of the first three groups might favor accumulation and maintenance of mutant or domesticated characteristics in the evolutionary passway. Of course, natural intergroup hybridization seldom occurs because of the isolation barriers.

On the contrary, the genetic situation is reversed in the A. prostrata and A. clauda groups where all species are as yet confined to the wild type.

TRENDS IN OAT CULTIVAR PERFORMANCE IN THE NORTHWEST, 1952-81

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ARS-USDA

Agronomic data were summarized for oat cultivars grown in the Uniform Northwestern States Oat Nursery under irrigation and on dryland during the 30-year period 1952-81. Performance data for the three highest yielding cultivars were compared annually to the check cultivars 'Markton' and 'Park' and summarized over five-year intervals or test periods beginning with 1952-56 and concluding with 1977-81. Park was coincidentally a popular commercial cultivar during the early portion of the 30-year period considered in the review. It was formally released in 1953 and continues to be grown on a limited acreage in the northwestern states. Thirty-eight oat cultivars were tested during the last five-year period, 1977-81, in trials involving 122 station-years of testing. During the thirty year period, 1952-81, 637 station-years of testing were considered, 296 station-years in irrigated trials and 341 station-years in dryland trials.

During the test periods 1952-56 and 1977-81, the three highest yielding cultivars in the irrigated trials averaged 102% and 125% of the checks, respectively. Similar results were observed in the dryland trials, with the three highest yielding cultivars averaging 107% of the checks for the test period 1952-56 and 124% of the checks for the test period 1977-81. Average plant height declined to 87-88% of the checks along with the observed increase in yield. Average test weight declined slightly and about a 1% shift in heading date was observed, the recent high yielding cultivars being slightly later.

During the last five-year test period there has been a tendency toward improved test weight and yield and earlier maturity vs the previous five-year test period. Plant height and straw strength have averaged about the same for the last 10 years.

The western states of Colorado, Idaho, Montana, Oregon, Utah, Washington, and Wyoming principally involved with the Uniform Northwestern States Oat Nursery produced an estimated 17.1 million bushels of oats in 1980 with an estimated value of 34.6 million dollars.

Tissue Culture and Molecular Approaches to Oat Improvement

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Cellular and molecular approaches to plant genetic improvement have created much interest and research activity in both the public and private scientific communities. This report describes examples of the use of some of these techniques in oat improvement research with the aim of provoking ideas and suggestions for further possible applications in oat improvement. Aspects discussed include the use of tissue cultures initiated from oat sporophytic tissues, anther cultures for haploid development from gametophytic cells, and mitochondrial DNA restriction pattern analysis for characterizing cytoplasms.

Tissue cultures from which plants can be regenerated even following several subcultures have been initiated from immature embryos of several lines of *Avena sativa*, *A. sterilis*, and *A. fatua* (Rines and McCoy, *Crop Sci.* 21:837, 1981). The frequency of culture initiation and the retention of regenerative potential vary widely among genotypes. An F_4-derived line GAF-30, selected for high culture response in the F_3 and F_4 generations from a cross of Garland X *A. fatua* 1223, is being used for *in vitro* selection for resistance to various chemicals including methionine sulfoximine. This latter compound can act as a functional mimic of the toxin produced by *Pseudomonas coronafaciens*, the causative agent of halo blight in oats (Frantz, Peterson, and Durbin, *Plant Physiol.* 69:345, 1981). Selection for resistance to *Helminthosporium victoriae* toxin has been successful only in cultures which were initially heterozygous for the dominant gene for sensitivity. A high frequency of partial chromosome loss observed in oat plants regenerated from tissue culture (McCoy, Phillips and Rines, *Can. J. Genet. Cytol.* 24:37, 1982) indicates potential of tissue cultures as a source of unique monosomic and telosomic stocks and as a means to facilitate interspecific gene transfer.

Callus initiation from microspores in cultured anthers of oats has been attained at frequencies consistently greater than 10% of anthers cultured, but only a single haploid plant has been recovered (Rines, manuscript submitted). This anther was from the cultivar 'Stout'. Genotype appears to be a key variable with only Stout, 'Clintford', and related lines producing anther callus on a consistent basis. Haploids would be valuable for pure line development, mutant selection, and genetic analyses.

Mitochondrial DNA restriction pattern analysis will provide information on cytoplasmic relatedness among lines and species, as has been done in wheat (Vedel and Quentier, *Plant Sci. Lett.* 13:97, 1978), opportunities to analyze nuclear-cytoplasmic interactions, and cytoplasmic genetic markers if protoplast fusion becomes possible in oats.

These studies further demonstrate that the application of tissue culture and molecular technologies to plant improvement requires the cooperative efforts of geneticists, breeders, tissue culturists, and molecular biologists for maximum progress.

OATS - MILLING QUALITY REQUIREMENTS

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The objective of this presentation is to quantifiably define the desired oat properties for maximum oat milling efficiency.

The two general areas in milling that effect efficiency are contaminant removal and the percent of groats in oat kernels. For efficient contaminant removal (straw, sticks, weed seeds, foreign grains) with existing processes, the desired length and width ranges are:

Maximum oat length	14 mm
Minimum groat length	5 mm
Maximum oat width	3.5 mm
Minimum oat width	1.5 mm
Maximum groat width	3.0 mm
Minimum groat width	1.3 mm

Percentage of groat in a kernel is the most influential factor affecting milling efficiency. The desired target is 80% groats with a minimum of 70% being acceptable. A study is now in progress to correlate other oat physical properties (kernel weight, width, length, density, test weight) to groat percentage. Data from one year's study (1981 crop) indicate that 1,000 kernel weight and kernel length are better indicators of groat percentage than test weight. Final results will be available after one more year of evaluation.

THE NUTRITIONAL VALUE OF OATS

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As the population of the world increases and the animal products of the world decrease, people will need to depend more and more on vegetable matter, such as grains, for their sustenance. Oats is well qualified to make its contribution to the nutritional needs of the world. Oats, which is consumed as the whole kernel including the germ, has certain unique properties for a grain. Besides having the largest quantity of protein of any of the cereal grains, oats has a protein whose quality compares favorably with the protein of all of the other cereal grains. The digestibility of oat carbohydrate is good, so that the energy from carbohydrate is readily available. Oats has the highest level of fat of any of the cereal grains, even if it hasn't been developed into a commercial vegetable oil source. The oat fat has a favorable polyunsaturated fatty acids to saturated fatty acids ratio. In common with other cereal grains oats supplies most of the B vitamins as well as the fat-soluble vitamin, vitamin E. Although oats is known best for its iron and phosphorus, it is a source for many other minerals as well.

Variation for grain protein content and protein productivity in oat varieties and species

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A wide range in grain protein content has been found among exotic genotypes of *A. sativa*; genotypes which combine a high grain protein content with a high protein yield have been identified. Small but consistent differences in grain protein content have also been identified among high yielding European varieties.

The relationship between grain yield, grain protein and the distribution of N and carbohydrate within the plant has been studied in detail in two European and three N. American varieties. High grain protein was associated with a reduction in yield, but in only one variety was high grain protein related to a reduced grain size. Within both the N. American and European varieties grain protein was inversely related to both straw protein and straw non-structural carbohydrate (NSC), indicating high grain protein to be associated with an increased remobilization of nitrogen without an associated decline in the remobilization of NSC.

The performance of two European and two N. American varieties of *A. sativa* was compared with seven wild *Avena* species in a pot experiment at two fertility levels (low and very low). The higher fertility level gave much higher yields but did not affect groat protein percentage which ranged from 8-13% in *A. sativa* and from 16-22% in the wild species. The yields of total dry matter (DM), grain, total protein, grain protein and groat protein were as high among the wild species as in the *A. sativa* varieties, but the latter had high groat yields and a higher rate of DM accumulation in the groat. All species had comparable rates of total DM accumulation. The ability to assimilate nutrient N and the rate of N uptake by the plant and the rate of N accumulation in the groat were as high among the wild species as in the *A. sativa* varieties. Thus although the groat yield of wild species is inferior to that of *A. sativa* this is not associated with any impairment of N utilization. There appears to be potential for increasing the protein of oats using both *A. sativa* genotypes and wild species.

Fatty Acid Inheritance in Two Oat (*Avena sativa* L.) Crosses

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The fatty acid composition of oats is like that of other grains and oilseed crops in that palmitic, oleic, and linoleic acids account for more than 90 percent of the total fatty acids present. The oat is most similar to soybean as it has a substantial concentration of linolenic acid. This fatty acid has been implicated as a cause of rancidity in soybean and cereal oils. Data from two high x low linoleic acid oat crosses indicate that oil and palmetic, stearic, and linolenic acids are under additive genetic control while partial dominance for low linoleic acid and high oleic acid is suggested. Oleic and linoleic acids are highly negatively correlated. Linoleic and linolenic acids are highly negatively correlated with oil percentage while the oil-oleic acid correlation is positive. Fatty acid percentages do not give a true picture of groat fatty acid content due to the differences in correlations between specific fatty acids and oil. High oil, low linoleic acid percentage cultivars may contain more mg of linoleic acid than low oil, high linoleic percentage types.

SEPARATION AND CHARACTERIZATION OF OAT GLOBULIN POLYPEPTIDES

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The 12S storage globulin of oat seeds was separated into its acidic (α) and basic (β) polypeptides by ion exchange chromatography in 6 M urea and further characterized by several electrophoretic techniques. Molecular weights of the α and β polypeptides were 32,500-37,500 and 22,000-24,000, respectively. The unreduced protein existed as disulfide-linked $\alpha\beta$ species of molecular weight 53,000-58,000 when denatured by sodium dodecyl sulfate (SDS). Isoelectric points were approximately 5.9-7.2 for the α polypeptides and 8.6-9.2 for the β polypeptides. Two-dimensional electrophoresis revealed considerable heterogeneity within both α and β polypeptides. The amino acid compositions of the α and β polypeptides were different, the former being lower in asparagine, methionine, and the basic amino acids, but higher in glutamine. The data are consistent with a proposed structure of six $\alpha\beta$ polypeptides per molecule of the native protein. Similarities between oat globulin and the legumin storage proteins of several legumes were noted.

Inheritance of Tolerance to BYDV in *Avena sativa* L. - A Preliminary Study

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Abstract

Four unrelated oat accessions with tolerance to BYDV, Otee, M921, FF64/74 and CI 4492, were crossed to the susceptible cultivar Clintland 64. From 126 to 200 random F_5 lines per cross, obtained through single seed descent were studied in replicated trials for their reaction to naturally occurring BYDV at Palmerston North, New Zealand.

Highly significant differences in disease score occurred between the lines of every cross tested. No evidence of simply inherited BYD tolerance was obtained in any of the crosses. Tolerance to the New Zealand isolates of the virus appears to be conferred by two or more genes. The frequency distributions of BYD scores were fairly normal and exceeded those of both parents in all crosses.

The authors were concerned about possible BYDV isolate variation from region to region and the possible need for international BYD nurseries was discussed.

Evaluation of recurrent selection for grain yield and its effect on correlated traits

J. A. Radtke and D. D. Stuthman

A recurrent selection program for grain yield in oats was initiated in 1968. The objectives of the program include assessing the utility of recurrent selection in a pure line breeding program, creating germplasm with high yielding potential, and measuring correlated responses in traits related to grain yield.

The C_0 set of parents consisted of five cultivars and seven Minnesota selections, all high yielding for their maturity. Those parents were crossed in all combinations (except two missing ones) to generate 64 crosses. Ten random near-homozygous (F_6) lines from each cross were evaluated in replicated hill plots. Twenty-one C_1 parents were selected by first identifying the best yielding crosses and then choosing the highest yielding line in the selected crosses. The C_1 parents were systematically intermated using a circulant partial diallel to generate 63 crosses. Subsequent cycles have been generated following the same procedures. Currently, the crosses for C_3 have been completed and lines are being advanced to near homozygosity.

Thus far yield has been increased 4% per cycle, which is greater than 1% per year (minimum cycle time is three years). These yield increases indicate that recurrent selection is an effective procedure to create high yielding germplasm, especially since the initial parental set yields more than the varieties currently grown commercially. Seed weight, plant height, and heading date have also been increased; the latter two changes are not desirable.

Initial attempts to apply some secondary pressure against further increases in plant height and heading date appear promising. An alternate set of C_3 parents, selected with upper limits for plant height and maturity, yielded equal to the original set in subsequent tests.

Future efforts in this program will focus on additional cycles of selection for grain yield, continued selection to reduce plant height and heading date, and studies of correlated responses to determine which traits are responsible for the observed increases in grain yield.

Stem Elongation and Anatomy of Two Dwarf Oats

F. L. Kolb and H. G. Marshall[1]

Peduncle elongation and parenchyma cell length in the peduncle of two dwarf (OT 207 and NC 2469-3) and the two conventional height lines (OT 184 and NC 2469) from which the dwarfs were derived were studied. Parenchyma cells were measured to determine if the peduncle of the dwarfs have longer, shorter or the same length parenchyma cells as the conventional height lines. Plants were measured during peduncle elongation and after elongation was completed. Using longitudinal sections from three locations in the peduncle parenchyma cells were measured in totally elongated plants. The rate of peduncle elongation of OT 184 was faster than that of the OT 207. The cells in the lower part of OT 207 peduncles were significantly longer than those of OT 184. Dwarfness of OT 207 resulted primarily from decreased cell division rather than less cell elongation. OT 207 had fewer cells in the peduncle than OT 184. NC 2469-3 peduncles had shorter cells than NC2469. In NC 2469-3, dwarfness results primarily from less cell elongation in the upper part of the peduncle. In NC 2469-3, NC 2469, and OT 207, longer cells in the lower part of the peduncle than in the upper part implies that all cells produced by cell division have elongated. For OT 184 shorter cells in the lower part of the peduncle than in the upper parts suggest that cell elongation ceases before all the cells produced by cell division have elongated.

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RESPONSE OF OATS TO N FERTILIZATION IN WISCONSIN

M. A. Brinkman and Y. D. Rho

The response of three oat varieties to five rates of applied nitrogen (0, 25, 50, 75, and 100 lbs N/a) was evaluated at Madison and Arlington in 1979 and at Madison in 1980. The oat varieties were Stout, short and early, Marathan, tall and late, and Lodi, taller and later. Based on soil tests, growing conditions, and grain yields in 0 nitrogen, the three growing seasons (environments) were classified as low (Madison, 1979), medium (Madison, 1980) and high (Arlington, 1979) in productivity.

For most triats studied there was a significant response to applied N in the low (Madison, 1979) and medium (Madison, 1980) environments, but the response to N in the highly productive (Arlington, 1979) environment was considerably smaller. The grain yield response to applied N in each environment was more favorable for the short, early variety Stout than for the taller, later varieties Lodi and Marathon. For each of the varieties grain yields increased significantly as N applications were increased from 0 to 50 lbs/a in the low and medium environments. However, in the high environment grain yields were highest at 25 lbs N/a.

Lodging and crown rust infection were measured in the medium environment (Madison, 1980). Stout, the variety with the stiffest straw, had better standability than Lodi and Marathon in 50 and 75 lbs N/a, while all three varieties lodged considerably in 100 lbs N/a. Crown rust infection increased as nitrogen level increased, especially in 75 and 100 lbs N/a.

Grain quality characteristics were also evaluated. In general, groat percentage tended to remain relatively constant across N levels in each environment. Groat protein percentages either increased or decreased gradually from 0 to 50 lbs N/a, and increased considerably from 50 to 100 lbs N/a.

In this study the short, early variety Stout had better N responsiveness for most traits except straw yield. While the grain yield and lodging responses of Stout were especially impressive, short varieties should be early-maturing because of potential problems with an alfalfa underseeding and weed control. Farmers wanting high straw yields will probably be more satisfied with tall varieties.

Progress and Challenges in Development of Oats Tolerance to Barley Yellow Dwarf Virus

H. Jedlinski[1/]

Barley yellow dwarf (BYD) is one of the most devastating diseases of oats in America and other parts of the world. The epiphytotic of 1959 caused an estimated loss of 34.5 million bushels amounting at that time to $24.3 million, and representing 28 percent of the total oats production in Illinois. Since that time, divergent sources of tolerance have been found in a number of oats from the U.S. Department of Agriculture World Collection, and some of them have been successfully incorporated into acceptable commercial cultivars and improved experimental germplasm lines. In order to broaden the genetic base, tolerance to the disease also has been identified in *Avena sterilis* and *A. fatua*. The desirable characteristics of these species are being incorporated into agronomically desirable types. Oat cultivars tolerant to BYDV have an excellent potential to minimize the disease as a serious problem in oat production. Although fairly effective control of BYD throughout the oat-producing areas can be achieved by using tolerant cultivars, we must keep ahead of it and make provisions for controlling other problems as well. For example, with some desirable traits from *A. sterilis* such as tolerance to BYDV and resistance to crown rust we brought in susceptibility to stem rust of oats, which needs to be corrected. Oat smuts may also pose a problem. Different isolates of BYDV vary greatly in virulence, in vector specificity, and in the rapidity with which they produce symptoms. It is a big challenge to learn more about interrelationship of luteoviruses, of which BYDV is a member. It is important from the standpoint of epidemiology and control to know which member of the luteovirus group is prevalent, which plant host species represent virus reservoirs, which vectors are most important and what are their relationships. Use of proper cultural practices e.g. seeding time, and vector control linked to the migration forecasting also should be explored as possible control measures in addition to the use of tolerant cultivars.

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BYDV resistance in the genus *Avena*

A. Comeau B. Landry J.P. Dubuc

Hybridation within the species *Avena sativa* and *A. byzantina* has failed to produce BYDV resistance levels significantly better than those available in lines such as 76-S6 - 1454 and AA 68-75. Currently the other species in the genus Avena are under study to find better sources of resistance. Table 1 lists the actual status of knowledge on the subject. The species that contain resistant lines are not all easy to cross with *A. sativa*. Greatest facility will be encountered with the use of *A. hybrida*, *A. fatua*, *A. occidentalis* and *A. sterilis*. The use of *A. strigosa* and *A. nuda* (diploid) as parental material is not easy, and *A. macrostachya* has not been hybridized yet to any other species. It is our feeling that the resistance in *A. macrostachya* is of special interest, but comparison is difficult between spring and winter cereal types. Hybridation with some of the best *Avena sterilis* like CAV-1514, CAV-1516, CAV-1517, CAV-1981, CAV-3604 indicated that the resistance is mostly additive and due to more than 3 genes.

Table 1. Classification of wild *Avena* sp. as potential sources of BYDV resistance

Resistance not common	Resistance common
abyssinica	hybrida
barbata	fatua
canariensis	macrostachya
clauda	nuda (diploid)
damascena	occidentalis
eriantha	sterilis
hirtula	strigosa
longiglumis	
murphyi	
magna	
prostrata	
pilosa	
ventricosa	
wiestii	

Interactions of BYDV Strain x Source of Resistance in Oats and Barley

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Individual pure strains of barley yellow dwarf virus (BYD) were used to determine if a significant interaction existed between these strains and diverse sources of BYD resistance. Seedlings were infested in the one leaf stage with viruliferous aphids, <u>Rhopalosiphum padi</u> L., carrying either strain RPV or PAV in controlled chambers for four days.

Infested seedlings and noninfested (control) seedlings were then transplanted to the field in a split plot design with three replications. Whole plots were varieties with subplots consisting of strains ROV, PAV, and control. Individual subplots included four rows of seven plants space planted so that rows and plants within rows were three inches apart. Data were collected from the center five plants in each of the two center rows of each plot.

The analysis of seven different plant and agronomic characters showed that California Mariout barley was more susceptible to strain RPV than strain PAV. Porter oats exhibited resistance to both strains while Clintland 64 oats was susceptible to both strains. BYD infection in all varieties had little effect on kernel weight or harvest index; however, there was a significant effect of BYD on plant height and yield corresponding to the visual score of BYD infection.

The significant strain x resistance interaction has important implications for studies with segregating populations. Many studies with BYD have utilized local field collections of BYD; however, genotypes need to be tested with pure strains of the virus to gain a clear understanding of the inheritance of resistance.

EVALUATION OF SOURCES OF CROWN RUST RESISTANCE BY USE OF A LARGE NUMBER OF FUNGUS ISOLATES

L. J. Michel and M. D. Simons

ARS, USDA and Iowa State University

We have accumulated many lines of oats having potential usefulness as sources of resistance to crown rust. We needed to determine which of these lines had the same resistance genes, and the relative breadth of resistance of the different lines. Seventy lines, most with resistance genes from *Avena sterilis*, were chosen for intensive study. Field testing of older plants showed that most lines were resistant to common races under field conditions. Thirty-four single-pustule isolates were used separately to inoculate seedlings of the 70 oat lines in the greenhouse. They showed infection types ranging from immune to fully susceptible. When infection types were arbitrarily divided into "resistant" or "susceptible" categories, the 70 lines comprised over 40 patterns of host reaction, which ranged from resistance to all cultures all the way to susceptibility to all cultures. All the lines that were highly susceptible as seedlings had good field resistance to common races as older plants.

Promising oat rust resistant combinations from the germplasm collection

Paul G. Rothman, USDA and Univ. of Minnesota

Four germplasm lines with diverse sources of rust resistance are good prospects for widening the genetic base of future rust resistant oat cultivars. Selections within all four lines cross readily with the hexaploid oats. These are all represented in the 1982 International Oat Rust Nursery and are available there as parents for crossing.

A. "Delredsa" (6X)

Origin: From the cross Delta Red 88*2/C.I. 7152//Delta Red 88*2/CI 7152/3/Saia

Source: CI 4220 = Delta Red 88 (6X)
CI 7152 = Hajira/Joanette/3/Lee/Victoria//Fulwin/4/Bond/Anthony/5/Landhafer (6X)
CI 7010 = Saia (2X)

Entry number 29, 1982 IORN

B. "Aojss" (6X)

Origin: From the cross Alpha/Omega//Johnson Selection/Sturdy

Source: CI 9221 = Alpha (6X)
CI 9139 = Omega (6X)
CI 7906 = Johnson Selection (6X)
CI 7922 = Sturdy (Pur. 5939B1-3-1) (6X)

Entry number 30, 1982 IORN is a selection from the cross Aojss/Delredsa. Its resistance component is not determined.

C. "Obee" (8X)

Origin: Arose through a meiotic anomaly as an octoploid twin seedling from the cross Saia BCF//Japanese strigosa/A.s.g. 660/3/Florida 500

Source: CI 7010 = Saia (2X)--colchicine doubled = Saia BCF (4X)
CI 3815 = A. strigosa glabrescens (2X)--colchicine doubled = A.s.g. 660 (4X)
CI 8023 = Florida 500 (6X)
No number = Japanese strigosa--an autotetraploid of an unknown line of A. strigosa (4X)

Entry numbers 36 and 37 in 1982 IORN

D. "Amagalon" (6X)

Origin: A synthetic derived hexaploid obtained through colchicine treatment of a newly initiated tiller of the hybrid from the cross A. magna/A. longiglumis

Source: CI 8330 = A. magna (4X)
CW 57 = A. longiglumis (2X)

Entry numbers 33, 34, and 35 in the 1982 IORN

VARIABILITY OF *PUCCINIA CORONATA AVENAE* IN AUSTRALIA

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The findings reported here, are of a survey of *Puccinia coronata avenae* conducted from 1975 to 1979 in Australia with the main emphasis on the southern and northern parts of New South Wales (N.S.W.). Parallels are drawn with the variability observed in *P. graminis avenae* during the same period. To measure the variability of *P. coronata* the international differential set (Simons and Murphy 1955) was used in combination with a tester set comprising seven Pc lines, viz. Pc-38, Pc-39, Pc-45, Pc-48, Pc-50, Pc-55 and Pc-56.

Of the 1010 isolates from N.S.W. identified as 26 different races on the international differentials, 26% were taken from wild oats, 42% from cultivated oats and the remaining 32% from unspecified 'oat' plants. In all but one year (1975) the number of races of *P. coronata* detected in the north was greater than in the south. The mean number of races recovered per year from wild oats and cultivated oats was 9.0 and 9.4 respectively in the north with only 5.8 and 4.6 in the south.

When the racial diversity is expressed using the Shannon Index, the populations of *P. coronata* in the north were significantly more diverse than in the south in all survey years except 1975. The mean values for the five-year period ranged from 0.75 in the south to 0.94 in the north. The type of host plant appears to have no significant effect on the racial diversity observed in either part of that State.

The degree of virulence of isolates was measured as the number of international differentials they could attack, ten being the maximum. The total range found was 0 (race 239) to 9 (race 264). Little difference existed between isolates from either cultivated or wild oats within the regions but northern and southern N.S.W. differed markedly with the average degree of virulence of *P. coronata* being 22.4% greater in the north. The frequency distributions for virulence were different between the rust species. In the south, the distribution for virulence for *P. coronata* isolates resembled a normal distribution with only a small proportion (10%) having a wide virulence pattern. The situation in the north was similar, the proportion of isolates in the wider virulence category having increased to 25%. The distribution of virulence for *P. graminis* however, was distinctly bimodal in both regions.

The geographic trend of changing racial diversity and virulence values can be shown to extend to other mainland states. The isolates of *P. coronata* collected during the years 1978 and 1979 in southern N.S.W., Victoria, South Australia and Western Australia had virulence values ranging from 2 to 6, 2 to 8, 2 to 4 and 2 to 6 respectively. The corresponding values for Queensland and northern N.S.W. were 2 to 9 and 1 to 9. Taking only the seven Pc lines as a tester set, the proportion of the isolates having no virulence for any of the resistance genes of these lines increased respectively from 34.5% and 48.7% for Queensland and northern N.S.W. to 68.3% and 60.9% for southern N.S.W. and Victoria, and 80.7% and 76.9% for South Australia and Western Australia.

A study (Burdon, Oates and Marshall 1982) of wild oat populations in N.S.W. has shown that there is a considerable reservoir of resistances present in the three wild oat species Avena fatua, A. ludoviciana and A. barbata. No differences were detected in the average response of any of these species to P. coronata but in general, populations from northern N.S.W. were more resistant and more diverse in their infection response than were populations from southern N.S.W. The genetic make-up of such wild oat populations is likely to have a great influence on the distribution of virulence and diversity of the Australian crown rust flora.

Inheritance of Crown Rust Resistance From Hexaploid Oat Translocation Lines Which Obtained Resistance From Diploid Avena strigosa Schreb.

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University of Wisconsin - Madison

Three hexaploid oat translocation lines, which carried crown rust resistance from Avena strigosa Schreb., were crossed to susceptible Avena sativa L. varieties or test selections. (The translocation lines were developed from crosses between A. sativa and two donor sources: (1) 6x amphiploids and (2) derived tetraploid C.I. 7232.) Four types of crosses were made: translocation line x A. sativa (Type-1), translocation line x translocation line (Type-2), (translocation line x translocation line) x A. sativa (Type-3), and (A. sativa x translocation line) x A. sativa (Type-4). Segregation ratios were determined in F_2 populations from individual F_1 plants and in F_3 lines and families.

Observed 3R:1S segregation in most Type-1 and Type-4 F_2 populations indicated that the translocation lines (N569-42, N770, and DCS 876) contained one dominant gene which controlled resistance. Observed 15R:1S segregation in most Type-2 and in some Type-3 crosses indicated that the resistance genes were on independent loci in the translocation lines. The cause of some aberrant 1R:1S ratios remains unknown at the present time. The N569-42 translocation lines have proven to be very good breeding stocks, and the agronomic characteristics of the N770 and DCS 876 lines are being enhanced through additional crosses to A. sativa.

Breeding for Smut Resistance in Oats

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Breeding for resistance should be used to prevent a disease in any cereal if all of the following criteria are met:

1) some form of control of the disease is necessary to prevent losses; and the cost-benefit ratio strongly favours breeding for resistance;
2) diverse sources of resistance are available, and resistance is easily transferred into agronomically acceptable types;
3) resistance is likely to be long-lasting;
4) techniques exist to efficiently test large numbers of lines.

Smut of oats meets these four criteria. It is suggested that for diseases that meet these criteria the authorities responsible for licensing of varieties establish guidelines calling for resistance in new varieties, and that they provide assistance in screening breeders' material.

Inheritance of Greenbug Resistance in Oats

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The most serious insect pest of winter oats and other small grain crops in Texas is the greenbug aphid [Schizaphis graminum (Rondani)]. Resistant oat varieties would provide the most economical way to prevent serious damage of the commercial oat crop by the greenbug. Although oat germplasm lines with resistance to the greenbug biotypes prevalent in Texas (C and E) are available, no greenbug-resistant oat cultivars are available for commercial production. Information about the inheritance of resistance to greenbugs in oats is very limited.

The mode of inheritance and the number of genes conditioning high-level resistance to biotype C of the greenbug in nine oat germplasm lines of diverse origin were studied in crosses between resistant and susceptible genotypes. Greenbug-resistant lines also were intercrossed to determine whether they had the same, or different, genes conditioning reaction to the greenbug. Greenbug reactions of the parents, F_1, and F_2 generations were determined by artificial infestation in an insectary. High greenbug populations were utilized to provide a severe "test" for greenbug resistance. Susceptible genotypes usually were killed within 14 days after greenbug infestation.

The greenbug-resistant lines C.I. 1579, C.I. 1580, P.I. 251896, P.I. 251898, P.I. 258612, P.I. 258637, and P.I. 258644 were found to have a common single, partially dominant gene conditioning resistance to biotype C. P.I. 251580 also was found to have a single, partially dominant gene conditioning greenbug resistance, but this gene appears to be different than the one in the other lines. The gene of P.I. 251580 appears to be linked in repulsion phase (frequency of crossover gamete ≈ 14%) with the locus conditioning greenbug resistance in the other germplasm lines.

TX64D23-162R was found to have a single, recessive gene conditioning greenbug resistance. The locus for this recessive gene also appears to be in the same linkage group as the partially dominant genes conditioning greenbug resistance in C.I. 1579 and P.I. 251580.

It is disappointing that the number of genes conditioning greenbug resistance in this germplasm is quite limited. Even more discouraging is the finding 1/ that oat lines derived from crosses to C.I. 1579, C.I. 1580, P.I. 251896, and P.I. 258612 are not resistant to the field strain of the greenbug prevalent at the Experiment Station "La Estanzuela" near Colonia, Uruguay, in 1981. This provides additional evidence that the gene conditioning greenbug reaction is the same in these lines. It also provides a warning that new biotypes capable of overcoming the resistance of these lines may develop in the future in the United States. Oat lines developed from crosses to TX64D23-162R had excellent field resistance to the heavy field infestation of the greenbug at "La Estanzuela" in 1981. Unfortunately, lines derived from crosses with P.I. 251580 were not tested in Uruguay.

1/ Monica Rebuffo (unpublished).

Contribution of International Oat Rust Nursery to Oat Research

by

J. G. Moseman

The International Oat Rust Nursery, which was initiated by H. C. Murphy in 1954, has been coordinated by W. Q. Loegering, R. A. Kilpatrick and J. G. Moseman. The objectives of the International Oat Rust Nursery program until 1980 were:

1. To test advanced lines and varieties for cooperators.
2. To determine the effectiveness and relationships of resistance sources.
3. To make rust resistant germplasm available to cooperators for variety improvement.

The objectives were expanded to include the identification of new pathogenic biotypes of the rust pathogens, when the Uniform Oat Rust Nursery was discontinued in 1980.

The number and types of entries has changed since 1979. Drs. P. G. Rothman and M. D. Simons select and furnish seed of the entries used to identify new pathogenic biotypes of rust pathogens. Their entries are at the beginning of the nursery. The other entries are furnished by the cooperators. Prior to 1982, the number of entries was less than 80. For the 1982 nursery the number of entries increased to 119 and for the 1983 nursery the number of entries will be approximately 150. The increase in number of entries has resulted from our receiving 57 new entries in 1982 and 50 new entries in 1983.

Changes have been made in the management of seed and preparation of the reports. The cooperators are now requested to furnished 15-20 grams of seed of their new entries by March 1. The seed is grown in Idaho and assembled for distribution to the cooperators in October. A preliminary report, with the data received by December 31 of the following year, is prepared and sent out. The final report is prepared and sent out the following November.

Drs. Rothman and Simons determine the pathogenicity of rust pathogens throughout North America by analyzing the pathogenicity of the rust on leaves of plants from their entries sent to them by cooperators. They also monitor the reactions of their entries to rust in other countries. Those procedures enable them to identify new pathogenic rust biotypes before they become prevalent and cause large losses.

The cooperators are responsible for using the information on the reactions of their entries. Some of them use the information to determine the selections which they will release as new varieties.

The effectiveness and relationships of resistant reactions of entries in the nursery can be used by all cooperators. The cooperators are encouraged to use the entries as parents in crosses to develop new varieties, and in special research projects. We cannot determine how many entries have been used, since cooperators use the entries without our permission. However, several cooperators have indicated that they have saved seed of many entries. Cooperators should contact the coordinator before they increase seed of an entry and release that entry as a variety. Several cooperators have contacted the coordinators for the release of an entry as a variety. The coordinators have referred the cooperator to the individual who submitted the entries so that approval could be obtained. I do not know of any instance in which such approval has not been given.

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QUAKER OATS PRESENTS A COMPUTER PROGRAM TO COMPARE ADVANTAGES IN OATS PRODUCTION

by
A. Bruce Roskens
Quaker Oats Company

For many years the Quaker Oats Company has been providing information to High School Vo-Ag Departments and interested farmers on approved and recommended cultural practices for oats production. Our goal has been to show the farmer how to make oats a profitable crop and thereby encourage him to produce more milling quality oats. Our free information has included such items as film strips, transparency teaching kits, booklets on oats growth and insect control, and fact sheets on oats varieties, fertilization, and marketing.

Recognizing the new technology available and recent advancements in education, we have now developed a computer program entitled "Quaker Oats Company - Crop Comparison Program." This program is available to any and all Vo-Ag Teachers, farmers, bankers or grain marketers. It is a highly versatile computer program designed to allow the user to compute and compare costs of production and returns for nearly any crop he might choose. The user may set up his own crop data, including his own crop choices, cost of production, and local markets. Net return, total production costs, and break even prices are all calculated and shown.

By building a program in which all factors of cost and return are entered for each crop on an equal or relative basis, some crops, especially oats, can be more equitably compared to many row crops. As we all know, oats production in the U.S. has been on a steady decline due mainly to two factors: 1) reduced on-farm use of oats as a livestock feed; and 2) failure to compute net returns of oats in a rotation program on a equitable basis. We feel that when the user can compare his actual costs and returns and use this information in his management choices, he can make better decisions. He might even see that a cropping pattern which appears most profitable for one year might not be profitable in his long range cropping program. With oats prices as high in relation to many other crops as they are this year, oats can most definitely show up as a very profitable choice when all factors are considered.

The Quaker Oats Company wishes to see every farmer make the most profitable decisions in the production and marketing of his grain. We hope that this program will aid in that decision making process.

RELATIONSHIPS BETWEEN GRAIN MORPHOLOGICAL CHARACTERISTICS AND GROAT-TO-HULL RATIO IN OATS

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Quaker Oats Company
Chicago, Illinois

Ten kernel and groat morphological traits (including kernel weight, length and width) and three grain-quality traits (groat-to-hull ratio, test weight, milling) were determined for 70 oat genotypes. These oat samples represent a selection from the many oat samples that Quaker receives each year from oat breeders and various plant locations.

The samples represented a range in groat-to-hull ratio of 43 to 77% groats. Also, these oats had a range in oat kernel weight of 2.2-3.5 mg and groat kernel weight of 1.2-3.0 mg. Oat length and width ranged from 8.8-13.3 mm and 2.5-3.3 mm, respectively. Groat length and width ranged from 5.4-7.8 mm and 2.2-3.0 mm., respectively.

Both oat and groat weights were highly correlated with groat-to-hull ratio with R^2 values of 0.91 and 0.89, respectively. Other kernel traits that were correlated to groat-to-hull ratio with R^2 values greater than 0.70 were oat kernel length and width and groat kernel density and length.

We would like to acknowledge the fine work of W.R. Root and R.A. Forsberg (Wisconsin) and Y. Pomeranz (Kansas State) in this area. At this time, we have not reviewed our results in enough detail to see if our work agrees. Also, we will be continuing this study and will issue more complete results in the next couple years.

We would like to thank the numerous oat breeders who contributed the samples used in this study and measured oat kernel characteristics. In advance, we will thank you for your support in the continuation of this study. I also want to thank Rick Pohl of Quaker for analyzing the data generated in this study.

OAT STEM AND CROWN RUST IN 1981

A. P. Roelfs, D. L. Long, and D. H. Casper
U.S. Dept. of Agriculture and Univ. of Minnesota

In 1981, oat stem rust was first observed in a Beeville, Texas nursery on April 6. This is three weeks later than the 40-year mean (1941-1980). Before the end of the growing season, however, stem rust became widespread and often severe in Texas, resulting in losses in severely infected fields. This extensive disease increase in Texas provided inoculum for the northern area where rust developed in nearly every oat field. Losses of 10% occurred in a few late maturing Texas fields. Oat stem rust was scattered and light in varietal plots and commercial fields throughout the southeastern U.S. The vast quantities of inoculum produced in Texas resulted in earlier than normal infections in the north central states. However, the 1-2 week earlier than normal planting date in the north nullified much of the effect of the early disease occurrence. Only a few late fields in the north central region suffered losses.

The most prevalent race in 1981, was NA-27 (1530 isolates from 555 collections), making up 95% of all isolates (Table 1). In 1980, NA-27 comprised 78% of the isolates. The frequency of NA-16 (3%) was less than 1980 (11%), because fewer of the isolates from wild oats were identified as NA-16. Race NA-5 was identified from collections made in Texas, Minnesota, and Oklahoma. In 1981, race NA-5 comprised 3% of the isolates from Texas and in 1980, 20%. No collections from inoculated nurseries are included in Table 1.

Oat crown rust development throughout the southern U.S.A. was light, causing minimal losses. During June, crown rust increased rapidly in Minnesota and North Dakota oat fields but hot windy weather in early July prematurely dried most of the leaves. Losses were light except for a few late planted fields in Minnesota, North Dakota, and Wisconsin where losses were moderate to heavy.

Table 1. Physiological races of stem rust identified from 1981 collections from oats and wild oats.

State	Source	Number of		Percent of isolates of each race[a]				
		Collec.	Isol.	NA-5	NA-6	NA-16	NA-25	NA-27
Alabama	Nursery	1	3			33		67
	Field	1	3					100
Georgia	Nursery	2	6					100
Illinois	Nursery	6	17					100
Iowa	Nursery	19	54					100
	Field	5	13					100
Kansas	Nursery	6	15			7		93
	Field	3	6					100
Louisiana	Nursery	2	4					100
	Field	2	6			17		83

Dr. John F. (Jack) Schafer joined the staff of the Cereal Rust Laboratory in January of 1982 as Laboratory Director and Research Leader. Jack is a native of Pullman, Washington, and obtained his B.S. degree at Washington State University. He earned his Ph.D. in Plant Pathology and Agronomy at the University of Wisconsin in 1950. He was a faculty member at Purdue University from 1949-1968 where he conducted research on cereal diseases with emphasis on resistance of wheat to leaf rust. From 1968-1972 he was head of the Department of plant pathology at Kansas State University at Manhattan. From 1972 to 1980 he was Chairman of the Department of Plant Pathology at Washington State University. During the past two years he has been on loan from WSU to the USDA as the Integrated Pest Management Coordinator of SEA and later as Acting National Research Program Leader for Plant Pathology and Nematology for ARS.

Interspecific Oat Selections Available for Rust and BYDV Resistance

Paul G. Rothman

Cereal Rust Laboratory, USDA, ARS
University of Minnesota

The wide use of the oat species *Avena sterilis* in many breeding programs during the past 15 years may well have reduced the genetic vulnerability of the oat crop. New cultivar releases and advanced lines in the Uniform Nurseries with *A. sterilis* germplasm are increasing in numbers.

Of the 27 newest *Pc* genes added during the past 18 years to the *Standardized System of Nomenclature for Oats*, all but 2 were from *A. sterilis*. Of the 4 newest *Pg* genes found during the past 14 years, 2 were from *A. sterilis*.

Excellent combined resistance to the 3 major diseases of oats; barley yellow dwarf, crown rust, and stem rust is now available in a wide range of interspecific genotypes. Tolerance to BYDV was found in a colchicine-derived hexaploid from the interspecific cross between *A. magna* (4x)/*A. longiglumis* (2x). Good crown rust and stem rust resistance was also identified in selections of this derived hexaploid (dubbed Amagalon: CI 9364). This resistance has now been combined with other sources of better agronomic types and with crown rust and stem rust resistance from other oat species.

All lines are fully compatible with hexaploid oats and available in limited quantities of seed from the Cereal Rust Laboratory.

Table 1. cont.

State	Source	Number of Collec.	Number of Isol.	Percent of isolates of each race[a] NA-5	NA-6	NA-16	NA-25	NA-27
Michigan	Nursery	6	18					100
Minnesota	Nursery	36	103	1		2		97
	Field	94	248			1		99
	Wild Oats	11	33	3				97
Mississippi	Nursery	2	6			50		50
Montana	Nursery	1	3					100
	Field	1	3					100
Nebraska	Field	1	3					100
New Mexico	Nursery	1	3					100
North Dakota	Nursery	28	83					100
	Field	26	71					100
	Wild Oats	20	54			2		98
Oklahoma	Field	6	16	6				94
Pennsylvania	Nursery	5	12				17	83
South Dakota	Nursery	18	53					100
	Field	18	54					100
	Wild Oats	14	39			5		95
Texas	Nursery	163	455	2	*	6		92
	Field	28	73	4		8		88
	Wild Oats	16	37	8		5		86
Wisconsin	Field	5	15					100
1981-USA	Nursery	296	835	1	*	4	*	94
	Field	198	532	1		2		97
	Wild Oats	61	163	2		3		94
	Total	555	1530	1	*	3	*	95
1980 Total		433	1150	9		11		78
Mexico[b/]	Nursery	31	86	5		1		94

a/ See Phytopathology 69:293-294 for description of races.

b/ Collections were from Durango, Tlaxcala, Chihuahua, and Mexico states during late September and early October.

* = Trace

Disease Reactions of Interspecific Avena Crosses

Selection No.	Pedigree	Crown[3/] Rust Reaction	Stem[4/] Rust Reaction	BYDV Rating[1/] 1980 Rep. I	1980 Rep. II	1981 Rep. I	1981 Rep. II	1981 Rep. III	Avena Species Involved[2/]
788377	Amagalon Selection	S	HR	1	3	1	1	2	1,3
788378	Amagalon Selection	S	HR	1	2	1	1	1	
801444	Amagalon Selection	HR	HR			1	2	3	
804016	Amagalon Selection	HR	HR			1	1	1	
808763	Amagalon Selection	HR	HR-R			2	2	1	
808766	Amagalon Selection	HR	HR-R			1	1	1	
808781	Amagalon Selection	HR	MR			1	3	4	
809869	Amagalon Selection	HR	HR			3	2	1	
809870	Amagalon Selection	HR	HR			1	2	1	
788329a	Amagalon/Black Mesdag	HR	MR			2	2	2	1,3,6
799857	Amagalon/Black Mesdag	R	R			2	4	1	
802215	Amagalon/Black Mesdag	HR	S	3	1	1	1	1	
802216	Amagalon/Black Mesdag	HR	S	4	3	1	1	1	
795026-4	Amagalon/Marvellous	HR	HR	1	2				1,3,5
795026-12	Amagalon/Marvellous	HR	HR	2	3				
795001-2	Amag//Amag/Black Mesdag/4/Alpha/ RL 2629/3/AG-27/Lodi//Lodi/EG-26	S	S	1	3	3	1	1	1,3,6,7
805065-2	Amagalon/Black Mesdag//AOJSS	HR	HR			4	2	1	1,3,6,7
805065-5	Amagalon/Black Mesdag//AOJSS	HR	HR			2	2	2	
805076-3	Amagalon/Black Mesdag//Obee/3/ Gopher/RL 2629//Fulghum/FLA 500	SEG	HR			1	1	1	1,2,3,4,6,7

1/ Screening done by H. Jedlinski, Urbana, Illinois. Scale 0 = fully tolerant to 9 - intolerant

2/
1. A. longiglumis (2x)
2. A. strigosa (2x)
3. A. magna (4x)
4. A. byzantina (6x)
5. A. orientalis (6x)
6. A. sativa (6x)
7. A. sterilis (6x)

3/ Grown adjacent to inoculated buckthorn hedge

4/ Inoculated with races NA 26 and NA 27 in the field

Dosage effect in Barley Yellow Dwarf diseased oats.

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University of Missouri

Whether there is a dosage effect of the barley yellow dwarf virus is an unanswered question. Burnett and Gill (2) found a dosage effect for numbers of seed and seed yield with the cultivar Rodney when 1, 20, and 100 viruliferous aphids were placed on the plants. Boulton and Catherall (1) found essentially no dosage effect for six spring barleys when inoculated with 1, 5, 10, 20, and 50 viruliferous aphids.An experiment conducted in 1981 at Missouri was an attempt to monitor any dosage effect in our BYDV inoculation technique.

Our technique for BYDV inoculation is to first plant seeds into 6 cm peat pots. When the plants are in the two leaf stage of growth they are transfered to a growth chamber where heavily aphid infested, BYDV diseased barley leaves are placed over the plants achieving a good distribution of aphids on and around the plants. After three days the plants are sprayed with malathion and moved to the greenhouse. Since the aphids must move onto the plants to be inoculated, we felt plants inoculated earlier or by more aphids may possibly display more severe symptoms than those plants inoculated later in the three day inoculation period.

To test this possibility thirty plants of Stout, a BYDV susceptible cultivar, and Mo.06234, a BYDV resistant experimental line, were inoculated at the two leaf stage in the growth chamber. After a specified period of 1, 2, or 3 days five plants of each genotype were removed from the chamber, sprayed with malathion, and transplanted to six inch pots in the greenhouse.The inoculated plants along with uninoculated control plants of each genotype were randomized and grown to maturity in the greenhouse.Notes on tiller number, plant height, spikelets/plant, fertile florets/plant, weight/seed, and grain yield were taken on each plant.

The treatment means for the genotypes Mo.06234 uninoculated, Mo.06234 inoculated, Stout uninoculated, and Stout inoculated are presented in table 1. The inoculated treatments within a genotype have been pooled over the three inoculation time lengths. For the agronomic traits presented Mo.06234 does appear more resistant than Stout. When the inoculated means are not pooled a dosage trend seems to appear for Mo.06234 but not for Stout. This is evident from table 2.

Regression analysis of the traits on all inoculation time lengths including the control (0,1,2, and 3 days) presented in table 3 supports the idea of a trend for Mo.06234 and also for Stout since the beta estimate (slope of the line) is significantly nonzero for many of the traits. When the control plants are taken out of the analysis, however, both the low r^2 value (amount of variance in a trait attributed to its regression on inoculated time lengths) and nonsignificant beta estimate in all but two traits show no significant dosage effect among the inoculated plants. Dosage effect, then, does not seem to be a problem in our inoculation technique, and this data supports the notion of no dosage effect of BYDV. The significant beta estimates in the regression analysis using all the data can be explained by the significant beta estimates obtained from the regression of the traits on the uninoculated and pooled inoculated treatments (0, pooled 1, 2, and 3 days).

1. Boulton, R. E., and P. L. Catherall. 1980. The effect of increasing dosage of barley yellow dwarf virus on some resistant and susceptible barleys. Ann. appl. Biol. 94:69-75.
2. Burnett, P. A., and C. C. Gill. 1976. The response of cereals to increased dosage with the barley yellow dwarf virus. Phytopathology 66:646-651.

Table 1. Means for agronomic traits with the inoculated plants pooled within genotypes.

Genotype	Tiller no.	Plant height (cm)	Spikelets/ plant	Florets/ plant	Weight/ seed (g)	Seed yield (g)
Mo. 06234 control	4.4 a†	77 a	85 a	154 a	.03 b	4.6 a
Mo. 06234 inoculated	3.2 b	72 a,b	47 b	58 b	.03 b	1.8 b
Stout control	3.4 b	77 a	70 a	141 a	.03 b	4.5 a
Stout inoculated	3.0 b	68 b	21 c	17 c	.04 a	.7 c

† Different letters in the same column signify a difference at the .05 level.

Table 2. Means for agronomic traits separated by time length of inoculation.

Genotype	Tiller No.	Plant height (cm)	Spikelets/ plant	Florets/ plant	Weight/ seed (g)	Seed yield (g)
Mo. 06234						
(0)*	4.4 a[†]	77 a	86 a	154 a	.03 c	4.6 a
(1)	3.4 b	75 a,b	52 b,c	64 b,c	.03 c	2.0 b,c
(2)	3.4 b	72 a,b	50 b,c	69 b,c	.03 c	2.0 b,c
(3)	2.8 b,c	68 b	40 c	43 b,c	.03 c	1.4 b,c
Stout						
(0)	3.4 b	78 a	70 a,b	142 a	.03 c	4.5 a
(1)	2.8 b,c	68 a,b	19 c	12.5 c	.05 a	.5 b,c
(2)	3 b,c	67 b	24 c	22 c	.04 a,b	.9 b,c
(3)	3.3 b,c	70 a,b	21 c	15 c	.04 b,c	.6 c

* days inoculated
† different letters in same column signify a difference at .05 level

Table 3. r^2 and beta estimate significance ($\alpha = .05$) for regressions.

(trait = length of inoculation)

	Tiller No.	Height (cm)	Spike/ plant	Floret/ plant	Weight/ seed (g)	Seed yield (g)
regression using all inoculation	.52*[a]	.36*	.69*	.66*	.03	.66*
lengths and control	0	.02*	.04*	.45*	.03	.43*
regression using pooled inoculation	.49*	.17*	.08*	.83*	.01	.85*
length and control	.07	.39*	.67*	.71*	.22*	.68*
regression using only inoculated	.02	.30*	.34*	.23	.01	.22
plants and not control	.12	.03	.01	0.0	.01	0.0

[a] Top value in each row is for Mo. 06234; bottom value in each row is for Stout. The * refers to the beta estimate at the .05 level of significance.

HISTORY OF BREEDING OAT CULTIVARS SUITABLE FOR PRODUCTION IN DEVELOPING COUNTRIES

H. L. Shands
University of Wisconsin

There has been a long-time interest in breeding oats suitable for Latin American countries, especially where The Quaker Oats Company purchases its raw material for oat products. The overall project has been in progress for more than 20 years. This dates back to the days of D. E. Western when he and Dr. H. C. Murphy had a direct interest in growing oats in Mexico. As early as 1961, nurseries were grown in Mexico at several locations. Usually there were severe crown rust infections in the area of Monterrey, Mexico.

D. E. Western arranged for a project to commence at Porto Alegre, Rio Grande do Sul, Brazil when The Quaker Oats Company hired Rubem Dischinger around 1963. The Aid for International Development Program(AID) authorized Dr. H.L. Shands,University of Wisconsin, Madison, Wisconsin to spend one month in Rio Grande do Sul in contact with Mr. Dischinger. This was in 1965 and a second one-month's stay was in 1967. It was learned that there was severe crown rust infection in most varieties in the Guaiba area near Porto Alegre and also in Pelotas, Rio Grande do Sul. The latter location also had severe Septoria infection.

In 1974, Dr. S. C. Litzenberger who was then working with AID in Washington with the State Department suggested that a project with oats could be developed. A large wheat project was centered in Nebraska, with testing over many locations in the world, and it seemed only logical that a similar project with oats could be developed. To this end, H. L. Shands wrote a proposal for Dr. Litzenberger with Shands as the project leader to be helped by Dr. D. M. Peterson. The life of the project was to be 2 years and the size of grant was $25,000. Papers were signed and the project was funded in late 1974.

Objectives

The objectives of this breeding program were to find good genotypes that would include the following characteristics:

1. High grain yield and high test weight with good kernel and groat characteristics and weathering resistance of straw, grain, and groats.

2. Early vegetative growth and maturity where double cropping is practiced.

3. Resistance to important diseases and pests such as crown rust, stem rust, smuts, Helminthosporia, mildew, Septoria, root rots, aphids and other animal pests, viruses, red leaf (barley yellow dwarf virus), possible soil borne viruses, and several species of bacteria.

4. High nutritional qualities including high protein, high lysine, methionine and threonine, high vitamin content, and high digestibility.

5. Lodging resistance, including sturdy short straw with good feed value, taller straw where needed, and a good root system.

6. High forage yield, grazing adaptation (regrowth), high grazing yield (animal gains), followed by acceptable grain yields.

7. Adaptation to various environmental and stress conditions: poor and fertile soil, low temperature during flowering, low and high temperatures during growth period, sudden temperature changes, mineral imbalance, drought, existing photoperiods, and winter survival.

In 1974, there were 7,960 entries in the World Oat Collection. Drs. Litzenberger and Andy Downie arranged for these samples to be sent to four locations in South America. The entries were arranged so that each location would have a certain amount of the earlier accessions, and about an equal amount of the later accessions for testing in the C.I. (Cereal Identification) collection. Arrangements were made to send 2,004 selections to Porto Alegre to be grown at Guaiba. A total of 2,060 samples were sent to Santa Maria in Rio Grande do Sul, Brazil. Observations were made at both locations in 1974. A total of 2,046 samples were sent to EMBRAPA (the federal research branch in Brazil) at Passo Fundo, Rio Grande do Sul, but there was a delay in the delivery of these samples and they did not get planted until 1975. A total of 1850 samples were sent to Bogotá, Colombia and were grown there in 1975. These nurseries were usually planted in rows about five feet long and one foot apart. In 1975, H. L. Shands reviewed the nurseries at Porto Alegre, Santa María, Passo Fundo, and Bogotá. At that time, Dr. W. F. Kugler took a genuine interest in the nursery and had harvested possibly as many as 100 lines to be redistributed to other locations, especially in Argentina.

Project Plan

A search of the U.S.D.A. World Collection of Oats supervised by J. C. Craddock at Beltsville, Maryland was to be observed in detail at four South American locations. The plan was to find varieties or lines with best combinations of disease resistance in agronomic characters that would be suitable for production in those environments. If none were available, parental breeding stocks would have to be found. By growing the collection in partitioned units, a lesser load would be assigned to the people at the four locations. One fact evident in Rio Grande do Sul in 1974 and onward was that the varieties from Texas, South Carolina, Florida, and Georgia seemed to most nearly answer the needs of the environment. The variety Coronado from Texas was being grown commercially in Rio Grande do Sul and one breeder had as many as 80 hectares of this variety for seed production purposes. Professor Barreto, Santa María, Rio Grande do Sul had also conducted grazing and cutting trials indicating that Coronado would be able to be grazed and still produce a certain amount of grain at the end of the season.

At the outset, there were willing cooperators who would grow the nurseries and also make selections to be tested the following year. Simultaneously, crosses were being made at Madison, Wisconsin so that segregating material would be provided for the cooperators to be used in selecting types that might be useful in their area. More than a thousand crosses have been made at Madison and distributed. There has been a set of sustained contributions from Texas under the leadership of Dr. M. E. McDaniel, Texas A&M University, College Station, Texas. It is well to point out that many of these selections, both from Texas and Wisconsin, had the benefit of prior crown rust test in Puerto Rico.

A Few Recent Highlights

In the beginning, not many selections were highly resistant to the important diseases such as crown rust, stem rust, barley yellow dwarf virus (BYDV), and also other diseases such as mildew which is prominent in certain areas such as Tunisia. Dr. Fernando Carvalho at Guaiba received segregating material between the variety Dal and some selections from Texas and also from the cross of Goodland and Texas selections. In 1976, the F_3 generation of these crosses showed a great deal of promise for having agronomic types that would be useful as well as carrying crown rust resistance. Incidentally, these are now in increase stages in Rio Grande do Sul. Material was sent from Dr. G. Kingma from the CIMMYT station in Kenya to Dr. Frank Zillinsky of CIMMYT in Mexico to be planted at Obregon, Mexico. The oat nursery there was accidentally treated with the herbicide Illoxan or Diclofop, whereupon most of the oats were killed except several lines from Kingma that had resistance to stem rust derived from Minnesota 720183.

The EMBRAPA responsibility in oats improvement was transferred to the University of Passo Fundo and Professor Elmar Floss in 1977. He has increased the selection Fla AB113 with the designation UPF 1. He also increased X2505-4, a Wisconsin line, and it is designated as UPF 2. He has other selections of interest such as one from Coronado x X1779-2. Currently, there is cooperative work between Floss, Carvalho, and Mr. Medeiros of Cotrijui, a Cooperative located at Ijui, Rio Grande do Sul, Brazil. Grain was produced in 1981 of all of these selections including some from Dal x Texas 71C3093-2 and Texas 71C1017-3 x Goodland. It seems likely that one or more of these selections will be distributed in the near future.

There is continuing interest and cooperation by a sizeable number of workers in North America, South America, Africa, Asia (lesser), and Australia. Most of these generous workers are listed in the first four reports of "Breeding Oat Cultivars Suitable for Production in Developing Countries" by H. L. Shands, et al. Currently, there are productive oats breeding programs being supported by The Quaker Oats Company in Brazil, Uruguay, Argentina, and Mexico. Additionally, the international nursery is grown in Australia, Bolivia, Chile, Ecuador, Colombia, Kenya, Pakistan, Tunisia, Turkey, and the U.S.A. Dr. M. E. McDaniel has been the project leader since 1979. Dr. H. L. Shands remains very active and an integral part of the program. Dr. Marshall Brinkman at the University of Wisconsin has become active in the project in recent years and is expected to assume additional responsibilities in the future.

IV. STATE REPORTS

ARKANSAS

F.C. Collins, J.P. Jones, A. Bassi,
M.L. Fouts, and D.E. Longer

Production: According to the Crop Reporting Service, Arkansas farmers planted 60,000 acres of winter oats during the 1980-81 growing season; only 36,000 acres were harvested. The average yield was 60 bu/A. Because the market for oats produced in the state is primarily for seed purposes, oat acreage has not enjoyed the recent expansion that has occurred in wheat. Based on acreage of oats grown for certification, the most widely grown varieties are Bob and Nora.

Diseases: There was little evidence of disease incidence this past year; the diseases observed were barley yellow dwarf, smut, and downy mildew. A seed treatment test was conducted at Fayetteville and Stuttgart using 'Compact' oats which was naturally infected with smut. Good to excellent control of smut was obtained with CGA 64251, ICI-PP296, Baytan, GL668, BASF 42100, a Benlate-Manzate combination, and Vitavax. Excellent control of downy mildew was obtained with Ridomil combinations of Ridomil-CGA 64251 and Ridomil-Vitavax DB.

Personnel Changes: Dr. J. P. Jones is on a two-year assignment in Egypt. Dr. A. Bassi will continue the pathological research.

GEORGIA

D. D. Morey (Tifton), A. R. Brown (Athens),
J. W. Johnson and B. M. Cunfer (Experiment)

The Georgia Crop Reporting Service reported 80,000 acres of oats harvested for grain in 1981. The indicated yield was 60 bu per acre for a total production of 4,800,000 bushels of oats.

The relatively old oat variety, Fla. 501, continues to have a good yield record and is popular with growers. Coker 227 has a good yield record, is disease resistant and popular with growers. For north Georgia, Coker 716 is used because of its winterhardiness and adaptation. Cultivars such as Elan and Ga. 7199 will be replaced with newer ones as they become available.

Grain growers, like all farmers, are always looking for new and better ways to make a living. When several large breweries were established in Georgia, there was considerable interest in trying to grow malting barley. Dr. Acton Brown and other breeders and agronomists finally convinced the barley growers it is not possible or practical to grow malting barley in Georgia because of the many adverse factors influencing a quality malt.

Now the interest has shifted to an attempt to grow high quality oats for race horses and show horses. The markets are in Georgia, north Florida and even in Tennessee and Kentucky. The question is--can the farmers grow high quality oats for the horse trade? The answer is, they cannot be produced consistently and probably not at all. Test weights of oats in Georgia rarely exceed 34 pounds per bushel and usually range between 30 and 33 pounds per bushel. A second limiting factor is weathering at harvest time which takes away "brightness". The yields, protein content and amino acid balance of oats grown in Georgia are satisfactory but these factors are not as important in horse feed as plumpness and brightness. Table 1 shows about as far as we can go in producing quality oats in south Georgia.

Table 1. Yield, test weight, groat percentage and protein percentage of the uniform southern oat nursery grown at Tifton, GA, 1981, average 4 reps.

	Yield Bu/A	Test Weight	Groat %	Protein %
Coker 80-33	120	33.0	75.8 a	15.9 a
Coker 79-23	124	34.5	74.6 a	15.5 ab
Coker 80-29	125	34.5	74.5 ab	16.1 a
Coker 80-20	128	32.0	72.7 bc	15.9 a
Fla. 7118A	124	34.0	71.2 c	14.8 b
Elan (Ga.)	109	32.0	67.6 d	16.5 a
Coker 227	130	33.0	65.7 d	16.3 a
Fla. 501	140	33.0	65.7 d	16.2 a

INDIANA

H. W. Ohm, F. L. Patterson, G. E. Shaner, J. J. Roberts (Breeding, Genetics and Pathology), J. E. Foster (Entomology), Kelly Day and O. W. Luetkemeier (Variety Testing).

Production. Estimates from the Statistical Reporting Service, USDA, reported oats harvested in Indiana in 1981 totalled 85,000 acres with an average yield of 65 bu/A. Precipitation was unusually low throughout the winter months of 1980 to 1981 until the first week of April 1981. Much of the oat acreage was seeded by early April. Oats emerged well. Favorable temperatures and ample rainfall beginning in early April and continuing throughout the growing season contributed to excellent crop growth and good yields. Diseases, including barley yellow dwarf, were generally of little consequence.

Breeding. The variety Porter was released and breeder seed was shared among interested states in the North Central region. It will be available to Indiana farmers for seeding in spring 1983. Porter has very good resistance to barley yellow dwarf virus. It has yielded at or near the top of performance tests. It flowers about six days later than Noble.

We have modified our advanced yield nursery plots to consist of seven rows 15 cm apart and 3 m long. Plots are centered 1.2 m apart. Prior to harvest plots are end-trimmed and the outside rows are removed. We harvest the center 2.3 m of the center five rows.

Research. David Harper observed continuous variation for apparent resistances to barley yellow dwarf virus (BYDV) within backcross F_1, F_2, and among F_3 families based on visual symptom score and plant height. Means of F_2 populations were generally similar to the midparent value. Means of populations from singlecross F_1 plants backcrossed to the more resistant parent were closer to that of the resistant parent compared to the mean of the F_2. Likewise, means of populations from F_1s backcrossed to the more susceptible parent were closer to that of the susceptible parent. Similar observations were made by Lori Carrigan in winter wheat. Other observations over the years in isolated tests suggest that resistance may not be as polygenic or complex as these early generation studies indicate.

There may be several reasons for apparent ambiguities in our earlier observations. Lori Carrigan has observed in oats and wheat that apparent leaf discoloration and plant stunting from BYDV infection is significantly affected by soil fertility and moisture stress. Although leaf discoloration and plant stunting from BYDV infection are enhanced under moderate to severe stress conditions, selection for resistant plants is more effective when plants are grown under ample soil fertility and moisture or in mild stress conditions.

Our source of BYDV for inoculum has been from local field collections each year. In 1981 David Baltenberger studied interactions of two strains of BYDV (RPV and PAV) with four oats: Porter, Ogle, Clintland 64, and a breeding line received from Dr. R. I. H. McKenzie; and two barleys, California Mariout (CM) and CM 67. CM 67 is similar to CM, but carries the Yd 2 gene. Clintland 64 was susceptible to both strains, based on symptom severity, plant height, number of tillers per plant, and plot yield. Porter was moderately resistant to both strains. The other varieties were moderately resistant or moderately susceptible to one or the other virus strain, suggesting that resistance may be strain-specific.

We need to develop varieties which are resistant to locally-occurring virus strains. But to more clearly understand the genetic relationships and to effectively select for resistance we need to infect plants with pure strains of the virus.

Personnel. David Harper, supported in part by a grant from The Quaker Oats Company, has completed collection of data for Ph.D. degree and has accepted a position as corn breeder with Holden's Foundation Seeds, Inc., Williamsburg, IA. Lori Carrigan, supported by a grant from the Indiana Crop Improvement Association, has completed requirements for the Ph.D. degree and is a corn breeder and station manager at Willmar, MN for Pioneer Hi-Bred International. David Baltenberger joined the project in June 1981 and is supported in part by a grant from The Quaker Oats Company. He is a candidate for the M.S. degree.

IOWA

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

Oat production in Iowa has remained fairly constant for several years at about 60 million bushels. In 1981 the acreage harvested for grain was 960,000 and the yield was 62 bushels per acre. Oats in Iowa had significant amounts of both blue dwarf and barley yellow dwarf diseases in 1981, but compensation by nondiseased plants resulted in good oat yields in spite of these diseases. Oat stem rust and crown rust were present in all parts of Iowa, but both diseases developed so late in the season that they caused little reduction in yields.

A series of isolines has been developed using 'Lang' as the recurrent parent for use in a new multiline cultivar. Ten isolines from the Multiline E and two new *Avena sterilis* collections were used as the donors of crown rust resistance genes for the new multiline. The mating was done through Bc_2 to Lang, so the recovered lines should carry ca. 87.5% of Lang germplasm. A facsimile of the new Iowa multiline was entered in the 1981 USDA Early Oat Nursery, and this multiline with the exact isoline composition to be released as foundation seed will be in the regional nursery in 1982.

It is well established that genes are carried in both nucleus and cytoplasm of plant cells. Genes carried in the cytoplasm are called plasmagenes, and the best known plasmagenes are those that cause cytoplasmic male sterility in several plant species. We have completed a study to determine the effect of plasmagenes from *A. sterilis* on productivity of cultivated oats. The parental materials were five *A. sterilis* lines and two adapted cultivars. Reciprocal crosses of the ten possible interspecific matings were carried to Bc_2 using the adapted cultivars as recurrent parents. Isopopulations of random segregates from each pair of reciprocal crosses of a mating were tested in Iowa in 1979, 1980, and 1981. The *A. sterilis* cytoplasm caused a 6% greater grain yield, a 1% greater harvest index, and a 1 day later heading date. In certain specific matings, the *A. sterilis* cytoplasm resulted in 25% yield increase over the recurrent parent and the best comparable lines in the *A. sativa* cytoplasm. These results indicate that use of plasmagenes from *A. sterilis* in an oat improvement program, in addition to diversifying the genetic base of cultivated oats, may be useful for increasing grain yielding ability.

Most oat cultivars grown in Iowa produce two seeds per spikelet. However, some lines used in Multiline E cultivars set a high percentage of tertiary seeds. In a recently completed study, it was found that the tertiary seed set was determined by alleles at two loci, Ts-1 and Ts-2, with multiple alleles operating at each locus. For the Ts-1 locus, the alleles and their respective effects are:

Ts-1a = partial dominance for low tertiary seed development
ts-1b = partial dominance for high tertiary seed development
ts-1c = high tertiary seed development, epistatic to ts-2b in single dose

For the Ts-2 locus, the alleles and their respective effects are:

Ts-2a = partial dominance for low tertiary seed development, epistatic to ts-1b and ts-1c
ts-2b = low tertiary seed development
ts-2c = high tertiary seed development

Tertiary seed development, although interesting as a possible way to increase sink size and being simply inherited, was uncorrelated with grain yield in our studies.

There have been some fairly significant changes in the personnel on the oat project at Iowa State University during 1981. After 28 years as co-leader of the oat project at Iowa State, Dr. J. A. Browning resigned to accept the headship for the Department of Plant Pathology at Texas A&M University, College Station, Texas. He took up his new duties in Texas on July 1, 1981. Dr. Browning was replaced at Iowa State by Dr. Charlotte Bronson, a recent Ph.D. graduate from Michigan State University, who will be an epidemiologist in the Plant Pathology Department. Students who received degrees on the small grain project in 1981 and their present locations are as follows:

a. Paul Murphy, who received a Ph.D. degree, is a corn breeder with the Purdue Agricultural Alumni Seed Association, Lafayette, Indiana;
b. Paul Gibson, who received a Ph.D. degree, is on a special assignment with Iowa State University in Costa Rica;
c. Sandy Johnson, who received an M.S. degree, is an assistant corn breeder with Pfizer Genetics at North Platte, Nebraska;
d. Bruce McBratney, who received an M.S. degree, is continuing work towards a Ph.D. at Iowa State;
e. Chris Mundt, who received an M.S. degree in plant pathology, will be continuing graduate study at North Carolina State University.

Persons who have begun graduate programs on the oat project in 1981 are Bill Beavis from New Mexico A&M, Neil Cowen from Michigan State, John McFerson from the University of Wisconsin, Jaime Sahagun from the Graduate School, Chapingo, Mexico, and Gary Weber from Montana State. All are working toward Ph.D. degrees. Debbie Colville from the University of Georgia, Fred Rattunde from the University of Wisconsin, Virginia Collison from the University of Maryland, and Bryce Abel from Iowa State University all are working toward M.S. degrees.

MARYLAND

J. G. Moseman

<u>International Oat Rust Nursery</u>

The International Oat Rust Nursery is a combination of a Uniform and International Nursery. The objectives of the nursery are: (1) to aid in monitoring and studying the pathogenicity of the pathogens which incite stem and crown rust in North America, (2) to enable cooperators to have their advanced lines and selections tested for reactions to rust world-wide, and, (3) to enable cooperators to observe and obtain new sources of rust resistance for their oat variety improvement research.

Dr. M. D. Simons and Dr. P. G. Rothman select the first entries in the nursery, which are used for studying the pathogenicity of the pathogen. The remaining entries are furnished by other cooperators.

Entries in the nursery are being used by cooperators. In 1981 cooperators in the Republic of South Africa requested permission to release as a variety, entry 37 from the 1976 nursery. Entry 37 had been submitted by Cornell University and has been released as the variety, Cayuse, CI 8263, by Cornell University and Washington State University. Arrangements were made for a joint release of the variety by Cornell University, Washington State University and the Republic of South Africa.

Two changes have been made in the operation of the nursery. Instead of requiring 200 to 250 grams of seed of each new entry, the cooperators are being requested to furnish 15 to 20 grams of seed of any selection, advanced line, or variety which they may wish included in the nursery. The seed of all entries for the nursery is then increased in Idaho. A preliminary report with data received by specific time is being prepared to send to all cooperators in April. Data from all cooperators can not be obtained until September or October. The report on the 1980 nursery was sent in Novwember 1981. A preliminary report on the 1981 nursery will be sent in April 1982.

The International Oat Rust Nursery is to assist all plant breeders, pathologists, and other scientists interested in rust diseases of oats. Therefore, we welcome any suggestions which may enable us to make that nursery serve your needs more effectively.

MARYLAND

D.J. Sammons
University of Maryland

Maryland farmers harvested a total of 20,000 acres of oats in 1981, slightly more than in 1980. Statewide, oat yields averaged 55 bu/A, for a total state harvest of about 1.1 million bushels. Oats are a relatively minor crop in Maryland, and the involvement of the small grain program with this crop is limited to variety testing. Spring oats are generally successful in the western region of the state if they are planted early enough to mature grain before the excessive heat of early summer. Winter oats are risky in most areas of the state except on the Eastern Shore because of the danger of winter kill. In 1981, for example, our winter oat variety trial was lost due to cold. The following winter oats have been planted in the 1982 Winter Oat Variety Trial for Maryland:

*Norline	Coker brand 227	Southern States brand 76-30
*Pennwin	Coker brand 716	PA 7408-174
*Compact	Coker line 79-23	KY 64-10653
Windsor	Coker line 76-20	
	Coker line 76-21	

*Recommended variety in Maryland

The results of the 1981 Spring Oat Variety Trial for Maryland are summarized in the accompanying table. Most noteworthy in the data is the fact that excellent test weights were obtained for all lines tested. Yields were only fair for most lines, due, in part, to a major level of cereal leaf beetle (*Oulema melanopus*) infestation and also to high temperatures in the early summer. Diseases were not a problem. Ogle was the top-yielding spring oat variety in Maryland in the 1981 tests.

Performance of spring oats for several characteristics, Clarksville, Maryland, 1981

Variety	Yield (bu/A)	Bu. Wt. (lb/bu)	Percent Lodging	Head Date	Height (in.)
Ogle	93.9	35	25	May 5	36
Garry	35.5	36	50	May 4	40
Otee *	47.7	40	48	May 4	39
Astro	44.1	40	60	May 6	37
Clintford	38.6	36	40	May 3	36
Lang *	70.1	34	15	May 2	40
Larry	68.5	37	15	May 3	39
Noble *	72.6	36	15	May 5	38
Dal	56.0	40	25	May 7	44
Mariner	43.8	41	25	May 6	45
SS 76-30	68.9	40	42	May 6	42
Clintland 64	22.2	36	25	May 6	42
Jaycee	57.7	36	8	May 3	37
Norline	35.2	40	5	May 8	40
Clintland 60	31.6	38	45	May 10	41
PA 7527-1079	60.0	36	5	May 5	40
PA 7628-457	53.3	39	45	May 3	36
PA 7773-618	52.1	38	0	May 3	35
PA 7773-1269	59.0	38	0	May 4	38
PA 7836-2093	50.6	40	0	May 6	39
PA 7836-2334	68.5	38	12	May 6	36
PA 7836-6571	80.4	38	15	May 3	34
PA 7836-9925	70.9	42	0	May 4	30
PA 7836-10330	61.6	36	0	May 4	39

Conducted at: Forage Research Farm
Soil Type: Manor Silt Loam
Date planted: March 18, 1981
Date Harvested: July 14, 1981
Fertility: 40 lb. N/A, 60 lb. P_2O_5/A, 60 lb. K_2O/A.

* recommended variety in Maryland

MINNESOTA

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

Production

Oat production in Minnesota exceeded 90 million bushels in 1981. Acreages, both planted and harvested, were only slightly below 1980. The 63 bu/A average yield is the second highest on record. Because of a mild and dry winter, planting was ahead of schedule. Weather during the growing season was quite favorable, except for the southwest corner of the State which was quite dry. Current oat prices will probably result in at least a modest increase in oat acreage in 1982.

Varieties

An oat variety survey was conducted in Minnesota in 1981. Leading varieties and the percentages of the total oat acreage they occupied were Lyon (18%), Rodney (14%), Noble (12%), Lodi (10%), Moore (9%), and Benson (5%). Compared to the previous survey of 1977, the greatest declines were in Froker (-14%), Chief (-8%) and Harmon (-4%). Regarding future acreages, Lyon, Moore, and Benson were grown on 46% of the Minnesota certified seed acreage in 1982.

Personnel

We are pleased to announce that J.F. Schafer is the new director of the USDA-ARS Cereal Rust Laboratory at St. Paul. Unfortunately, Randy Jeppson, extension small grains specialist, left us. The status of his replacement is uncertain at this time.

Two Ph.D. candidates will soon complete their degree requirements. Robert Nielsen has been studying the relationship among specific combinations of oat and alfalfa cultivars, particularly those that might be used in establishing alfalfa stands in Minnesota. He has accepted an extension position at Purdue dealing primarily with soybeans.

James Luby's research is an extension of the studies Mike McMullen did earlier analyzing micronuclei frequencies in various *Avena sativa*-*A. sterilis* hybrids. Jim is working with seven *A. fatua* lines and the same nine *A. sativa* genotypes Mike used. Based on micronuclei frequency of F_1 progeny, Jim selected high and low crosses and will evaluate homozygous progeny from them to test the relationship between recombination and micronuclei frequencies.

Tom Payne has joined us to work on a M.S. degree. His research involves a number of morphological and physiological measurements of the parents from cycles zero, one, two, and three of our recurrent selection program. We hope to be able to explain some of the 12+ percent gain in grain yield which we have observed for the first three cycles of selection.

MISSOURI

Dale Sechler, Paul Rowoth, Jeff Gellner (Columbia),
and Calvin Hoenshell (Mt. Vernon)

Production: Approximately 190,000 acres of oats were planted in Missouri in 1982 according to the Missouri Crop Reporting Service. About 90,000 or 47% of the planted acreage was harvested for grain. Sizeable acreages not harvested for grain are grown for hay. The acreage planted almost doubled in 1981, since conditions for seeding were favorable in most areas, and the average yield of 51 bushels per acre was above normal for the state. While growth was excellent, heavy rains during July delayed harvest and contributed to heavy lodging and discolored grain. Reduced ability to germinate has been observed in some of the late harvested grain. Late as compared to early maturing, varieties performed relatively better than normal.

Diseases: Herbicide carryover, following the unusually dry 1980 season, resulted in an unusual amount of damage to oats. Crown rust was also rather prevalent late in the season and damaging in some fields. Barley Yellow Dwarf Virus symptoms could usually be observed but damage was not severe.

Varieties: Certified seed of 3 varieties, Bates, Lang and Otee, was produced in 1981 with a total of only 211 acres of the certified class and 71 acres of the registered class. In 1981 variety trials, Ogle produced the highest yield of the named varieties tested. Bates, Lang and Noble have been superior in performance over years. No winter oats were seeded for certification in the fall of 1981.

NEW YORK

Mark E. Sorrells

1981 Spring Oat Production. The 1981 spring oat crop for New York State averaged 64 B/A on 280,000 acres, about the same as 1980. Astro and Garry each occupy about one-third of the acreage. Many cultivars make up the remaining third. In our regional trials, Ogle continues to out-yield all entries followed by Porter and Marathon. Marathon is second only to Astro in lodging resistance.

Introgression of Tetraploid and Diploid Avena spp. We have developed long term strategies for using diploid and tetraploid (*A. barbata* or *A. abyssinica*) oat species in crosses with cultivated hexaploids to create 8X amphiploid lines and gene pools. Briefly, the procedure for tetraploids is to make 4X·6X crosses and double the pentaploid F_1 with colchicine to obtain a decaploid. Because of the tetrasomic condition of the 'A' genome, chromosomes of this genome are preferentially lost. We are exploring screening techniques for identifying individual plants with approximately 56 chromosomes.

The procedure for diploids is to make 2X·6X crosses, culture the embryo, and double the tetraploid F_1 to obtain octoploids directly. Several diploid species are being studied to determine which ones are amenable to this type of manipulation. Ultimately, our goal is to intermate octoploids that have the same species as parents to create segregating populations for further selection and improvement. Hexaploid lines are readily obtained from the progeny of 8X·6X crosses. We believe there are two advantages to this approach. First, all of the genes of diploids are conserved in 2X·6X derived octoploids and at least half of the tetraploid genes are conserved in 4X·6X derived octoploids. Second, octoploids have the potential to store more diverse genetic information, to offer more alternative genetic pathways, and to create more interallelic interactions. From a field evaluation of 200 A. abyssinica accessions, 12 have been selected for use in crosses with hexaploids. Several decaploid progenies are being screened for vigor, fertility and chromosome number. Sue Fritz is conducting much of this work for her thesis research.

Equipment. A new plot planter designed and built by Allan Neiss (Specialist on small grains) performed very well in 1981. It mounts by 3-point hitch, has double-disk openers, adjustable row spacing, and adjustable row length. Using different cone distributor attachments we can plant 2, 3, 4, or 6 row plots. A short knife-like guard in front of the disk-openers pushes rocks out of the way for uniform planting in rocky soil.

NORTH CAROLINA

C. F. Murphy, T. T. Hebert and R. E. Jarrett

The level of interest in oat production in North Carolina is the highest it has been in many years. Part of this interest can be attributed to strong oat prices (especially so relative to corn) and to increased opportunities for double cropping. An additional incentive, though, is the relatively high protein production potential of the new variety, Brooks.

A swine feeding project conducted by Crop Science and Animal Science Extension Specialists indicated that 400 pounds of oats could be substituted for 400 pounds of corn in a grower ration. Their results also indicated that Brooks oats contained 0.67% lysine, compared with a lysine content of around 0.44% for other oat varieties they tested and a requirement of 0.61% lysine for pregnant sows. A number of swine producers are now utilizing 50 to 100% oats in their pregnant sow rations. In these instances, five pounds of oats are replacing three pounds of corn and one pound of soybean meal.

While the protein potential of Brooks is derived from conventional sources, we are devoting considerable effort toward introgressing high protein from A. sterilis into lines with commercial potential. We are pleased with our progress to date but one complicating factor has been a lack of winter hardiness in our A. sterilis derivatives.

NORTH DAKOTA

Michael S. McMullen
North Dakota State University

Production

The North Dakota Crop and Livestock Reporting Service reported 44,160,000 bushels of oats were harvested from 960,000 acres with an average yield of 46 bu/a in North Dakota in 1981. A total of 1,200,000 acres were planted. Production was more than triple the 1980 drought-damaged oat crop. Excessive heat during July resulted in low test weights, particularly in later maturing varieties. The 1981 environment was more favorable for varieties of early maturity than those with later maturity. Moore and Lancer both performed well in eastern North Dakota while Otana performed well in the west.

Diseases

Diseases caused few problems in fields planted early in the season. Little crown rust was observed, but stem rust did reach levels sufficient to cause economic losses in late-planted fields, particularly in the northeastern quarter of the state.

Personnel

William Laskar is studying the inheritance of yellow dwarf resistance from several sources that are being used in our breeding program.

OKLAHOMA

H. Pass, E. L. Smith and K. J. Starks

Production: The Oklahoma state average oat yields and acreage fluctuate, from year to year. The 1981 oat crop harvested for grain amounted to 4,095,000 bushels and was harvested from 105,000 acres with a yield of 39.0 bushels per acre. Harvested acreage was up 5,000 acres over the past year. This is the second consecutive year for a 5,000 acre gain in harvested oat acreage. Normally about one-half of the seeded acreage is harvested for grain and the rest is used for pasture and hay crop.

Oat Varieties: Most of the oat acreage is seeded to winter oats. However, there seems to have been an increase in spring oat seeding in the state for the past two or three years. Popular varieties are Cimarron, Chilocco, Okay and Nora. A small acreage of Bob and Walken have been planted the past two years. Relative little disease or insects were observed. Some Barley Yellow Dwarf was observed on Nora. However, winterkilling had the most detrimental effect on yields of this variety.

Research: Work is continuing on the development of greenbug resistant oat variety for Oklahoma. Most of this work is with the bio-type "C" resistance. There has been some indications, in preliminary screening, that this resistance in oats may carry over to the "E" bio-type. We are in the process of screening this material with bio-type "E" greenbug at this time. In other research, two selections with most promise in preliminary yield tests are OK79602 (OK64201-63/Nora) and OK79601 (Nora/Chilocco) and these will be looked at again.

SOUTH DAKOTA

D. L. Reeves and Lon Hall

Production

Oat production increased about 7 percent in 1981 with 70,520,000 bushels produced. Acreage planted was 2,250,000. This was a 50,000 acre increase, 2.3 percent increase from the previous year. From this total, 1,640,000 were cut for grain with an average yield of 43 bushels per acre. This is a decrease of one bushel per acre from last year. The last two years have had dry springs with summer rains. This has resulted in later varieties outproducing the early ones over much of the state. Because of this, there has been a noticeable shift toward later varieties in much of the state. Oat production in the southeastern corner of the state was about nil due to the spring drought. Small grains there were about a foot tall after heading. Diseases did not present a problem in the state this year although a small amount of stem rust was present.

Breeding

Crosses have been emphasizing yield with acceptable kernel type. Test weight is of major concern to many farmers in the eastern part of the state as oats with high test weights are sold at a premium. Some areas also exhibit a strong preference for white hulls so those high test weight oats can be sold as "race horse oats".

Equipment

Our cone planter was modified so scrapers are no longer used to move the grain to the drop spout. Oat kernels sometimes caught on the scraper and didn't drop properly. This was especially true with awned types or kernels with long tips. The present unit has a belt around each cone. Above the grain tube, the belt is pulled away from the cone thus permitting the grain to drop down the spout.

Personnel

Sonja Fillingsness joined the project in July. Her thesis problem concerns the inheritance of groat oil.

TEXAS

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

Production: The 1981 seeded acreage of oats in Texas increased slightly to 1,500,000 acres. The seeded acreage remained below the 10-year (1972-1981) average of 1,666,000 acres. The 1981 harvested acreage of 410,000 acres also was below the 10-year average harvested acreage of 453,000 acres. However, the 1981 statewide yield average of 46.0 bushels per acre is the highest on record. This yield broke the previous record of 42.0 bushels per acre set in 1979. The average oat yield in Texas has equaled or exceeded 40.0 bushels per acre only four times during the 116 year period 1866-1981; all four of these high yield levels have been achieved in the past nine seasons. The high yields in 1981 were obtained despite unusually high greenbug infestations and the most severe armyworm outbreak in many years. However, rust diseases were unusually light.

Many farmers in the Blacklands area of Central Texas produced yields at or near the 100 bushel per acre level. Four of the leading oat producing counties in the Blacklands had average yields ranging from 60.6 to 65.3 bushels per acre. Test weights of combine-run oat samples approaching 40 pounds per bushel were common. Small-scale milling tests of six commercial oat varieties produced in the McGregor area were conducted; three of the six varieties (Nora, Mesquite, and TAM 0-312) had very good milling yields, requiring 157.3 - 159.8 pounds of oats to produce 100 pounds of product. Coker 234 rated good (163.2 lbs. of oats/100 lbs. product), and Big Mac rated average (165.7 lbs. oats/100 lbs. product). Of the six varieties tested, only Coronado was rated poor for milling yield (172.7 lbs. oats/100 lbs. product). These results indicate that milling-quality "winter" oats can be produced in Texas if conditions are favorable. Winter oats are not used for milling in the U.S.; however, they are used extensively for milling in Latin America, and good milling yields are obtained.

Research: Crown rust and stem rust resistance is being emphasized. Progress in transferring stem rust resistance from C.I. 9221 into agronomically acceptable lines has been painfully slow, although definite progress is being made. A genetic study of eight of the oat germplasm lines found to have the lowest biotype C greenbug damage ratings among 4343 lines screened by Norris Daniels (see 1978 Oat Newsletter, pages 82-84) was conducted. Seven of these lines were found to have a common single, partially dominant gene conditioning resistance to biotype C. P.I. 251580 also was found to have a single, partially dominant gene conditioning greenbug resistance, but this gene appears to be different than the one in the other lines. TX64D23-162R, a greenbug-resistant germplasm line not included in Daniels' study, was found to have a single, recessive gene conditioning greenbug resistance. A more complete discussion of this genetic study can be found in the Abstract of the paper "Inheritance of greenbug resistance in oats" (McDaniel, Gardenhire, and Tesfaye) which was presented at the American Oat Workers' Conference - International Oat Workshop. This abstract appears elsewhere in this volume of the Oat Newsletter.

Latin American Oat Research: The Quaker Oats company is sponsoring a Latin American oat research project designed to improve production and quality of oats in Latin America. An experimental oat nursery of 350-400 entries is assembled by oat research workers at Texas A&M University and at the University of Wisconsin, Madison; this nursery is distributed to one or more locations in Mexico, Brazil, Argentina, Uruguay, Chile, Colombia, and Ecuador each year. Improved disease and/or insect resistance is needed to make oat production practical in many areas of Latin America. A number of promising experimental lines from this program are being increased for possible release in Brazil. Our cooperative working relationships with Latin American oat research workers are excellent. A more detailed discussion of this project can be found in the Abstract "International oat breeding project" (McDaniel, Shands, Schrickel, and Weaver) included in the American Oat Workers' Conference - International Oat Workshop abstracts section of this Oat Newsletter.

Personnel: Norris E. Daniels, Entomologist at Bushland, retired in 1981. He had a very productive career as crop research entomologist on the Texas High Plains. Dr. David Worrall joined the small grain research group of the Texas Agricultural Experiment Station as a Wheat Breeder at Chillicothe-Vernon. Dr. Worrall comes to us from the CIMMYT wheat breeding program in Mexico; he replaces Dr. Earl C. Gilmore, who has assumed full-time administrative duties as Resident Director of the Texas A&M University Agricultural Research and Extension Center at Chillicothe-Vernon.

UTAH

R. S. Albrechtsen

Production. Utah's harvested oat acreage is small, but has remained constant for the last several years. Some acreage is harvested for forage but most is produced for grain. Present levels of production are expected to continue in order to meet specialized needs. Essentially all production is under irrigation. Disease problems are generally minimal; smut occasionally causes severe losses.

Oat Program. Our oat program in Utah is confined largely to the testing of entries in the Uniform Northwestern States Oat Nursery, plus additional named cultivars. We are not doing any breeding work. Adapted improved cultivars from other programs are identified through our testing program.

WASHINGTON

C. F. Konzak and K. J. Morrison

In spite of widespread BYDV infestation of cereals, oat yields were high at Pullman and in research trials in growers fields. Top yield at Pullman on summer fallowed land was 180 bu/ac. High yielders included ID742300, WA6159, Cayuse, Appaloosa and Ogle. Ogle showed the least BYDV symptoms and a deep green plant color. ID742300 and Ogle had the highest test weights.

WISCONSIN

R.A. Forsberg, M.A. Brinkman, Z.M. Arawinko, R.D. Duerst, T.M. Luk, E.S. Oplinger, H.L. Shands, D.M. Peterson, and P.J. Langston (Agronomy), and D.C. Arny and C.R. Grau (Plant Pathology)

The 1981 statewide average grain yield of oats in Wisconsin was 58.0 bu/a, a decrease of 3 bu/a from the 1980 average of 61.0 bushels. Wisconsin farmers planted 1,100,000 acres of oats in 1981, a decrease of 20,000 acres from 1980. While rainy weather during the 1980 and 1981 harvest seasons contributed to acreages harvested for grain of 963,000 and 957,000, respectively, the acreage of oats harvested as silage continued to increase during the past two growing seasons. Farmers harvesting oatlage are more assured that their alfalfa underseeding will provide a cutting late in the season. Oatlage is a good substitute for corn silage in dairy rations when the supply of silage dwindles during the summer.

Mild, dry weather in March allowed the 1981 crop season to get off to an early start throughout Wisconsin. Farmers in the southern counties were seeding oats during the latter part of March, the earliest ever on some farms. During the 67-year period from 1914 to 1980, some oats were seeded in March in only 11 of those years. In 1980, only a few farmers planted oats before mid-April, and during the past 10 seasons there were only three years in which any oats were seeded by April 6th. These years were 1973 and 1976, both very low grain-yield years, and 1977, which was the year with record high yields per acre (65.0 bu/a).

The early planting in southern Wisconsin in 1981 was offset by wet soils in the northern part of the state. The net result was that by May 18th, seeding of oats on a statewide basis was only 95% completed compared with 99% in 1980. Later planting and considerable lodging statewide probably were the two main factors that held grain yields down.

A third factor which appears to be having an increasingly detrimental effect on oat yields in Wisconsin is the red leaf virus. The early spring in southern Wisconsin in 1981 resulted in aphid populations and activity far greater than normal. While visible red leaf symptoms in farm fields of oats did not appear to be worse than normal, it is possible that undetected yield reductions were caused by virus infection. A second reason for this deduction is the high yield level attained by Ogle (Illinois) and Porter (Indiana) in Wisconsin trials. Both of these new cultivars possess more tolerance to the red leaf virus than other cultivars, a fact which supports the above reasoning.

USDA OAT QUALITY LABORATORY

Personnel of the Oat Quality Laboratory continue to cooperate with oat breeders by analyzing groat samples for protein and moisture. Demand for this service has stabilized at about 25,000 samples per year. Dr. Peterson, Plant Physiologist, has continued research in the areas of oat protein characterization and synthesis, structures of the oat caryopsis, relationship of assimilate transport to grain composition, and source-path-sink relations. Dr. Langston has discovered a lectin (sugar-binding protein) in cell wall preparations from oat groats that may function as a protectant from pathogenic fungi. In addition to characterizing this protein, she has initiated research on the mechanism of glutamine synthetase inhibition by tabtoxin. Glutamine synthetase is a primary enzyme for nitrogen assimilation, and tabtoxin is produced by *Pseudsmonas syringe*, the pathogen which causes halo blight. Chris Brinegar, a Ph.D. student working under the direction of Dr. Peterson, is making rapid progress on characterization of oat globulin, the primary storage protein of oats. His work includes electrophoresis, electrofocusing, and column chromatography, as well as determination of probable subunit relationships. He is also synthesizing protein from extracted mRNA and comparing the products with *in vivo* proteins.

THESIS RESEARCH PROJECTS

Fatty Acid Study. Mr. Russell S. Karow completed his M.S. program in December of 1980 and is continuing on for the Ph.D. degree. His Ph.D. thesis research is composed of two main studies, a fatty acid inheritance study and a study of the enzyme lipoxygenase. Lipoxygenase is thought to break down linoleic acid, which is associated with rancidity.

Avena Translocation Lines. Mr. Bernard J. Hable obtained crown rust inheritance data from field nurseries in 1980 and 1981, and completed his M.S. program during the spring semester of 1982. Mr. Hable's thesis research was concerned with genetic and agronomic evaluations of several Wisconsin hexaploid translocation lines which contain genes for crown rust resistance from diploid *Avena strigosa*.

Oat Smut Inheritance. Mr. Donald T. Caine is working towards the M.S. degree on a reduced schedule while working full time as a specialist for Dr. D.C. Arny in Plant Pathology. His thesis research involves inheritance studies of prevalent races of oat smut and different genes in certain *A. sativa* parents which have potential usefulness in breeding programs.

Interspecific Transfer of Genes for Stem Rust Resistance. Mr. P. Douglas Brown has completed his formal course work and is conducting remaining phases of Ph.D. research at Winnipeg, Manitoba, where he is employed by the Canadian Department of Agriculture. Mr. Brown is using two different gene-transfer methods in attempting to transfer a gene for stem rust resistance from tetraploid *A. barbata* to hexaploid *A. sativa*. Nearly all research phases have been completed and Mr. Brown's major effort in 1982 will center on thesis preparation.

Inheritance in A. sativa x A. fatua crosses. Mr. Johathan M. Reich completed his M.S. degree in May of 1981. His M.S. thesis was concerned with hybrid vigor for yield and agronomic traits and the inheritance of groat protein percentage in *A. sativa* x *A. fatua* crosses. Hybrid vigor for grain yield and yield components was observed in all 21 crosses evaluated, with F_1 hybrids exceeding their respective mid-parent values by an average of 81 to 198% over 2 years.

Response of Small Grains to Nitrogen Fertilizer. Dr. Yeong D. Rho completed his Ph.D. degree in August of 1981. Yeong evaluated the influence of five levels of nitrogen fertilizer (0, 25, 50, 75, and 100 lbs N/a) on grain and straw yield, protein percentage, and other agronomic characteristics in oats, barley, and spring wheat. Studies were conducted in three environments which ranged from low to high in productivity in 0 nitrogen. The short, early variety Stout responded more favorably to the higher N levels than the tall, late varieties Lodi and Marathon.

V. CONTRIBUTIONS FROM COUNTRIES OUTSIDE THE UNITED STATES

NEW SOUTH WALES OAT CROP 1981-82

R. W. Fitzsimmons
Department of Agriculture
Sydney, New South Wales
Australia

The area sown to oats is estimated at 650,000 hectares of which 400,000 hectares were sown for grain production. Grain production was expected to be 570,000 tons with a yield of 1.43 tons/hectare which, if realized, would be a record, the previous best being 1.37 tons/hectare achieved in 1978-79.

A significant percentage of the oat area was sown early either after rains in February or dry. Early sown crops hung on well until the next useful rain in May. Good rains during the winter promoted the growth of pastures so that a lower proportion than normal of the oat crop was grazed and the grazing was more lenient than usual. This resulted in many crops producing very high yields of grain. A large amount of grain has been retained on farms as stock feed. It is likely that the area sown to oats for the 1982-83 season will be less than that for 1981-82.

The new oat variety "Carbeen" is described under "New Cultivars".

OATS IN WESTERN CANADA 1981

J. W. Martens, P. D. Brown, R. I. H. McKenzie
D. E. Harder and C. C. Gill

Agriculture Canada Research Station
Winnipeg, Manitoba

1981 growing conditions in western Canada were generally good. A dry May permitted farmers to complete seeding without delay into soil with good moisture reserves. There was enough rain in June and July to permit good growth but there was heat stress in some areas in July. Light rains hampered harvesting but most oats were harvested by the end of August.

In 1981, 1,681,00 hectares were sown to oats in western Canada according to Statistics Canada. This is up 12% over last year and up 3% over the past five year average but down 16% over the past ten year average. Harmon continues to be the most commonly grown cultivar in western Canada. During the period 1972 to 1981 the area sown to Harmon has held constant at 38%. During the same time period the cultivars Grizzly, Random, and Hudson have increased in popularity and in 1981 each of these cultivars covered approximately 10% of the oat area. Average yields in Manitoba, Saskatchewan and Alberta were 1.93, 1.82 and 2.31 tonnes per hectare respectively.

Oat Stem Rust

Oat stem rust was first observed in southern Manitoba on July 13 as the result of earlier and heavier than usual spore showers from the south. The rust was common throughout the Red River Valley by July 20 and throughout Manitoba and eastern Saskatchewan by late July. The stem rust susceptible cultivar, Harmon comprised about 50% of the hectarage in the rust area and Hudson, a moderately resistant cultivar, about 40%. Fields planted early escaped with little or no damage but late fields in the Red River Valley and central Manitoba sustained light to severe losses. By mid-August infections of 60-80% of the stem area were common.

Ten avirulence/virulence combinations were identified from field collections from western Canada in 1981. Race NA 27, the dominant race for many years comprised 89% of all field isolates identified. Races NA 6, 16, 29 and 30 all occurred more than twice.

The new highly rust resistant and smut resistant cultivar, Fidler, is expected to be widely grown in the eastern prairies in 1982.

Oat Crown Rust

The first crown rust infections in Manitoba in 1981 were seen on July 17. However, infections remained scattered despite climatic conditions favorable for rust development. Although the inoculum arrived relatively early, it appears that the amount of inoculum that entered Manitoba remained light. Subsequently, crown rust was confined to the Red River Valley of Manitoba, and only late sown fields suffered a moderate amount of damage.

The physiologic specialization of the pathogen population did not change greatly relative to the past few years. Generally virulence on lines with genes Pc35, Pc40, Pc45, Pc46 and Pc56 predominated. One exception was an increase in the number of cultivars virulent on Hudson, a cultivar which occupied a substantial average (40%) in Manitoba in 1981. Currently the main resistance sources used in the breeding program at Winnipeg are combinations of genes Pc38-Pc39 and Pc55-Pc56. These combinations have remained highly effective.

Virus Diseases

Barley yellow dwarf virus (BYDV) was economically important on cereals during 1981 in southern Manitoba. When the aphid populations migrated into the province during late July, many crops were still vulnerable to the aphids and susceptible to BYDV. Early in August, aphids were sampled from cereals at Portage la Prairie and tested for the presence of virus on oats. Out of 15 test plants each infested with three *Schizaphis graminum* aphids, 11 became infected. Out of 11 test plants infested with two *Rhopalosiphum maidis* aphids, five became infected. Populations of three other aphid vectors of BYDV were also present (*R. padi*, *Sitobion avenae*, and *Metrophium dirhodium*).

Very high populations of the leafhopper, *Macrosteles fascifrons*, a vector for aster yellow mycoplasma (AYM) and oat blue dwarf virus (OBDV) were also present. Symptoms of AYM on barley and of OBDV on oats were common in space seeded plots. Also about 10% of the leaf hoppers sampled from an area south of Winnipeg transmitted AYM to asters. The epidemic area extended from the western edge of the Red River Valley at least as far as Carlyle in eastern Saskatchewan.

Oats & Oat Breeding in Saskatchewan 1980

B.G. Rossnagel - Feed Grain Breeder
R.S. Bhatty - Cereal Chemist
Crop Development Center - Univ. of Sask.

Acreage:

Oat acreage in the province of Saskatchewan was more than 10% above the 1980 acreage to total some 1.45 million acres in 1981. As in 1980 the main reason for this increase was due to the drought conditions and requirements for annual forage and more grain as feed to replace the shortfall in perennial forage.

Varieties:

Harmon continues to be the most popular variety still occupying more than 50% of the acreage. Other varieties of importance included Kelsey, Hudson, Random, Rodney, Sioux and Garry with the new high yielding variety Cascade catching on very quickly.

Oat Breeding and Research at the U. of Sask.

Thanks to the generous support of the Quaker Oats Co. of Canada Ltd. we are able to continue our modest oat breeding effort. Because the program is small we continue with our strict objectives of producing varieties adapted to our area with high yield, large, plump, thin hulled kernels and high test weight.

In 1980 we reported on two lines OT307 and OT308 which are in Cooperative tests and appear to be meeting the above criteria. These lines performed well across the west again in 1981. A brief summary of data from 1980 and 1981 for those lines follows:

1980-1981 Western Coop Oat Tests - 25 station years.

	Yield as % of Harmon	T.wt. kg/hl	K.wt. g/1000	% Hull	Ht. cm	Days to mature	% Plump
OT307	112	50.0	35.7	22.2	94	103	60.0
OT308	114	49.5	36.3	22.2	94	103	57.8
Cascade	111	47.1	35.2	25.2	94	101	55.7
Harmon	100	47.6	33.1	23.6	108	101	67.5

These lines although a bit later than the check varieties appear to combine high yield with excellent kernel quality. They should make excellent oat varieties for food or feed usage and also their relatively tall stature should make them attractive as a forage type oats.

LODGING CONTROL OF OATS

H. W. Johnston & J. A. MacLeod
Research Branch, Agriculture Canada
Charlottetown, P.E.I., Canada

Lodging of oats in Prince Edward Island and other areas is due both to the physical weakness of straw and to stem infection by such pathogens as *Septoria avenae* f. sp. *avenae*. Trials to evaluate intensive production systems for oats have illustrated that fungicides effective for the control of *Septoria* leaf blotch and black stem, may also be effective for lodging control. In 1981 the fungicide propiconazole (Tilt) plus captafol (Difolatan) was more effective in lodging control than the growth regulator ethrel. In combination, both were no more effective than the fungicide alone.

Fertility	Control	Fungicide	Growth Regulator	Fungicide plus Growth Regulator
Low N[1]	4.75[2]	1.00	1.00	1.00
High N[1]	6.50	1.50	4.25	1.38

[1]Low N - 45 kg N/ha at seeding, High N - 45 kg N/ha seeding plus 40 kg N/ha Growth Stage 7 (Feekes Scale).

[2]Lodging index 1-9, 1 upright, 9 flat.

These results emphasize the importance of stem diseases in lodging and the usefulness of fungicides in lodging control.

EFFECT OF FOLIAR SPRAY ON YIELD AND KERNEL WEIGHT OF OATS

D.A. Galway, R.V. Clark and V.D. Burrows

Research Branch, Agriculture Canada

An ad hoc trial on the control of crown rust, Puccinia coronata Cda f. sp. avenae Erikss. & Henn, by CGA 64250 (Tilt) was attempted in 1981 when it appeared that the disease would be severe. Ten 4-row plots of dormoats (12 m long and 1:2 m wide) were divided lengthwise into four 3 m subplots. Each subplot received either 0, 1, 2 or 3 applications of CGA 64250 at the rate of 125 g a.i./ha. Applications were made on July 7, July 17 and July 27. Two 2.4 m rows per subplot were harvested and grain yield and 1000 kernel weights determined.

The application of CGA 64250 significantly increased both yields and kernel weights (Table 1). However there was no advantage in employing more than two applications for either trait.

Table 1. The mean yield and kernel weight of oats following applications of CGA 64250 to the foliage in the field at Ottawa in 1981

	Mean of 10 breeding lines	
Treatment frequency	Yield (kg/ha)	Kernel Weight (g)
1X	2411 b*	25.65 b
2X	2762 a	27.36 a
3X	2867 a	29.69 a
Check	2041 c	23.96 c

*Values followed by the same letter are not significantly different by Duncan's Multiple Range Test (P=0.05).

OAT DISEASE TOLERANCE TEST AND KERNEL WEIGHT OF OATS

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A tolerance test similar to that described in the two previous newsletters was run again in 1981. Forty-five cultivars were employed and 3 treatments replicated 4 times as follows: 1. Regular maneb spray application to control diseases; 2. Inoculation with septoria following heading and supplemental irrigation to promote disease development; 3. Unsprayed and uninoculated check. Crown rust was again prevalent and severe in eastern Ontario and as in 1980 the septoria inoculated and the check treatments were equally infected by crown rust. Little additional septoria development occurred following septoria inoculation. As in 1980 there was good control of diseases on the maneb treated plants and substantial increases in kernel weights (Table 1). No yield data was used due to problems from bird damage.

Table 1. The mean 1000 kernel weight (g) of seed of maneb sprayed, septoria inoculated and untreated plants of 45 cultivars of oats grown in the field at Ottawa in 1981

	Treatment		
Variable	Maneb sprayed	Septoria inoculated	Untreated check
1000 K.W.	31.42 a*	22.36 b	22.33 b
S.E.	1.43	0.85	0.81

*Values followed by the same letter are not significantly different by Duncan's Multiple Range Test (P=0.05).

The mean loss in kernel weight in both the septoria inoculated and untreated check treatments amounted to a highly significant 29%. The loss was largely due to the severe crown rust infection in both treatments and the inoculation by septoria only affected a very few cultivars. This year only one supplemental irrigation was used at inoculation time and so had little affect.

RELATIONSHIP BETWEEN SEPTORIA RATING AND DAYS TO HEADING IN OATS

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Significant advances have not been made in breeding oats resistant to septoria (*S. avenae* Frank f. sp. *avenae*). One of the major problems has been the proper identification of resistance. Whenever resistant lines are identified, they are late maturing and hybrids between them and early maturing lines have not yielded plants possessing the desired combination of early maturity and septoria resistance. In fact early maturing lines often have high disease ratings. Septoria infection may occur early in the development of the oat plant but the devastating effect of the fungus on the plant occurs in the ripening process. When notes were taken on the severity of infection, early maturing cultivars appeared more susceptible than intermediate or late maturing cultivars.

In 1981, 6 oat cultivars (OA 366, Elgin, OA 421-7, Oxford, Sentinel and Lamar) were rated for septoria reaction and days to heading at 19 test sites in eastern Canada, (4-6 replicates per site). A correlation coefficient of -0.91 was obtained between these two traits. Presumably all of these oat cultivars are susceptible to septoria and the apparent differences in septoria rating are more related to stage of maturity when the notes were taken than to a true resistance. When searching for resistance comparison of septoria reaction should probably be done on cultivars at the same stage of growth.

INTRA-SPECIFIC GENETIC VARIATION FOR FODDER ATTRIBUTES IN OATS (*Avena sativa* L.)

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Among the large number of species in the genus *Avena*, only the cultivated hexaploid species *Avena sativa* (L.) is widely grown throughout the world. In India, this species has, in recent years, assumed considerable importance for its fodder value for livestock in addition to its grain value in the human diet and in animal feed, particularly for calves, young stock, horses, poultry and sheep. With the advent of an intensified dairy industry in the country, especially with the cross-bred animals, the oat crop is playing a progressively more important role, and is attracting the attention of plant breeders on one hand and of crop husbandry and livestock specialists on the other.

Concerted efforts towards developing improved fodder oat varieties at the Indian Grassland and Fodder Research Institute, Jhansi, led to the development of several high yielding lines which are now being tested in multi-locational trials. The newer materials are also being continuously added to the germplasm collection with a view toward having a wider genetic base for rapid and sustainable improvement.

Two-hundred-fifty-eight genotypes collected from diverse sources in the country were evaluated in a randomized complete block design in single 3 m long rows, 50 cm apart with plants spaced at 25 cm. Each block was sub-divided into three sub-blocks with 86 genotypes in each block. Two replications were used for increasing the overall efficiency. All the 258 genotypes were evaluated for fodder yield components, viz., days to 50% bloom, plant height, culm thickness, tiller number, leaf number, leaf length, leaf width, leaf/stem ratio, green fodder yield and dry matter yield as well as seed characters, viz., spikelets per panicle, seeds per spikelet, 1000 seed weight and seed yield per plant. The evaluation for quality characters was done for only 114 genotypes selected from the germplasm on the basis of D^2 analysis. The quality characters studied were crude protein, *in vitro* dry matter digestibility (IVDMD) and bulk density.

Mean squares due to genotypes were highly significant for all the seventeen characters studied at the 1% level of significance. This showed that there was considerable genetic variation in the material for these characters. Further, the ranges and means for the different characters (Table 1) also suggested a high degree of genetic variation. The examination of frequency distributions for different characters, which also indicated that the variation with respect to most of the characters was well distributed in the material, but for some characters such as days-to-50% bloom, leaf width and crude protein, almost all the genotypes were grouped in a few central classes, showing a narrow range of variation.

Based on these observations, the genotypes with specific desirable attributes pertaining to fodder yield, quality and seed production were identified. These selected genotypes will be exploited for direct use as well as for use as parents in a hybridization program aimed at fodder yield and quality improvement.

Table 1. Range, Mean, Standard Error (S.E.) and Coefficient of Variation (C.V.) for various characters in fodder oats (*Avena sativa* L.)

Character	Range	Mean ± Standard error	Coefficient of variation
A. Fodder yield components			
1. Days to 50% bloom	106.0 - 129.0	115.3 ± 1.78	2.18
2. Plant height (cm)	92.3 - 158.1	125.4 ± 3.63	4.09
3. Culm thickness (mm)	3.3 - 8.1	5.9 ± 0.34	8.20
4. Tiller number	3.0 - 7.4	5.1 ± 0.30	8.30
5. Leaf number	3.0 - 7.0	4.8 ± 0.25	7.32
6. Leaf length (cm)	21.2 - 45.1	31.8 ± 2.54	11.29
7. Leaf width (cm)	1.3 - 2.5	1.8 ± 0.13	10.68
8. Leaf/stem ratio	0.24 - 0.61	0.38 ± 0.02	6.02
9. Green fodder yield per plant (g)	209.5 - 700.0	471.8 ± 25.40	7.61
10. Dry matter yield	41.1 - 228.4	113.1 ± 6.31	7.90
B. Seed characters			
11. Spikelets per panicle	38.1 - 175.0	91.3 ± 7.18	11.13
12. Seeds per spikelet	1.40 - 2.01	1.75 ± 0.87	3.12
13. 1000 seed weight	15.1 - 45.8	29.1 ± 0.55	2.65
14. Seed yield per plant (g)	7.8 - 35.7	21.8 ± 0.64	4.18
C. Fodder quality characters			
15. Crude protein (%)	3.1 - 11.4	8.3 ± 0.73	8.63
16. IVDMD (%)	41.6 - 76.4	64.9 ± 7.25	2.75
17. Bulk density	0.82 - 1.51	1.10 ± 0.86	0.37

D^2 - ANALYSIS IN FODDER OATS

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Mahalanobis's D^2 statistics, utilizing the concept of statistical distance to measure the genetic divergence, was employed to classify fodder oat germplasm comprising 258 genotypes. The data recorded on various fodder yield, quality and seed yield components were used for this analysis. The material was classified into 21 divergent clusters which were observed to vary with respect to the number of genotypes in each of them. Three clusters, viz., 19, 20 and 21 having only one genotype each were not considered for comparison. Some clusters, viz., 1, 2 and 3 were quite large having 40-41 genotypes each. Clusters 5, 6 and 7 were medium in size with 20-27 genotypes whereas others were small, having less than 10 genotypes each. This indicated that the material possessed considerable diversity within and between groups that could be exploited.

The intra-cluster means revealed the differences in the values for particular characters between the groups indicating the degree of suitability of particular clusters for identification of desired variants for the hybridization program. None of the clusters had genotypes with all desirable traits. However, some clusters exhibited high intra-cluster means for some characters as compared to others and, therefore, could be exploited.

The clusters 12, 13, 16 and 17 possessed the late genotypes whereas cluster 2 and 6 had early genotypes. The tallest genotypes were found in cluster 6 whereas the genotypes with short height belonged to cluster 18. The genotypes with thickest culms were observed in clusters 2, 6, 13, and 16, whereas thin culm types belonged to cluster 4. High tillering genotypes assembled in cluster 9, whereas very low tillering types were found in cluster 4. The genotypes with high leaf number were observed in cluster 12, whereas the genotypes with fewer leaves were found in cluster 6. Cluster 13 had genotypes with the longest leaves and clusters 12 and 15 possessed genotypes with smaller leaves. Clusters 9 and 16 had genotypes with broader leaves, whereas genotypes in cluster 7 possessed comparatively narrow leaves. Clusters 18 and 11 had genotypes with high leaf/stem ratio, whereas genotypes in cluster 7 showed very low leaf/stem ratio. The highest green fodder yielding genotypes grouped in cluster 9 whereas lowest yielding genotypes assembled in cluster 18. Very high dry matter yielding genotypes belonged to cluster 15, whereas clusters 4, 5 and 18 had low dry matter yielding genotypes.

Clusters 5 and 12 had high protein genotypes and the genotypes with high IVDMD belonged to clusters 5 and 17. The genotypes in cluster 11 showed high bulk density, whereas those in cluster 17 showed the lowest bulk density. Genotypes with large seed fell in cluster 15, whereas genotypes with small seeds were found in cluster 12. The clusters 1 and 7 had the genotypes with high seed yield, whereas clusters 3 and 7 possessed low seed yielding genotypes. The genotypes with high spikelet number were found in clusters 1, 16 and 17, whereas those with low spikelet number were grouped in clusters 8 and 15. The clusters 1, 13, 16 and 17 possessed genotypes with more seeds per spikelet, whereas those in clusters 5 and 6 showed low seed number.

Interestingly, the genotypes in cluster 1 were very promising with respect to seed yield and its components, whereas these were relatively less promising for fodder yield components. The genotypes in cluster 13 were thick stemmed with profus tillering, highly leafy and high fodder yielding whereas these were not promising for quality and seed yield components. Cluster 5 had the genotypes which possessed high crude protein and high *in vitro* dry matter digestibility (IVDMD) but low tiller number, low dry matter yield and fewer seeds per spikelet. Suitable genotypes selected from these clusters would be of great value for use as parents in a hybridization program aimed at developing high yielding and nutritive varieties with good seed production ability.

CANONICAL ANALYSIS FOR GROUPING OF MATERIAL IN FODDER OATS

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The canonical analysis of principal components which makes possible the representation of the variates in graph form, is helpful in classification and in confirming the group constellations arrived at by the use of D^2 statistics. The size of the coefficient in the first two canonical roots indicates the relative importance of the character in the major and secondary axes of differentiation. This method was employed to group fodder oat germplasm collected from diverse sources.

The data on canonical vectors supplying the best linear functions of variates indicated that about 96% of the variation was absorbed by the first seven roots. The canonical vectors corresponding to the best two roots (λ_1 and λ_2) supplied the two best linear functions accounting for 63.18% and 15.64% of the variation respectively. Since the first two roots accounted for the major portion of variation (78.82%), the other five roots were not considered. The values of the first two canonical variates Z_1 and Z_2 were corresponding to the largest roots λ_1 and λ_2 were used for two diamensional representation with a view toward understand the grouping pattern. The canonical analysis supported the clustering pattern obtained from D^2 analysis.

The assessment of the contribution of different characters in canonical analysis is presented in Table 1. The weighting of different characters given by canonical vectors indicated that 1000 seed weight and seed yield were important for the first vector and that seed yield, spikelets per panicle and dry matter yield were important for the second vector.

Table 1. Contribution of different characters in canonical analysis.

Character	Multipliers of first two canonical vectors	
	1	2
1. Days to 50% bloom	-0.0161	0.0051
2. Plant height	0.0118	0.0972
3. Culm thickness	0.0169	-0.0143
4. Tiller number	0.0039	0.0870
5. Leaf number	-0.0094	0.0048
6. Leaf length	0.0114	0.0189
7. Leaf width	0.0030	-0.0105
8. Leaf/stem ratio	-0.0289	0.0069
9. Green fodder yield	0.0245	0.0873
10. Dry matter yield	0.0309	0.1202
11. 1000 seed weight	0.7362	-0.6461
12. Spikelets per panicle	-0.0766	0.1589
13. Seeds per spikelet	-0.0609	-0.0220
14. Seed yield	0.6671	0.7189
Value of canonical roots	41323.047	10228.781
Percentage contribution	63.18	15.64

EFFECT OF METHOD OF APPLICATION OF NITROGEN ON THE PRODUCTION OF GREEN FORAGE AND DRY MATTER OF OATS (*AVENA SATIVA* L.)

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Oats is a *rabi* cereal fodder which is becoming popular among the farmers particularly in areas having a limited supply of irrigation water. The favorable effect of nitrogen application to cereals needs no emphasis. Foliar application of urea is known to increase grain yield of cereals, particularly of wheat. Information on the effect of nitrogen applied through soil as well as through the leaves on the production of green forage and dry matter of oats is lacking.

The present experiment was, therefore, conducted at the research farm of the Haryana Agricultural University, Hissar, India, during 1977-78 and 1978-79. Variety HFO 114 of oats was used and rows were sowed 25 cm apart using 100 kg seed/ha following an application of irrigation water.

It is apparent from the data (Table 1) that the application of nitrogen either to the soil or as a foliar spray had a significant effect on the forage production of oats. Yield responded significantly to the soil application of 30 kg N/ha in 1977-78 and 60 kg N/ha in 1978-79, and higher application did not increase yield. In 1977-78, 30 kg N/ha through the soil plus 30 kg N/ha as a foliar spray gave significantly higher green fodder and dry matter over 30 kg N/ha through the soil; however, it was at par with 60 kg N/ha through the soil. It was also clear from the data that 60 kg N(S) plus 30 kg N(F)/ha at 30 days before flowering produced higher green fodder yields than 90 kg N/ha applied to the soil. This may be due to the lodging of the crop with higher doses of nitrogen.

Table 1. Effect of soil and foliar application of urea on the production of green forage and dry matter of oats (*Avena sativa* L.).

Treatments	Green fodder yield (q/ha) 1977-78	1978-79	Mean	Dry matter yield (q/ha) 1977-78	1978-79	Mean
N_0-Control	303.7	319.9	311.8	54.7	50.5	52.6
N_1-30 kg N/ha (Soil)	409.7	385.3	397.5	86.8	67.2	77.0
N_2-60 kg N/ha (Soil)	470.2	499.8	485.0	91.1	85.5	88.3
N_3-90 kg N/ha (Soil	440.0	487.1	463.5	91.1	87.9	89.5
N_4-120 kg N/ha (Soil)	459.2	505.3	482.2	93.2	87.3	90.2
$N_5T_1^*$-30 kg(S)+30 kg(F) N/ha*	486.2	505.3	495.7	84.2	88.9	86.5
$N_5T_2^*$- "	495.0	510.7	502.9	93.9	97.2	95.5
$N_5T_3^*$- "	502.5	517.9	510.2	107.3	101.4	104.4
$N_6T_1^*$-60 kg(S)+30 kg(F) N/ha*	483.5	503.4	493.5	85.2	87.0	86.1
$N_6T_2^*$- "	498.5	518.0	508.2	99.7	96.0	97.9
$N_6T_3^*$- "	508.2	548.9	528.5	95.8	100.2	98.0
$N_7T_1^*$-90 kg(S)+30 kg(G) N/ha*	465.5	518.0	491.7	80.5	77.7	79.1
$N_7T_2^*$- "	487.2	521.6	504.4	90.1	98.4	94.3
$N_7T_3^*$- "	497.8	528.9	513.3	101.4	92.3	96.8
SEm$\pm$	23.9	18.2	--	6.1	6.1	--
C.D. 5%	66.4	52.2	--	17.5	17.4	--

Spray on*

T_1^*-10 days before flowering*

T_2^*-20 days before flowering

T_3^*-30 days before flowering

EFFECT OF PHOSPHORUS AND NITROGEN LEVELS ON THE QUALITY AND YIELD OF OAT FORAGE

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Crop yields vary depending upon soil fertility, fertilizer use and varieties. Therefore, an experiment was conducted to determine the response of newly devloped varieties to different levels of phosphorus and nitrogen in comparison to the varieties already being grown in the area.

The experimental treatments consisted of four varieties viz., HFO-114, Kent, OS-6 and OS-7. Phosphorus rates were 0, 30 and 60 kg P_2O_5/ha. Nitrogen rates were 0, 40, 80 and 120 kg/ha. Treatments were randomized in a split plot design with varieties and phosphorus level as main plots, and nitrogen level as subplots. Treatments were replicated three times. The crop was sown in the month of November each year and the samples were taken at 50% flowering stage. Crude protein was estimated by the conventional micro Kjeldahl method; *in vitro* dry matter digestibility was determined as per Tilley and Terry's two stage method. The results on quality characters and dry matter yields are presented in Table 1.

There were no differences in crude protein and digestibility percentages among the varieties in either year. Mean crude protein and digestibility percentages were higher in 1980-81 than in 1979-80. In both years, dry matter yields were higher in the recently developed varieties i.e., OS-6 and OS-7 than the older HFO-114 and Kent varieties. A similar pattern was evident for crude protein and digestible dry matter yields.

Crude protein digestibility percentages increased slightly with the application of 30 kg P_2O_5/ha in both the years. Dry matter yield increased significantly with the application of 30 kg P_2O_5/ha in both years, and a similar trend was seen for crude protein and digestible dry matter yields.

Crude protein percentage was almost the same up to 80 kg N/ha and increased slightly when 120 kg N/ha was applied. *In vitro* dry matter digestibility percentage decreased with higher applications of nitrogen in both the years. Nitrogen application was found to be beneficial in obtaining higher yields of dry matter. Dry matter yield increased significantly over the control with the application of nitrogen either at 40 or 80 kg/ha. However 80 kg/ha nitrogen application was more advantageous for the production of dry matter, crude protein and digestible dry matter yields.

It can, therefore, be concluded that the newly developed varieties of oats, i.e., OS-6 and OS-7 are superior to the older varieties, and that application of 30 kg P_2O_5/ha and 80 kg N/ha gave better results than the other fertilizer treatments.

Table 1. Effect of phosphorus and nitrogen levels of the quality of oat forage.

Varieties/ Treatment	CP %		IVDMD %		CP yield (q/ha)		DDM yield (q/ha)		DM yield (q/ha)	
	79-80	80-81	79-80	80-81	79-80	80-81	79-80	80-81	79-80	80-81
HFO-114	5.43	6.59	58.48	61.86	8.20	7.21	88.32	67.67	151.02	109.39
Kent	5.88	6.98	58.44	61.81	8.14	7.09	80.85	62.79	138.50	101.58
OS-6	5.79	6.50	60.09	61.23	10.11	8.16	104.90	76.89	174.64	125.58
OS-7	5.16	6.88	59.72	60.72	9.53	8.56	110.40	75.57	184.72	124.45
S.E.									3.79	3.83
C.D. (5%)									11.03	11.24
P_2O_5 (Kg/ha)										
0	5.47	6.65	58.24	61.85	8.29	6.68	88.22	62.13	151.53	100.46
30	5.81	6.82	61.25	62.98	9.74	8.24	102.70	76.08	167.65	120.80
60	5.41	6.75	57.99	59.38	9.06	8.40	97.21	73.93	167.57	124.51
S.E.									3.27	3.32
C.D. (5%)									9.57	9.73
N (Kg/ha)										
0	5.33	6.68	63.18	64.80	6.57	4.24	77.89	41.15	123.26	63.50
40	5.34	6.25	59.10	60.18	8.33	7.25	92.19	69.80	156.02	115.98
80	5.65	6.70	57.73	59.26	10.60	9.40	108.20	83.11	187.57	140.24
120	5.93	7.32	56.63	61.38	10.80	10.34	103.10	86.72	182.14	141.28
S.E.									3.44	3.20
C.D. (5%)									9.65	8.86

CP = Crude protein, IVDMD = *In vitro* dry matter digestibility, DDM = Digestible dry matter, DM = dry matter

WILD OAT ECOTYPES IN EAST ASIA

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Avena fatua, A. sterilis and A. barbata occur in waste places and cereal fields of Japan and Korea. A. fatua is a serious weed of barley in Japan and Korea. Barley is not a major crop in modern Japanese agriculture, but the Uzu-type short culm barley is of some importance. Short culm wild oats occur in cereal fields where the Uzu-type barley was predominantly cultivated. The three weed ecotypes reported here may be of value in breeding short culm oats.

Table 1 shows some morphometric characteristics of the three wild ecotypes compared with two common forms. A common feature of these ecotypes is early maturity and low plant stature, less than 80 cm. The second internode of the D-form, the first internode of U-form, and the panicle of the C-form are greatly shortened.

In 1974, I visited Cheju Island, Korea where the D-form infested rape and barley fields; the U-form also occurred in two rowed barley fields. Strong winds occur in the early summer, so the short culm ecotype may have some advantage for surviving in cereal fields. The C-form was found that year in another part of Korea, a barley field near Chungmu city. The C-form was found in herbarium specimens in Japan, that were collected on Megijima Island near Takamatsu city and Kibicho near Okayama city. I visited Megijima in the early summer and found the C-form and D-form growing with the common form of wild oats.

Taxonomic, genetic and morphometric analyses of these strains were carried out (MAYAGUCHI and NAKAO 1975, YAMAGUCHI 1976, YAMAGUCHI 1978). The D-form included two morphometric groups: stature in one is controlled by a major dominant gene, and in the other is polygenic. Stature in the C-form is controlled by an incompletely dominant gene located on #17 chromosome (MORIKAWA 1980). Inheritance of stature in the U-form is not known. These ecotypes may be useful in breeding short statured oats, but their weedy characteristics may be a problem.

Table 1. Characteristics of weed oats in Japan and Korea (cm)

Ecotype	No. of strains	Plant height	Panicle length	Internode length 1 st	Internode length 2 nd	Leaf* sheath
Common form						
from Japan	64	110.8	24.5	44.0	21.6	25.8
from Korea	22	98.9	22.5	44.2	20.6	23.9
C-form	1	58.1	7.3	31.3	15.9	18.5
D-form	17	60.1	19.3	28.7	8.2	16.1
U-form	3	68.6	20.4	19.7	15.5	24.0

*: Length of uppermost leaf sheath

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OATS IN NORTHERN MEXICO

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Production

In the "Largest Concentrated Oat Growing Region in the Western World" corn replaced a lot of oat acreage in 1981. In 1980, when the rainy season began in August instead of July, farmers planted about 200,000 hectars (494,000 acres) oats. In 1981 there was good rainfall from January to May and the regular rainy season started in early July; therefore, the farmers diversified their seeding by sowing more dry-beans, wheat and especially corn into their crop rotations than in 1980. Even though less oats was seeded than in 1980, yields were much higher: some farmers harvested 3,000 kg/ha (84 bu/A). The average was 1,500 kg/ha (42 Bu/A) to 2,000 kg/ha (56 Bu/A). Rain fall was 560.4 mm (22 in) from July to the end of October. 1981 was considered the best growing season to this date.

Oat Varieties

Since Paramo was released in 1975, it has become the variety 60% of the farmers seed. 20% of the farmers seed Guelatao (released in 1972) and 12% Burt (locally known as Texas), the principle variety seeded in 1975. The other 10% is seeded to Diamate R-31, Tarahumara, Chihuahua, Cuauhtemoc and Opalo. Paramo is preferred because of its earliness, resistance to lodging and shattering, high yields, large kernels and uniformity in maturing even though it is susceptible to stem rust and has a low groat content (58-68%).

Diseases

The major disease is stem rust. The early seeded Paramo oats escaped heavy infestation, but this variety showed a 100% infestation in our experimental plots. The prevalent rust race was NA-27. One isolate of race NA-16 was also found in the nursery.

Oat Improvement

The main emphasis in oat improvement is the production of high yielding, early varieties with high protein and groat content, resistance to stem rust and with the other good characteristics of Paramo. One such line is I-2092-11C-3R-1C-OR with 20% protein and 72.5% groat content. It lacks good lodging resistance, but is moderately resistant to stem rust. The variety Tulancingo is moderately resistant to stem rust, produces kernels with 19% protein and 75% groat content, but cool temperatures delay its maturity and therefore it may be more susceptible to frost damage than I-2092-11C-3R-1C-OR line or the variety Paramo.

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The oat program is divided into three phases:

(1) It is part of the germplasm bank of cereals being developed in South Africa. In addition to oats; wheat, barley, rye, triticales and selections of Aegilops are part of the collection.

The collection of named oats now numbers about 250. These have been obtained primarily from the International Oat Rust Nursery program. South Africa has been co-operating in this program since the beginning in 1954. During this period they have increased the seed of each year's nursery and stored it in metal tins in a cold room but the germination was never determined.

Random selections of seed from each of the nurseries were made in May-June, 1981. Seed was placed in petri dishes to germinate. After 10 days germinated seedlings were counted and percentages determined. Seed produced prior to 1964 was very poor and in some instances none of the seed germinated. Beginning in 1964, and subsequent years, seed germination increased up to 99 percent.

Forms are being prepared for recording different types of information for computerization. Seed for research purposes (5 to 10 g) will be available in 1983 without charge. We encourage exchange of seed and would appreciate receiving seed of newly named cultivars. Additional information on this program can be obtained from the WHEAT NEWSLETTER, 1982.

(2) The field program in 1981-82 consisted of planting 298 selections in the field. These collections came from the IORN of 1964 to '75. The seed was a hold-over from Dr. Ben Eisenberg's program of 1964-75. Each selection was planted in two rows. The objectives for planting this material were:

(a) to select entries encouraging for forage quality and regrowth after cutting, and
(b) stem rust resistance.

The late planting of July 20 prevented obtaining information on tolerance to frost. The nursery was inoculated with an endemic culture of *Puccinia graminis avenae*. Readings on forage potential were made on a scale of 0 - 9 - 0 = good to 9 = poor. One row was cut at 2-4 inch height, and evaluated for regrowth. One-half of the row was again cut and re-evaluated for regrowth. Stem rust readings were made in October, 1981. In another field, 298 additional selections (representing more than 30 programs) were planted in 2 m rows and evaluated for forage potential and stem rust. This material was planted in August, 1981 and evaluated for forage potential in November and stem rust in December.

Entries from different sources were outstanding. Entries from more than 30 different programs indicated a wide range of germplasm potential for forage. Most selections were susceptible for stem rust although a few selections from Minnesota were showing good resistance and selections were made for crossing during the winter of 1982. Entries from Canada, Illinois, South Dakota and Wisconsin were encouraging for selecting good forage potential and regrowth after cutting.

Data from the other field was most encouraging for stem rust; of 78 selections from Kenya the average disease index was only 18, while the average for germplasm from more than 25 locations was 39. Selections from Georgia, Idaho, Indiana, Kenya, Maryland, Missouri, Minnesota, New York, Nebraska, Sweden, Texas and Wisconsin were encouraging for forage potential. Several outstanding selections were made for crossing during the winter.

The winter crossing program will consist of seven Kenya selections and 3 Minnesota selections rated 0 to TR for stem rust and 10 selections outstanding for forage potential and regrowth. Other selections will be made for planting in the field in 1982.

(3) The greenhouse screening program for stem rust resistance and identification of biotypes is underway. Preliminary evaluation of cultures suggests two or three biotypes were present during the 1981-82 cropping season. Only the biotypes endemic to the Bethlehem area will be used for field evaluation.

BULBAN

J. B. Brouwer and P. H. Debrett

Bulban is a mid-season oat variety released in 1981 by the Victorian Department of Agriculture, primarily for grain production. It was selected from the cross Algeribee/Garry/Avon.

Bulban matures 3-4 days later than Avon and is slightly taller, but it is shorter than Swan. It equals Avon in resistance to shattering and is superior to Swan. Bulban tends to escape severe wind induced losses by bending over at maturity. In the south-western region, where strong winds are common and the windrowing of oat crops is becoming increasingly adopted, this characteristic is an important advantage.

Bulban has been evaluated in regional comparisons in Victoria from 1975 to 1980. It substantially outyields both Avon and Swan in the south-western region with an average gain over Avon and Swan of 12 and 31 per cent, respectively. Its yields in the north-east are up 7 and 2 per cent compared to Avon and Swan, and 2 and 10 per cent, respectively, in the north-central district. It is not recommended for the Mallee and Wimmera districts which favor varieties of earlier maturity.

The grain has an attractive light creamy color and retains a bright appearance when both Avon and Swan discolor in wet conditions at maturation. The quality of the grain is between Avon and Swan with the 1,000 grain weight, test weight and kernel percentage being equal or slightly superior to Avon. Bulban is similar to Swan in oil and protein content of the grain.

Bulban, having a tendency towards 'late rusting', is less susceptible to oat stem rust than either Avon or Swan. In seedling tests it appears to have one specific gene (Pg-4) for resistance to this disease. It is susceptible to oat crown rust, but is as tolerant to barley yellow dwarf virus as Avon. It is susceptible to cereal cyst nematode and shows little tolerance to this organism which is a serious problem in north-western Victoria.

Bulban is superior to both Avon and Swan for production of sheaved oaten hay.

CARBEEN

R. W. Fitzsimmons

"Carbeen" was released in 1981 in New South Wales, Australia. It is an earlier maturing and higher yielding alternative to Blackbutt in higher rainfall areas and a higher yielding alternative to Cooba in medium rainfall areas. It heads midway between Cooba and Blackbutt and is a few days later than Cooba in maturity. In early sowings it is superior to Cooba and Blackbutt for total grazing. It is not suitable for milling as it has a large proportion of double grains which do not separate easily during harvesting.

HILL

P. Portmann and R. McLean

Hill oats is being released as a replacement for West and Moore in all high rainfall areas of Western Australia, except in the far southern zone.

Hill is a selection from the cross KENT/BALLIDU/RADAR 2. It is a mid-season, medium height oat with good straw strength.

The variety is adapted to the higher rainfall areas (> 450 mm), except in the southern zone where it has significantly outyielded West and Moore. Quality tests have indicated that Hill should have satisfactory quality for feed and milling purposes. Husk color is darker than Moore and West, but similar to Swan. Groat percentage and nitrogen content of Hill is lower than West, but superior to Moore and Swan. Hill has slightly plumper grain than West, is similar to Moore and slightly thinner than Swan. Groat weight is slightly larger than West and Moore, but smaller than Swan. Hectolitre weight of Hill is slightly lower than that of Swan, West and Moore.

On overall assessment Hill is considered to have generally superior feed quality to Moore and Swan, but is lower than West. For milling purposes Hill appears slightly inferior to West, but compares favorably with Moore and Swan despite its slightly lower hectolitre weight.

PRESTON

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

Preston, Mn 76161, was released to certified seed growers in Minnesota in early 1982. It was selected from the cross Otee/Dal. Because of its morphological and agronomic characteristics, it should be well suited for use as a companion crop variety. Its high protein content makes it an excellent livestock feed. The yield potential of Preston compares favorably with most other varieties commonly used for companion cropping but is at least 10% less than our newer, later maturing, varieties, Lyon, Moore, or Benson.

Preston, CI 9422, was in the Uniform Midseason Oat Performance Nursery during 1978-80. It has intermediate levels of smut and crown rust resistance and some tolerance to Yellow Dwarf Virus. It is somewhat similar in appearance to Otee, one of its parents.

TULANCINGO

O. R. Castro Melendrez and C. A. Jimenez Gonzalez
(Translated and abstracted by James H. Oard from a Technical Bulletin written in Spanish)

The spring oat cultivar Tulancingo (Avena sativa L.) was developed by el Programa de Avena del Campo Agricola Experimental Valle de Mexico, Chapingo, Mexico. The pedigree of Tulancingo is 3304-Tippecanoe/Curt x Opalo-Curt/Cuauhtemoc.

Tulancingo is a late maturing variety that varies in height from 75 to 110 cm and is moderately resistant to shattering and lodging. It exhibits moderate resistance to stem rust and crown rust, but is susceptible to powdery mildew. The panicle of Tulancingo is equilateral with erect to semierect sidebranches. Spikelet number ranges from 37 to 68 and average size of glums is 7 x 30 mm. The kernel is thin and small with a cream or yellow color. Four years of yield testing at various sites in the central plateau region of Mexico indicate an average yield of 3,000 kilograms per hectare.

VELI

Marketta Saastamoinen

The spring oat variety, Veli, bred at the Institute of Plant Breeding, Agricultural Research Centre,in Finland, is a new early, high-yielding variety. It was selected from the cross Titus x Sisu L. It was included on the List of Recommended Varieties in Finland in 1981.

Veli is one day earlier than Finnish Nasta and Swedish Titus. It gives about 5 % higher yields than these varieties and about 10 % better yields than Pendek. Veli has as stiff straw as Puhti, the commercial variety in Finland and in Sweden.

Veli is especially well adapted to grow on peat and sandy soils and it has given high yields also in poor rainy years. It has a good resistance against stress conditions.

The grain yield of Veli is of good quality and has high protein content and low hull percentage. Veli has a rather large seed and its hectolitre weight is high. It gives high yields with high nutritional value in Finnish conditions.

THE USDA SMALL GRAIN COLLECTION

D. H. Smith, Jr., Curator

The renovation of the cold storage area has been completed. All of the windows have been bricked in, the walls have been insulated with 3 inches of styrofoam covered with foil backed sheet rock, the ceiling has been insulated with 9 inches of blown in insulation, new refrigerated doors have been installed, and a new air handler installed which gives us 10°C and 40% RH in the storage.

The results of the germination tests conducted by GAO of seed samples of the collection have been analyzed. The overall average germination was 89%. The averages by crop are: wheat - 94%, oats - 83%, barley - 97%, rye - 87%, <u>Aegilops</u> - 74%, triticale - 88%. The results show an influence of crop and a mild influence of year of last increase on germination. These results indicate that seed of common wheat and barley can be stored for 10-20 years under our storage conditions without hurting germination.

Accessions with low germination were not correlated with the number of years since last increase. These low germinations may be varietal or due to immaturity of seed at harvest.

Functional specifications for a new building have been written and a contract has been let to an architectural engineering firm to develop plans for the facility.

As we become more computerized it is apparent that there is a need for a unique identification number. The Plant Inventory (PI) system offers this characteristic and we plan to phase the CI system out by accessioning new entries to the collection through the Plant Introduction Office. Requests for numbers should still be made through me as has been done in the past. A 500 gram sample of the seed and information to be used in the documentation should be sent at the time the request is made.

When cultivars are released it would be helpful if a copy of the release notice be sent to: Mr. Al Burgoon
USDA, AMS
Seed Regulatory Branch
Rm 2609 SoAgriBg
Washington, D.C., 20250

In plant breeding programs advanced generation lines that do not make it to cultivar status are often discarded. We would welcome this valuable source of germplasm in the Small Grain Collection and urge you to contribute these lines as they become available.

OAT CI NUMBERS ASSIGNED IN 1982

CI No.	Name/Designation	Pedigree	Class	Source
9407	NY 5977-6-56	Astro X PI 193027	Spring	New York
9408	NY 6083-21	Orbit 2 X CI 6936 X Clintland 60	Spring	New York
9409	NY A-11	Selection from NY Composite I	Spring	New York
9410	OA 436-2	OA 111-2 X QO 19.27.1 2X OA 240-11		Minnesota
9411	OA 437-1	OA 111-2 X QO 19.27.1 2X OA 240-13		Minnesota
9412	Porter	CI 7684 selection//(Putnam*5/Minn.313) *2/Albion/3/Stout	Spring	Indiana
9413	Coker 227			South Carolina
9414	Coker 234			South Carolina
9415	Four Twenty Two			South Carolina
9416	Mesquite			South Carolina
9417	Big Mac			South Carolina
9418	Coker 716			South Carolina
9419	AR 104-18	Nora. Iowa Multiline (Asencao E)	Winter	Arkansas
9420	AR 125-4A	Nora/Cortez	Winter	Arkansas
9421	AR 102-5	Florida 501/PI 296254	Winter	Arkansas
9422	Preston	Otee/Dal		Minnesota
9423	Rodney Pga	Rodney/*2 Omega	Spring	Minnesota

VII. EQUIPMENT, METHODS AND TECHNIQUES

ONE PERSON RESEARCH PLOT COMBINE HARVEST AND DATA COLLECTION SYSTEM

C. F. Konzak, M. A. Davis and M. R. Wilson
Washington State University

Last year we developed a system for our Walter and Wintersteiger/ Seedmaster* plot combine to achieve delivery of the harvested grain to the combine operator. The combine operator can bag and transfer the harvest samples to a box attached to the combine. The box which serves as a temporary repository during combining is unloaded to a transport vehicle for processing later. The system permitted us to shift the person we formerly employed on the ground for bagging to another job during our labor-short harvest period. Since then, we learned that Dr. Peter Portman, Western Australia had developed a similar system, to be described in 1982 Crop Science. In 1981, we improved on our 1980 system and used it throughout our harvest season.

However, by the end of the harvest season we were able to put together and test a more complete one person system for our Wintersteiger "Nursery Master"* plot combine. Adding an electronic scale (two were used, K-Tron*, Rose Hill Engineering*) and an electronic data collector (Data Myte*) to the system permitted us also to collect harvest sample weight data as well, with no loss in plot harvest time. We achieved this by constructing a device for providing the polypropylene mesh sample bags in plot harvest order. Twine for tying, and identification tags were attached to the bags ahead of time, and the plot harvest sequence was down-loaded into the data collector from our computer before harvest. Bagging, weighing and data collecting was accomplished during the time period required for combine clean-out between plots. A more detailed description of the system will be submitted for publication, and a video tape of wheat plot harvesting using the new system was made for us by KWSU Educational T.V. We have encouraged the plot combine manufacturer and representatives to make available the accessory devices we constructed. A grain moisture meter to interface with the system is under development, and will be field tested this coming harvest season. Because the combine operator's time is now more fully utilized (in collecting the yield data) requiring no extra time over that needed for harvesting, we expect the system to have wide use in those programs using electronic devices. However, even the mechanical system for delivering the grain to a cyclone collector beside the operator has proved highly efficient. The procedure helps to reduce mixtures, because only one person, the combine operator, is in control of sample collecting. The saving of labor in this operation thus offers more than an economic advantage. This is especially meaningful when the person formerly required for sample bagging can be better utilized in less-mechanized harvest operations equally pressing for attention in a plant breeding or agronomic research program.

*Mention of trade names does not constitute endorsement by Washington State University of any manufacturer or product.

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