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May 1978

Sponsored by the National Oat Conference

Marr D. Simons, Editor

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I. NOTES

Newsletter Announcements and Instructions

Overseas contributions - Foreign contributors are urged to anticipate the annual call for material for the next Newsletter and to submit articles or notes to the editor at any time of the year.

Available back issues - Back issues of certain volumes are available on request. Please write the editor.

Variety descriptions - When you name or release a new variety, in addition to your account in the State Report section, please submit a separate description to be included under "Oat Cultivars." We would like to make the "Oat Cultivars" section as complete and useful as possible.

Please do not Cite the Oat Newsletter in Published Bibliographies

Citation of articles or reports of Newsletter items apparently is causing some concern. The policy of the Newsletter, as laid down by the oat workers themselves and later reiterated, is that this letter is to serve an an informal means of communication and exchange of views and materials between those engaged in oat improvement. Just as definitely, no material is wanted that is of a nature that fits a normal journal pattern. Each year's call for material emphasizes this point. Unless there has been a change of thinking the oat workers do not aspire to a newsletter that would in any way discourage informality, the expression of opinions, preliminary reports, and so forth.

Citing the Newsletter creates a demand for it outside the oat workers' group. For example, libraries send several requests a year for it, and we refuse them. (If the Newsletter were made available to libraries, it could not be produced as we now do it because the mailing list would approximately triple.) So why cite it in a bibliography?

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

AMERICAN OAT WORKERS' CONFERENCE COMMITTEE, 1978-81

Executive Committee

R. A. Forsberg, Chairman
*C. F. Murphy, Past-chairman
*H. G. Marshall, Secretary
*M. D. Simons, Editor, Oat Newsletter

Representatives

M. Sorrels, Northeast Region, USA
H. W. Ohm, Central Region, USA
H. Harrison, Southern Region, USA
To be elected, Western Region, USA
H. G. Marshall, U. S. Department of Agriculture
H. T. Allen, Canada Department of Agriculture
V. D. Burrows, Eastern Canada
R. I. H. McKenzie, Western Canada
M. Navarro-Franco, Mexico
D. Schrickel, Representative at large
C. M. Brown, Representative at large
M. E. McDaniel, Representative at large

* Non-voting member unless also a representative.

Minutes of the Executive Committee Meeting
American Oat Workers Conference
College Station, TX. March 19, 1978

In attendance: C. F. Murphy (Chairman), M. D. Simons, C. M. Brown, D. T. Sechler, M. E. McDaniel, D. M. Wesenberg, D. D. Stuthman, and H. G. Marshall

Chairman C. F. Murphy presided. His first action was to appoint all in attendance as a nominating committee (C. M. Brown, Chairman) for a slate of candidates for the offices of Chairman and Secretary of the Conference. Nominees for Chairman were R. A. Forsberg and D. D. Stuthman. H. G. Marshall was nominated for Secretary.

Chairman Murphy appointed Don Shcrickel and H. G. Marshall to serve as a resolutions committee for the Conference with Schrickel as Chairman. At this point, McDaniel presented a letter to Chairman Murphy to record that several firms were supporting the present meeting as follows:

Conlee Seed Co., Waco, TX	$100 rental fee for facility for AOWC Banquet	
Harpool Seed Co., Denton, TX	Social Hour Expenses	
Douglas King Seed Co., San Antonio, TX	$50 Coffee Contribution	
ESCO Ltd., McGregor, TX	$50	do
Star Seed & Grain Co., San Antonio, TX	$50	do

McDaniel reported that the registration fee for the Conference would be $10 including $5 for the banquet, and that transportation for the south Texas tour would cost $20 per person.

Stuthman reported that the nominating committee for the Distinguished Service to Oat Improvement Award (D. D. Stuthman, M. D. Simons, F. C. Collins) had met its charge and that three oat workers were elected by circulating a ballot to the regional representatives and the voting members of the Executive Committee.

Simons reported on the Oat Newsletter and indicated that the Quaker Oats Company continues to pay the publication costs. After some discussion about documentation of the present Conference program in the Oat Newsletter, the decision was to ask each moderator to prepare a one or two page summary of the discussion that ensued during his session.

Marshall reported that he had invited 22 foreign scientists to the Conference and two will attend. Fourteen scientists returned a questionaire and all expressed interest in forming an international oat conference. Most scientists favored meeting every 4 years.

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

Minutes of the Business Meeting
American Oat Workers' Conference
College Station, TX
March 22, 1978

Chairman C. F. Murphy presided.

J. E. Grafius reported for the ad hoc committee (J. E. Grafius, V. D. Burrows, H. G. Marshall) appointed to draft a new charter for the American Oat Workers' Conference so as to include Canada and Mexico and to delineate organization structure. Grafius reminded those in attendance that the proposed charter had been published in the 1976 Oat Newsletter and moved that it be adopted by the Conference. Discussion followed as to whether or not the name should include the word "workshop". The Conference name was not changed, but the Secretary was instructed to entitle future meeting announcements and programs as "Workshop of the American Oat Workers' Conference." The original motion was passed unanimously.

M. D. Simons reported for the Committee on Nomenclature and Cataloging of Oat Genes. The revision of the handbook (A Standardized System of Nomenclature for Genes Governing Characters of Oats) is in the galley proof stage, and Simons plans to distribute copies with the 1977 Oat Newsletter.

C. M. Brown gave the Nominating Committee report and announced that R. A. Forsberg and D. D. Stuthman were nominees for Chairman. There were no further nominations from the floor, and R. A. Forsberg was elected by majority vote. H. G. Marshall was the sole nominee for Secretary and was elected by acclamation.

The next item of business concerned designation of representatives of the American Oat Workers' Conference Committee under the provisions of the new charter. Representatives named for the various regions were as follows:

Southern Region, USA	Howard Harrison
Central Region, USA	H. W. Ohm
Eastern Canada	V. D. Burrows
Western Canada	R. I. H. McKenzie
Canada Dept. of Agriculture	H. T. Allen
U.S. Dept. of Agriculture	H. G. Marshall

According to the new charter, the Secretary shall solicit nominations and conduct an election by mail ballot to determine representatives and alternates for the Northeastern and Western Regions of the USA. The Secretary also shall contact the Mexican Department of Agriculture to determine the identity of the Mexican representative and alternate.

Nominations from the floor were received for three representatives at large. Nominees were K. Frey, D. Schrickel, C. Brown, and M. McDaniel. Schrickel, Brown, and McDaniel received the most votes and were elected. Chairman Forsberg automatically is a member of the Committee.

D. Schrickel reported for the Resolutions Committee. Two resolutions were presented, discussed, and adopted by those attending the conference. Resolution number 1 was as follows:

> Whereas the oat research budget of SEA, USDA continues to be gradually eroded, resulting in a lower level of research effort; and
>
> Whereas the membership of the American Oat Workers' Conference recognizes the inability to meet the oat improvement research needs of the producer, livestock feeder, and the commercial processors so as to maintain the competitive capability of oats; and
>
> Whereas the American Oat Workers' Conference believes that if this situation is to be remedied, it is imperative that the Executive Committee of the American Oat Workers' Conference communicate this need to the appropriate adminstrators of SEA and the Appropriations Subcommittee of the House Agriculture Committee, Therefore, be it
>
> RESOLVED that the Executive Committee of the American Oat Workers' Conference will meet with the appropriate officials of SEA and members of Congress as soon as possible, preferrably prior to May 1, 1978, and be it further
>
> RESOLVED that the American Oat Workers' Conference will request that a similar approach be made by the Milling Oats Improvement Association which represents the oat milling industry; and be it further
>
> RESOLVED that Conference members representing experiment stations express the aforementioned concerns to their respective experiment station directors, and that individual Conference members convey this concern to their respective members of Congress.

Resolution number 2 was as follows:

> Whereas the American Oat Workers' Conference recognizes the importance of the Barley Yellow Dwarf Virus (BYDV) Conference held at Urbana, IL, June 1-2, 1977, be it
>
> RESOLVED that the American Oat Workers' Conference recommends to SEA, USDA officials that a joint federal and state cooperative program be developed to establish centers to screen germplasm for BYDV resistance.

The Secretary was instructed to send Resolution 2 to appropriate SEA administrators and SEA National Program Staff members.

At this point a number of motions from the floor expressing appreciation of the Conference were unanimously passed as follows:

1. The 1978 AOWC program was an especially useful one and members of the Conference express their appreciation to the Chairman (C. Murphy) and Secretary (H. Marshall) for a job well done.

2. The membership appreciates various gratuities provided by several firms during the Conference and the Secretary is instructed to send appropriate letters of appreciation (see the minutes of the Executive Committee Meeting for listing of gratuities).

3. The membership commends M. E. McDaniel and Texas A & M University for being outstanding hosts to the Conference and expresses appreciation of a job well done.

4. The American Oat Workers' Conference commends the Quaker Oats Company for their generous and long standing support of our activities. We are grateful specifically for: (a) awards presented to the career award winners, (b) support costs of the Oat Newsletter, and (c) continued political and financial support for oat research.

Also, members of the Conference gave a standing ovation to M. Simons for his continuing work as editor of the oat Newsletter, and expressed a vote of thanks to retiring Chairman Murphy for his fine work in that capacity.

A motion (D. Schrickel) was passed to the effect that a plant pathologist be added to the Subcommittee for Improved Utilization of the Oat Germplasm Collection and that this subcommittee represent the American Oat Workers' Conference as an advisory committee for the Germplasm Resources Information Project.

As a final item of business, H. Marshall reported that 22 foreign scientists were invited to attend the present Conference, and two were in attendance (Bengt Mattson and David Thompson). Fourteen scientists returned a questionaire and all indicated a need for an international oat conference to meet periodically. There was some discussion concerning procedures to launch such an organization. J. Schmidt suggested that the group should meet the first time in conjunction with either the wheat or barley international meeting.

A motion (Frey) that a committee be appointed by the Chairman of the AOWC to look into the desirability and need for an international oat conference was passed.

New Chairman, R. A. Forsberg, adjourned the Conference.

Respectfully submitted,

H. G. Marshall

H. G. Marshall, Secretary

List of American Oat Workers
College Station, Texas Mar. 20, 1978.

1. Richard Bates
2. Ron Barnett
3. Verne Burrows
4. Doug Brown
5. L. W. Briggle
6. Charlie Brown
7. Marshall Brinkman
8. Andrea Comeau
9. Fred Collins
10. Willis Chapman
11. Leland Dean
12. Jean-Pierre Dubuc
13. L.W. Dosier
14. Charles Erickson
15. Ken Frey
16. Bob Forsberg
17. Verne Finkner
18. John Grafius
19. J.H. Gardenhire
20. Don Harder
21. Louis Jupe
22. J.P. Jones
23. Stanley Jensen
24. Dennis Johnson
25. Carlos Jiminez
26. H. R. Klinck
27. R.A. Kilpatrick
28. H. Marshall
29. D.D. Morey
30. Leonard Michel
31. Chuck Murphy
32. Bengt Mattsson
33. Manual Navarro
34. Lloyd Nelson
35. Dave Peterson
36. Y.C. Paliwal
37. Brian Rossnagel
38. Verne Reich
39. Dale Reeves
40. Alan Roelfs
41. Paul Rothman
42. Howard Rines
43. John Schmidt
44. Greg Shaner
45. Marr Simons
46. Deon Stuthman
47. Don Schrickel
48. Hazel Shands
49. Dale Sechler
50. Malcolm Shurtleff
51. David Thompson
52. Neal Tuleen
53. Sam Weaver
54. D. M. Wesenberg
55. Dallas Western
56. Vern Youngs
57. Dale Ray
58. Herb Ohm
59. M. McMullan
60. John Martens
61. Philip Dyck
62. H. T. Allen
63. Matt Moore
64. Henry Jedlinski
65. Howard Harrison
66. Jay April
67. M.E. McDaniel
68. D.J. Dunphy
69. Roger Smith

MINUTES OF THE BIENNIAL BUSINESS MEETING OF THE NORTH CENTRAL REGION OAT IMPROVEMENT COMMITTEE (NCR-15)

College Station, Texas
March 20, 1978

The 1978 NCR-15 business meeting was held in conjunction with the American Oat Workers Conference (AOWC) at Texas A&M University, College Station, Texas. The meeting was called to order at 7:00 p.m. in the Rudder Center by Chairman M. D. Simons. In addition to oat workers from North Central States, oat workers from many other states, the USDA, Canada, and the Quaker Oats Company were in attendance.

Thanks were expressed to Dr. Dale L. Reeves for hosting the 1977 N.C. Oat Workers Field Day at South Dakota State University, Brookings, S.D. Dr. John E. Grafius cordially invited 1978 Field Day participants to Michigan State University, East Lansing, Michigan.

Dr. Howard W. Rines reported that the Uniform Early and Uniform Midseason Nurseries would be discussed on March 22 in a scheduled session of the AOWC. (R.A.F. note: It was agreed at the March 22nd session to replace Mo. 0-205 with Bates, to replace Jaycee with Otee, to retain Andrew, Clintford, and Lang, and to drop Grundy as checks in the Uniform Early Nursery. Lodi was dropped as a check in the Midseason Nursery. After considerable discussion it was decided to continue tabulating data and preparing reports separately for the Early and Midseason Nurseries. Individual workers will grow the nurseries separately or together to best suit location needs.)

STATE REPORTS:

<u>Iowa</u> (K. J. Frey). In 1977, about 1,500,000 acres of oats were harvested for grain. Oat straw also commanded a very good price. The four new Iowa entries in the 1978 Uniform Early Nursery have <u>A. sterilis</u> germplasm in their pedigrees. A cluster analysis (geographic study) involving 17 traits in 500 lines of <u>Avena sterilis</u> has been completed.

<u>Illinois</u> (C. M. Brown). Thirteen oat selections with BYDV tolerance have been formally released by the Illinois AES. The registration article has been prepared for publication in CROP SCIENCE. A modest increase of Ill. 73-2664 was produced in 1977. This selection tends to produce awns which lower the test weight. Selection Ill. 73-2186 is very early and has better test weight and better agronomic type than Lang. Both selections have tolerance to BYDV that is equal to or better than that of Otee. The level of tolerance in Otee is superior to that in Lang.

<u>Indiana</u> (H. W. Ohm). Purdue will have four entries in the 1978 Uniform Midseason Nursery. Combining tolerance to BYDV with crown rust resistance is receiving much emphasis.

<u>Michigan</u> (J. E. Grafius). Oat acreage is holding constant at about 350,000 acres in Michigan. Two new Michigan selections are entries in the 1978 Uniform Midseason Nursery. Due to the absence of physiological resistance in oats to the Cereal Leaf Beetle, a graduate study of the genetics of trichome density has been initiated.

Minnesota (D. D. Stuthman). The 1977 average yield of oats in Minnesota was 68 B/A, a state record. Stem rust was severe at Lamberton. Minnesota oat selections 73231 and 71211 are scheduled for release in early 1979. *A. fatua* will be collected on a 4-week trip throughout Mexico in 1978.

Missouri (D. T. Sechler). Bates has been well accepted in Missouri. Several high yielding selections with BYDV tolerance are entries in the Uniform Early Nursery. In 1977, 140,000 acres of oats in Missouri were harvested for grain and 80,000 were harvested for hay.

Nebraska (J. W. Schmidt). The 1977 average oat yield of 58 B/A was a state record. The oat acreage in Nebraska is increasing with about 800,000 acres grown in 1977. Early types such as Stout, Lang, and Bates are favored. Some stem rust was prevalent in 1977.

Ohio (D. A. Ray). The oat acreage in Ohio has been relatively constant at about 1/2 million acres per year. Noble and Otee are the most widely grown cultivars. Selection for tolerance to BYDV receives much emphasis.

North Dakota (M. S. McMullen). The 1977 oat acreage of 1.8 million acres included an increase of 600,000 acres over the 1976 acreage, mainly due to the drop in wheat prices. Stem rust was serious in certain counties.

South Dakota (D. L. Reeves). The 1977 oat acreage of 2.8 million acres represented a sizeable increase in acreage. A major increase of SD 9095 (CI 9256) will be produced in 1978. SD 9095, developed from a single panicle selection from the same cross as Spear, is resistant to stem rust race 61, and it has higher test weight and groat percentage than Spear. A group of lines from a Dal x Nodaway 70 cross are showing promise with white, plump kernels, high test weight, and good straw.

Wisconsin (R. A. Forsberg and M. A. Brinkman). The 1977 state average oat yield of 65 B/A exceeded the previous record by two bushels. Oat smut has become a critical problem in Wisconsin. Nearly all Wisconsin foundation seed sold to seed growers in 1977 was seed treated with Vitavax. The Wisconsin Crop Improvement Association now requires seed treatment if the infection level in a certified seed production field exceeds 1%. In view of the seriousness of the oat smut problem, it was decided not to release selection X1839-1. A major increase of X2456-2 will be produced in 1978. This selection was derived from a cross between Holden and a sister line of Dal. Stem rust race 31 was widely prevalent in 1977 but infection was light. Resistance to this race from CI 9221 and CI 9222 is being incorporated into adapted types.

OTHER LOCATION REPORTS:

Pennsylvania (H. G. Marshall). Oat straw is very valuable in Pennsylvania--selling for $125 per ton (over 6¢/lb.). In some cases, 25 to 26-lb. bales were selling for $1.25 per bale. Several different dwarfs are being used to shorten plant height of adapted types.

Manitoba (P. D. Brown). Yield, larger kernel size, resistance to crown and stem rust, and screening for tolerance to BYDV are being emphasized. Some advantages and disadvantages of Terra, a new hull-less oat, were noted.

Ontario (V. D. Burrows). The most promising cultivars are being shifted into the Dorm-oats program, which has progressed to the point of large scale field testing at 10-12 sites. Excellent use is being made of a breeding nursery in southern California both as a winter nursery and for selection of daylength-insensitive types. Daylength-insensitive line OA 338 has been in the Uniform Midseason Nursery since 1976. Gratitude was expressed to Dr. J. E. Grafius for making available germplasm with tolerance to BYDV.

Saskatchewan (B. Rossnagel). Salinity tolerance and the contribution of oil content to feeding value are being emphasized in the relatively new oat program.

Title XII. D. J. Schrickel reported that a preproposal concerned with improving oat germplasm for utilization in developing countries has been submitted on behalf of a consortium for oat improvement in Latin America, Africa, The Middle East, and Asia. The preproposal document was developed by R. A. Forsberg and H. L. Shands at Wisconsin and it was built around cooperative efforts of nine Land Grant Universities, the USDA, and The Quaker Oats Company. Copies of the preproposal document were made available and were distributed to interested individuals by D. J. Schrickel. It was emphasized that if a favorable response to the proposal is received from the Joint Research Committee of BIFAD, oat workers will be notified so that interested workers and institutions will have the opportunity to participate. K. J. Frey reported that Iowa (oats) was a participant in another preprosal encompassing both barley and oats.

Officers. A nominating committee proposed Dr. H. W. Ohm for Secretary with R. A. Forsberg to become Chairman. These nominations were passed by unanimous vote.

An invitation by Wisconsin oat workers to host the 1980 NCR-15 meeting was duly considered and accepted.

Resolutions thanking Dr. M. E. McDaniel, his colleagues, and Texas A&M University for their efforts in making the 1978 oat meetings an enjoyable and profitable experience appear in the minutes of the American Oat Workers Conference.

Respectfully submitted,

R. A. Forsberg
Secretary, NCR-15

1977 North Central (NCR-15) Oat Workers Field Day

North Central oat workers gathered at South Dakota State University at Brookings for their 1977 annual Field Day. Following a relaxed and enjoyable discussion session on Sunday evening, June 26, Dr. Dale Reeves guided a group of 40 individuals through the many phases of his oat program on Monday, June 27.

Advanced yield trials were seeded in four-row plots, 14' long with the center 12'+12' harvested for yield. CV's generally range from 6 to 12%. Prior to entry in this advanced performance trial, the most promising F_5 bulk populations are evaluated in four-row plots, three replicates, at three locations. In addition, there were 188 bulk F_5 populations being evaluated in a preliminary test in two-row plots, two replications, at two locations. Entry sequence in all tests was systematic by cross in the first replicate and completely randomized in the other reps. There were 685 bulk F_4 entries, from F_3 lines, planted in a single replicate, two-row plots, 10 feet long. Each F_4 or F_5 bulk population traces back to an F_3 line from an individual F_2 plant. F_2 populations are planted at the normal seeding rate of 2.5 B/A with one to seven rows per cross depending on seed availability. Single F_2 panicle selections are made, and most F_2 populations are harvested in bulk with about half entered into a bulk-F_3 yield trial with two replicates.

Dr. Reeves recently converted to the "tray" method of planting oat panicle rows. Crosses or families or populations proceed down the field, from range to range, rather than in consecutive rows within a range.

Grain quality receives considerable emphasis, and Nodaway 70 had been widely used as a quality parent. Resistance to crown rust is also important. Less than 5% of the oat acreage in South Dakota is underseeded with a forage legume, so straw strength and lodging resistance are not quite as crucial as in other states.

Following an enjoyable lunch sponsored by the recently organized Milling Oats Improvement Association, the group inspected small-plot mechanical equipment and assessories at the Agronomy farm. At the final field stop Dr. Reeves discussed breeding procedures being used to reduce the height of winter rye populations utilizing genes from the "Snoopy" dwarf, a spring rye. The tour concluded with a demonstration of a new, automatic greenhouse watering system.

Our thanks to Dr. Dale Reeves and his associates for this meaningful and enjoyable tour and for the opportunity to share information and ideas.

Submitted,

R. A. Forsberg
Secretary NCR-15

OAT WORKERS IN ATTENDANCE, NORTH CENTRAL FIELD DAY

Tunji Adenola
Guy Ames
Rob Bertram
Marshall Brinkman
R. D. Duerst
R. A. Forsberg
Cheryl Gebhart
Scott Hackett
Richard Halstead
Charles R. Krueger
Dave Langer
Jacob Manistersky
James J. Martin
Matt Moore
Tom McCoy
M. S. McMullen
Ken McNamara
Leonard Michel
Jim Radtke
Dale L. Reeves
Howard W. Rines
Wesley R. Root
A. Bruce Roskens
Brian Rossnagel
Paul G. Rothman
Ted Schiele
Don Schrickel
Adrian Segal
N. H. Shands
Marr D. Simons
Ron Skrdla
Jim Stage
Arlel Terrls
M. B. Vande Logt
I. Wahl
Sam Weaver
Dallas E. Western
Roy D. Wilcoxson
Roy C. Wooley
Vern Youngs

MINUTES OF THE SUB-COMMITTEE FOR IMPROVED UTILIZATION OF THE OAT GERMPLASM COLLECTION
Meeting - June 20, 1977, Merchandise Mart
Chicago, Illinois

Attendance: D. J. Schrickle; D. D. Stuthman; D. M. Wesenberg; C. S. Murphy and J. C. Craddock

Discussion 1: Selection of descriptors to evaluate oat germplasm.

The traits agreed on for evaluating accessions in the oat collection are listed below. The order of listing a descriptor does not imply the importance nor priority for obtaining the information. The descriptors, location (where the information will be obtained), and the coding were summarized.

Descriptor	Location	Code
1. Visual rating at maturity (Acknowledging that this is a subjective trait but important in judging overall performance of an accession)	Aberdeen, Id. (spring seeding) Twin Falls, Id. (fall sown) North Carolina (site to be determined) (fall and spring seeding) Pennsylvania (site to be determined)	1 Poor 5 Average 9 Outstanding (9 classes available)
2 Growth Habit*	Aberdeen, ID. (spring seeding) Raleigh, N.C. (fall seeding)	1 Winter 2 Spring 3 Facultative
3. Winter Survival	North Carolina (site to be selected) Kentucky (site to be selected) Pennsylvania (site to be selected)	9 Classes (percent survival)
4. Straw Strength (Index of lodging)	Aberdeen, Id	9 Classes (Percent lodging)
5. Heading date	Aberdeen, ID.	Date and/or number of days from seeding when 50% headed
6. Plant Height*	Aberdeen, Id. Mesa, Az.	Centimeters
7. Tillering Capacity	Aberdeen, Id.	Open for suggestions. (No decision on how to rate or record)
8. Seed Weight	Beltsville, Md.	Milligrams
9. Seed Weight/volume	Beltsville, Md.	Gram/volume (cubic centimeters)

*Descriptors already being recorded.

10.	Seed/panicle	Beltsville, Md.	Number (Average of 10 panicles)
11.	Hull Color	Beltsville, Md.	9 classes
12.	Yield*	Aberdeen, Id	Grams/2.5 meter
13.	Groat/hull	Beltsville, Md. or Aberdeen, Id	Groat percent of seed
14.	Oil and Lipids	Contracted	Percent
15.	Protein	Contracted	Percent
16.	Diseases:		
	A. Rust	Screen site and	9 classes
	B. *Septoria*	techniques to be	For response
	C. *Helminthosporium*	determined by the	to each
	D. Barley Yellow Dwarf	scientist doing	disease
	E. Smut	the work	"
	F. Soil Borne Mosaic	"	"
	G. Mildew	"	"
	H. Root and Crown Rot Complex	"	"
	I. Ergot	"	"
17.	Insect Resistance:		
	Cereal Leaf Beetle	E. Lansing, Mich.	9 classes
18.	Origin		

In addition to these descriptors for immediate evaluation, the long range goal should include descriptors on physiological and morphological characters for developing a more efficient oat plant.

Discussion 2: Renewal of seed stocks.

The discussion pertained to changing the procedure for the renewal of the oat seed stock. It is the opinion of the committee that more efficient use of the existing seed increase nursery at Aberdeen, Idaho, could be obtained by growing segments of several thousand entries from the collection each year in consecutive order by CI or PI number. The next year several more thousand accessions would be grown continuing in consecutive order. The nursery would be supplemented with accessions from the rest of the collection that require a seed increase. This procedure would facilitate an orderly evaluation of the entire collection and provide researchers the opportunity to observe and select accessions in the oat collection without them having to grow large portions of the collection.

Discussion 3: Disseminating information.

Discussed the need and procedures for disseminating information pertaining to the oat collection. The Committee unanimously agreed that there is a need and that it would be worth the time to provide oat workers with current information about the collection. It was agreed that an oat germplasm information letter should be initiated. Such a letter would include (1) the segments of the collections being grown, where and who to contact concerning specifics about a nursery; (2) results of screening trials; (3) unique accession discovered; (4) when and where new accessions are being increased and evaluated; (5) miscellaneous germplasm items of interest to cereal workers.

A catalog of accessions in the oat collection should be distributed as soon as possible. Such a catalog will be in two parts (1) alphavetically by variety designation (2) numerically by identification (CI or PI) number. This catalog will include identification number and varietal designation, seed source and origin, and whatever evaluation data are available. Such a catalog would be supplemented periodically to include new accessions.

The preparation of the catalog and newsletter would be the responsibility of the Curator of the Small Grains Collection.

Discussion 4: Use of automated data system.

The adoption of a uniform automated data system for the storage and retrieval of information was discussed. It was agreed that the designated descriptors and codes should be compatible with the system adopted by the U. S. germplasm program.

Discussion 5: Proposal to obtain additional SEA support for the oat germplasm collection.

The committee unanimously agreed to recommend to the National Oat Workers Conference that a proposal for the improved utilization of the oat collection be combined with the wheat workers proposal and to cooperate with the preparation of the wheat workers proposal. Such an arrangement is plausible because the objective of both groups is basically the same.

Discussion 6: How to obtain information.

It was decided that the disease and insect information would be best obtained by having the collection screened by specialists.

Money should be available for travel, per diem, and for contracted services to recruit the services of individuals to obtain specialized information.

Summary of Recommendations:

1. The first 17 traits to be evaluated were designated.
2. The seed renewal program should be changed so that each year a portion of the oat collection of several thousand entries are grown in consecutive order by CI or PI number.
3. Information about the oat collection should be disseminated by:
    (a) A cereal germplasm informational letter.
    (b) Catalog of the accession in the oat collection.
4. Recommended the adoption of a standardized automated data system for the storage and retrieval of information.
5. Cooperate with wheat workers and other cereal workers to prepare a program for improving the utilization of the Small Grains Cereal Germplasm.
6. Funds should be available to recruit experts to obtain specialized data.

PLANT BREEDING SYMPOSIUM II

Plant Breeding Symposium II, sponsored by Iowa State University at the new Iowa State Center, will be held March 12-16, 1979. The symposium will review plant breeding advances of the past 15 years, and evaluate areas of future potential.

Ten half-day sessions will consider the following topics:

1. Progress in Meeting Human Needs Through Plant Breeding
2. Exotic Germplasm; Resources and Utilization
3. Application of Tissue Culture to Plant Improvement
4. Morphological and Physiological Traits
5. Selection and Breeding Methods
6. Chromosomal and Cytoplasmic Manipulations
7. Breeding for Stress Environments
8. Pest Resistance
   Pathology
   Entomology
9. Development of Plants for Multiple-Cropping Systems
10. Improvement of Nutritional Quality

For registration information please contact:

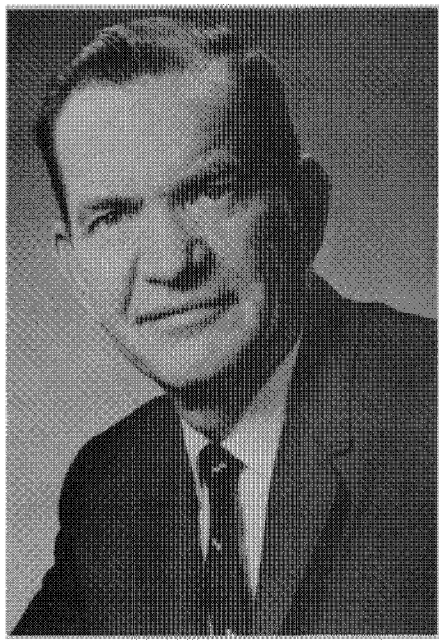
Dr. K. J. Frey
Agronomy Department
Iowa State University
Ames, Iowa 50011
(515) 294-7607
TWX 910-520-1152

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, and H. L. Shands.

At the 1978 meeting of the American Oat Workers' Conference held at College Station, Texas, chairman Murphy appointed a committee to nominate candidates, and three people were chosen in accordance with Conference procedures. Photographs and biographies of the three who were selected to receive the award for distinguished service to oat improvement at the 1978 meeting follow.



J. E. Graphius

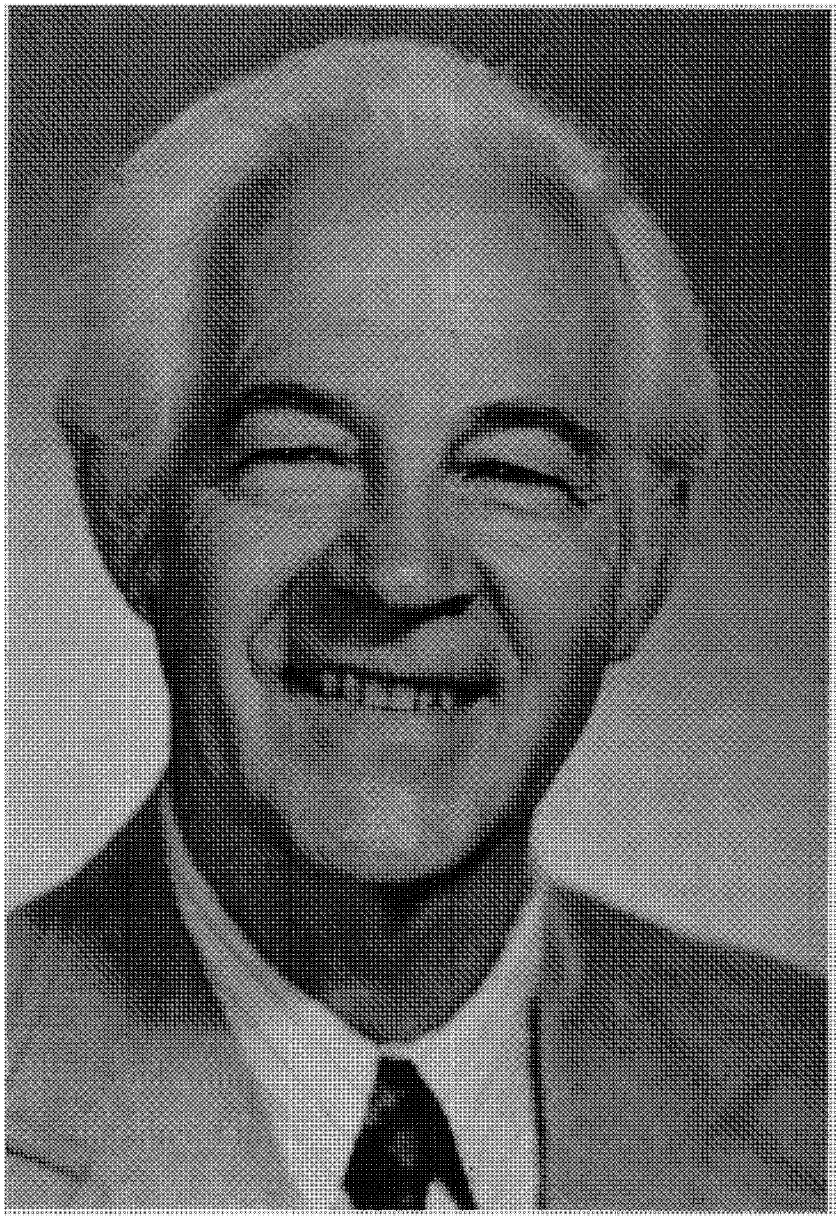
Dr. John E. Graphius, Professor of Plant Breeding at Michigan State University, has been a leader in research on small grains and in the development of improved small grain varieties. His oat varieties include James, a hulless type, Coachman, Menominee, Au Sable, Mariner, Korwood, and Mackinaw. He has developed varieties of barley, winter wheat, and rye as well.

Dr. Graphius authored more than 60 technical articles in plant breeding and related subjects, and is perhaps best known for his monograph entitled "A Geometry of Plant Breeding" which describes his philosophy and strategy of plant breeding. He has been instrumental in applying mathematics to many breeding problems. Also, he has made contributions in development of plot equipment, namely a mechanical plot seeder and a self-propelled plot combine.

He has been and is an excellent plant breeding teacher, having taught statistics and advanced plant breeding. During his career he advised a number of graduate students, both domestic and international.

He is a past Crop Science Achievement Award winner, a Guggenheim fellow and a Fellow in ASA. He is a member of Phi Kappa Phi, Sigma Xi, Alpha Zeta and the American Society of Agronomy and Crop Science Society of America. He has been active in university activities including service on the Academic Council of Michigan State University.

John E. Grafius was born June 8, 1916 in Rochester, New York. He received his B.S. degree from Michigan State University and his M.S. and Ph.D. degrees from Iowa State University. After receiving the Ph.D. in 1942, he joined the staff at South Dakota State University, then later moved back to Michigan State University in 1953, where he served as Professor of Farm Crops until his retirement.



N. F. Jensen

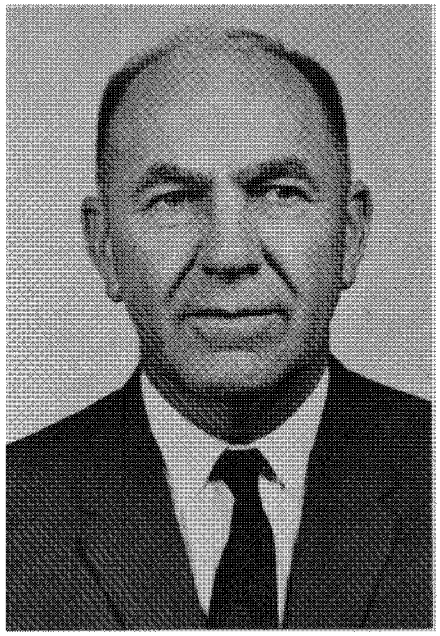
N. F. JENSEN

Dr. Neal F. Jensen, Professor of Plant Breeding at Cornell University, has been a leader in research on all small grains, not just oats. Oat varieties he has developed include Goldwin, Mohawk, Advance, Craig, Oneida, Niagara, Tioga, Cayuse (Washington and Idaho), Orbit, and Astro. His germplasm releases include Edgolon, NY Oat Composite I, and Nysel winter oats.

Dr. Jensen's research and thinking have been published in many technical articles. He is perhaps the best known for being one of the first, if not the first, to advocate multiline varieties and also as originator of the Diallel Selective Mating scheme. He wrote the chapter of Genetics and Inheritance in the Oat Monograph, and a chapter on Crop Breeding as a Design Science in Foundations for Modern Crop Science, an ASA publication. He was a founder and the initial editor for 17 years of the Oat Newsletter, for which oat workers are deeply indebted.

Dr. Jensen earned a reputation as an excellent teacher of plant breeding, and influenced many students, both in the classroom and as advisor. Dr. Jensen was the first recipient of the DeKalb Crop Science Distinguished Career Award presented in 1977. Other awards and honors include Fellow of the American Society of Agronomy and American Association for the Advancement of Science, and appointment as Liberty Hyde Bailey Professor of Plant Breeding. He is a member of the American Society of Agronomy, Crop Science Society of America, American Association for Advancement of Science, Genetics Society of America and Canada, Alpha Zeta, Phi Kappa Phi, and Sigma Xi.

Dr. Neal F. Jensen was born in Hazen, North Dakota and received his B.S. at North Dakota State University and his Ph.D. degree at Cornell University. He then spent three years in the U. S. Navy before joining the staff at Cornell University where he served until retirement.



J. M. Poehlman

Dr. John Milton Poehlman, Professor of Agronomy at the University of Missouri, has been committed to the improvement of world agriculture throughout his career. He was in charge of the University of Missouri oat breeding project from 1939 until 1970, and has also worked with wheat, barley, rice, and mungbeans. His oat varieties include Mo 0-200, Mo 0-205, Macon, Nodaway, Pettis, Nodaway 70, and Bates, as well as Dade and Hickory germplasms.

Teaching has been a major activity of Dr. Poehlman. He taught the introductory plant breeding course from 1936 until his retirement. He also taught graduate level courses in plant breeding and field experimentation, and directed the studies of many graduate students. He authored the book Breeding Field Crops in 1959, which is widely used in U.S. universities and has been translated into Spanish and Arabic. In 1969, he rewrote the book with special emphasis on Asian crops. That book, Breeding Asian Field Crops, was published in India.

Dr. Poehlman was the recipient of the University of Missouri 1978 Thomas Jefferson Award. This prestigious award is the highest given by the University of Missouri system. Awardees are chosen for their exemplification of the principles and ideals of Jefferson.

Dr. Poehlman was born May 9, 1910 at Macon, Missouri. After being reared on a general farm near Macon, he attended the University of Missouri receiving a B.S. degree in Agriculture in 1931, and the Ph.D. degree in Botany in 1936. He joined the faculty in the Field Crops Department in 1936, and was promoted to Professor in 1950. He has received many academic honors including Fellow of the American Society of Agronomy in 1955, and the Gamma Sigma Delta Senior Faculty Award in 1970.

II. ABSTRACTS OF DISCUSSION SESSIONS AT NATIONAL OAT CONFERENCE

Management Systems and Economic Aspects of Oat Production

F.C. Collins (Moderator), University of Arkansas, R.D. Barnett, University of Florida, H.W. Ohm, Purdue University, and S.H. Weaver, Quaker Oats Company.

Oats are produced over a wide geographical area for forage and/or grain. Only in a few states can oats be considered a major crop. In other areas, the crop fills a unique need and it is grown because it has an economic advantage over other crops. One such area is the Grand Prairie region of Central Arkansas which produces seed oats which are marketed in Texas and Southeastern states where oats produce excellent forage. Oats are grown in this region because farmers are able to produce high yields of clean, high quality seed and oats fit well into the system where rice mills can easily clean equipment of oat grain; also, the farmers double crop their oat land with soybeans.

Oats and other small grains are widely double cropped with soybeans and other warm season crops but there are production problems requiring research. Oat residue can interfer with seedbed preparation and add to weed control problems in the succeeding crop; it also serves as organic matter for the build-up of pathogens such as *Sclerotium rolfsii* and *Rhizoctonia solani*; and phytotoxic substances in the residue can reduce soybean growth and yields. Likewise, crops preceeding fall planted oats are likely to have similar detrimental effects on the oat plant. (Collins)

The acreage of oats used for forage production is not readily available but a rough estimate of of 25% can be made by looking at the difference between acres planted and acres harvested for grain. Because of the long growing season in the South, grazing winter oats can be economically attractive. Harvesting an 80 bu/A oat crop worth $1.25/bu nets a farmer about $100/A which is very close to production costs, but he can earn $180/A by grazing beef which gains 400 lbs/A and sells for 45 cents/lb.

Forage production research can be very complex because the animal needs and response adds to the complexity. Factors to be considered from the plant standpoint include seeding method, mixtures of species to give an extended period of grazing, platability, forage yields, and season of production. Emphasis should be placed on increased growth under cold temperatures, ability to produce forage when planted earlier in the fall, increased disease resistance, and better methods of evaluating forage potential in early generation breeding material. (Barnett)

Oat acreage in the midwest has been declining but oats are still important and can be economically competetive with corn and soybean when one also includes the value of the oat straw. Oats yielding 70 bu/A and producing 2 tons/A of straw should have a similar net return as corn yielding 110 bu/A. Oats are also used as a nurse crop with alfalfa in this area. Future research direction should be for better lodging resitance, earlier planting (planting after April 10 in Indiana results in a loss in potential of one bushel 1 day), and screening breeding material for sensitivity to chemical residue from previous crops (a Purdue oat selection, P62-3, was very susceptible to 2,4-D). (Ohm)

Long-term trends for planted and harvested acres of oats are down. An increase in non-grain utilization of oats is indicated. Feed uses will decline and food uses will increase slightly. Yield per acre will increase by about 4%. Federal research dollars have declined (1978 USDA budget was down 11%, or 16% when adjusted for inflation). Breeding and production research have suffered the most. State research dollars have recently remained stable but may decline in the future.

Because of the fact that no objective yield surveys are made on oats, estimates are generally erroneously reported. Consequently difficulty arises in justifying research dollars to administrators. Industrial support of oat research will have to increase by at least 6%/yr to 1990 in order to stay even. Based on the lack of representation at this conference of the majority of members of the Milling Oats Improvement Association, one should be deeply concerned about industry's commitment to oat research. The Quaker Oats Company will continue its support. (Weaver)

Approaches for Controlling Disease and Insect Pests

M. D. Simons, Moderator; G. E. Shaner and H. F. Harrison, Panel Members

Slow rusting oats are actually rust susceptible, but the rate of rust development is slower than in ordinary susceptible oats. Thus there is less rust on the plants at rust climax. Simulation work has shown that very small differences in rate of rusting are important. The cumulative effects will significantly slow the progress of the epidemic. There is considerable interest in slow rusting in recent years, and several research programs are trying to identify the reasons for slow rusting. Such factors as reduced frequency of spore penetration, longer latent period of the fungus, and smaller sized pustules all seem to be involved. Genetic studies are beginning to accumulate evidence that slow rusting is probably the polygenic in inheritance, but that not too many genes are involved, possibly a half dozen or maybe as few as two or three. Also there is evidence that slow rusting is horizontal in the sense of Vanderplank. No information is available on whether the different components of slow rusting such as reduced frequency of penetration or small uredia, are controlled by the same genes.

There is a possibility that slow rusting may not be practical to use in the case of forage oats, because of the loss of palatability to livestock due to the rust on the plants.

Selection for slow rusting in a breeding program is difficult in comparison with the work involved with other types of rust resistance. In the field, it is often necessary to take readings two or more times during the season, and rather laborious techniques must be used in the greenhouse, such as determining latent period, or measuring size of uredia.

Oats produced in the southeastern United States are subject to several relatively serious diseases, While some of these may be classified as minor diseases, it is important to have resistance to them. Soil borne mosaic is a good example. Resistance to soil borne mosaic found or utilized earlier has held up very well. Another "minor" disease, Helminthosporium culm rot, took out some of the best of the earlier varieties. The multiline approach to controlling crown rust is not generally regarded as practical, because of the many other diseases that must be dealt with. Crown rust is being controlled by "stacking" of crown rust resistance genes. Some oats now have four different genes for crown rust resistance. Further stacking of genes, of course, becomes increasingly difficult. Stem rust must be considered also, but since it can be controlled so efficiently with chemicals, it is not being given much attention in breeding programs for oats in this area.

The procedure for developing multiline cultivars for the control of oat crown rust is well known. The work with multilines of oats was recently reported at the wheat genetics symposium in India, where it was received with a great deal of interest. In Iowa, a new multiline is being developed using Lang as the recurrent parent. The gene donor parents are of good agronomic type and for this reason it is planned to use only two backcrosses to the Lang recurrent parent. Also, the donor parents are individual component lines of the Iowa early multiline variety. This multiline has much better test weight than Lang and it is hoped that using only two backcrosses may result in retention of some of this seed quality in the multiline.

Breeding for Resistance to Environmental Stress

H. G. Marshall (Moderator), D. Sechler, V. C. Finkner, and D. L. Reeves

The most notorious environmental stresses affecting oat production are low temperature, high temperature, and drought. Breeding for resistance to these production hazards is difficult because of their genetic complexity, poor measurement techniques, and a lack of known elite parents. Also, there generally seems to be a negative association between resistance to these stress factors and components for maximum yield performance.

Considerable effort to improve the winter hardiness of winter oats has been made in a few U.S. programs, but only minor improvements have been achieved during the last 40 years. Hardy x hardy crosses have not provided the transgressive improvement that is needed, but winter x spring oat crosses may yield populations with greater genetic diversity for future exploitation. The wild hexaploid oats also may have useful genetic diversity for winter hardiness. Effective breeding methodology for winter hardiness needs to be developed. Contrary to expectations, winter-hardy genotypes do not quickly become dominant in bulk populations, and attempts to manage natural selection pressure have not been successful. Research to develop systems to apply controlled selection pressure for freezing resistance and field winter hardiness should have high priority.

Oats thrive under relatively cool, moist conditions, and significant losses in grain bushel weight and yield may be caused by a few hot, dry days during the grain filling period. Heat and drought damages usually are confounded and losses may be subtle and difficult to measure. Except for rice, oats has the highest water requirement among the small grains, but little is known about existing genetic variability for drought or heat tolerance. At present, some breeders are either late planting to increase the chances of stress during the grain filling period or planting in areas where stresses frequently occur. Genotype comparisons and selection efforts probably should be restricted to those years when stresses occur. A high priority should be placed on studies of physiological and morphological characteristics which may be associated with heat and drought tolerance. More knowledge is needed about: (1) efficiency of water uptake and use, (2) efficiency of photosynthesis under water deficit, (3) importance of rooting depth and pattern, (4) role of leaf size, altitude, tendency to roll under stress, waxy bloom, and pubescence.

Evaluation of resistance or tolerance to environmental stress is especially difficult because of the undependable occurrence and variability of test conditions in the field. Some locations will yield differential data more often than others. Greater progress is likely from future research if potential parental germplasm and breeding populations and lines are tested at those locations. Regional and national cooperative selection and testing programs, like those for winter hardiness, should be established to support breeding efforts for improved resistance to specific environmental stress factors.

REPORT OF PANEL ON ALTERING PHYSIOLOGICAL TRAITS OF OAT PLANTS AT THE AMERICAN OAT WORKERS CONFERENCE FOR 1978

Panel members were K. J. Frey, D. M. Peterson, J. W. Martens, and M. A. Brinkman.

A regional research committee (NCR-107) was formed in the North Central Region in 1976 to develop a research project on Breeding Crop Varieties for Physiologic Traits. To date, this committee has held two meetings and sponsored one workshop.

Frey reported that yield increases obtained in oat genotypes by introgressing *Avena sterilis* germplasm into them seem to be due to increased leaf area duration of these lines.

Martens said that there is little evidence that physiologic traits *per se* contribute to a plant's resistance to disease. However, degrees of partial resistance, such as tolerance, must involve some peculiar physiologic reactions in the oat plant.

Peterson reported on nitrogen metabolism in oats. Orbit (low groat-protein percentage) has as much protein per caryopsis and yields as much protein per acre as Dal (high groat-protein percentage). It appears that Orbit simply translocates more carbohydrates to the caryopses, thereby diluting the protein in the groats. Sizable differences occur in nitrogen harvest indexes for genotypes of small grains.

Brinkman found that isolines of oats with different yielding capacities differ by many physiological traits.

The Oat Ideotype: A Symposium

This symposium led off with a comprehensive survey of ideotype research by Dr. Forsberg. While it is impossible to condense the scope of his talk in a few sentences, a brief synopsis follows.

Concepts: R.A. Fosberg

In C.M. Donald's 1968 paper entitled "The breeding of crop ideotypes," the word ideotype was defined as "a form denoting an idea." This definition led to hypotheses about plant morphology and physiology which might result in greater yields. Different oat ideotypes might well be expected to perform differently in different environments or regions. Planting date, daylength, maximum and minimum day and night temperatures, soil moisture, and other environmental factors all influence production, and these factors vary considerably from region to region and season to season. Regardless of environment, improvement in grain yield by altering plant structure will ultimately be based on (1) direct or indirect genetically-controlled increases in one or more of the three primary yield components themselves (in the absence of negative compensation) or (2) environmentally induced yield-component increases such as by higher fertilization of semi-dwarf types. Two critical yield components--number of tillers per unit area and number of florets per tiller--depend upon genotype and environment prior to heading. In fact, spikelet number in spring oats is developmentally set by 3 weeks after planting. Vegetatively, differences in leaf angle and in leaf width and length influence canopy formation and closure. Physiologically, genetic differences exist for nitrate and carbohydrate assimilation and remobilization during the grain-filling period. Chronologically then, we are concerned prior to anthesis about the development of sink storage capability. After anthesis we are concerned about individual plant morphology and overall canopy structure necessary to maximize photosynthate production and dry matter accumulation leading to maximum seed weight. Hence, "physiological ideotype" may be equally as important as "morphological ideotype."

Following the synopsis, Dr. Vern Burrows's presentation zeroed in on factors of primary concern for an oat ideotype for Canada. Dr. John Grafius discussed dry matter accumulation as it related to ideotype and Dr. John Schmidt presented newer attitudes and philosophies related to methods used in breeding for an ideotype.

Factors of Concern: Vern Burrows

A concerted effort must be made to raise the yield potential and extend the usefulness of the oat crop both as a feed and food grain. For spring oats, high yields can most often be raised by planting early in the season and one way to ensure early planting is to sow dormant seed in fall (dormoats). Early emergence of seedlings in spring ensures the development of large apical meristems with large numbers of seeds per panicle. Possibly oat breeders should search for dwarfs which are non responsive to gibberellic acid (block in GA utilization) as another way to foster the development of large heads (mimic experience in wheats). Recombinants derived from winter x daylength insensitive oats may also lead to higher yields by exploiting high tillering and synchronous flowering behavior. High straw and silage yields, and large seed size, are commonly desired by growers in Canada even though these characteristics are difficult to achieve and still retain high grain yield and lodging resistance. It is beleived that every effort should be made to exploit oat quality especially oat protein. The other major components of the oat kernel (starch, oil) will only become important commercially if the functional quality of oat protein can be identified and exploited. Major oat improvement programs should include quality as an important component of an ideal ideotype to upgrade the status of oats.

Dry Matter Accumulation: John Grafius

The problem here is to fit the developmental morphology to the available environmental resources in such a way as to minimize the effects of stress on grain yield and optimize the physiologic efficiences of the systems. Thus plant sinks and physiologic capability as influenced by plant morphology and canopy structure are major determiners of yield. The model ideotype will change with the environment and the gene pool.

The components of yield, heads/unit area, kernels/head and kernel weight frequently show negative correlations, so that it is unreal to expect maximization of all three components. Instead ideotypes can be expected to vary from location to location and from gene pool to gene pool. Examples of uncoupling the negative correlations between components and increased yield were given. The importance of a greater understanding of the control mechanisms at the interface between meristem development and plant morphology as related to yield was emphasized.

Breeding: John W. Schmidt

It is our philosophy at the University of Nebraska that, since the odds of obtaining new strains with better genetic combinations are so low, we should minimize the cost of our breeding operations. This we have tried to do by streamlining our procedures and maximizing the amount of material we can effectively observe. Bulk hybrid populations are used for the F_2 (agronomic and quality data collected) and F_3 generations. Head selection is exercised in the F_3 bulks and the lines thus obtained and advanced through the various nurseries are F_3-derived lines with varying degrees of heterogeneity. F_3 selection is a compromise between later-generation homogeneity and the higher F_2 probability of selecting a plant with the greater number of favorable factors, either homozygous or heterozygous. We believe this has value since breeding for wide adaptability has been an important objective in our program. Selection among F_4 families is for stem rust resistance, plant type and maturity.

Yield component studies in wheat consistently show high correlations between yield and tillering ability, intermediate to low correlations between yield and kernels per spike and essentially no correlation between yield and 1000-kernel weight. However, in winter wheats in the International Nursery 1000-kernel weight appears to contribute significantly to high cultivar performance over environments. Consequently, selection for high 1000-kernel weight is an important objective for us even at the expense of tillering ability which in our wheats is probably excessive.

The Audience:

Participation by the audience was welcomed and questions of great interest and importance were raised.

Future Research Needs on Barley Yellow Dwarf Virus in Oats

H. Jedlinski, (Moderator)
SEA, USDA, University of Illinois, Urbana, Illinois

The Barley Yellow Dwarf Virus and Its Effect on the Host Plant

THE VIRUS: The barley yellow dwarf virus (BYDV) is a member of the luteovirus group. It is a polyhedral virus about 25 nm in diameter containing as a nucleic acid core a single strand of RNA of approximately 2×10^6 daltons. The virus is carried persistently by several species of aphids, but to date there is no firm evidence that it causes pathology in the vector. The virus occurs in several forms which can be differentiated by their vector specificity, their biophysical and biochemical properties, their serological specificity, the severity of symptoms they induce and their effects on the ultrastructural cytology of the host plant.

SYMPTOMS: When a plant becomes infected, the first symptom which may appear in 4-14 days is a reduction in growth. This ultimately leads to a stunted plant with a reduced number of tillers, reduced root mass, fewer and smaller heads, with fewer and lighter kernels per head. Leaf symptoms which include reddening or yellowing usually begin at the tip or the margins of the leaf and progress inward and downward toward the base. Leaves are typically short, erect, stiffened and leathery. Infected plants typically head later than normal but leaves senesce prematurely.

PHYSIOLOGY: The development of this set of symptoms is the result of the disturbance of the plants normal physiology when the virus, introduced by an aphid, establishes infection in the vascular tissue. Within a half of day after becoming established, the virus spreads systemically through the plant. One of the first effects of viral infection in the vascular system is a disruption of translocation. This leads to an accumulation of the products of photosynthesis in diseased leaf blades and a reduced rate of growth in the meristematic tissues of the root and shoot. In the leaf blade the accumulation of sugars leads quickly to a feedback inhibitation of photosynthesis and a stimulation of respiration. The excess sugars also contribute to a breakdown of chlorophyll, which reveals the other leaf pigments, and results in the typical yellowing or reddening of the leaves. As the plant approaches maturity translocation to storage organs in the head or panicle is disrupted and grain yield and test weight are reduced. In wheat plants the effect on translocation at maturity is proportional to the distance between the source and the sink--the flag leaves and lower photosynthetic tissues contribute very little to grain fill while the glumes and awns are normally productive. In tests which combine physiology with genetics it has been reported in barley that genes for resistance are only expressed fully when they are introduced into a strong, vigorous genotypic background.

In summary trying to understand exactly how this virus affects certain critical cells and how these cells influence the vascular system points out our lack of knowledge of translocation in higher plants. Much more research is needed especially on healthy plants to identify the factors which regulate translocation and thereby photosynthesis, growth rate, yield, and other important parameters. When these factors are understood we will be in a position to use genetics and physiology to influence growth rate, photosynthetic efficiency and ultimately yield.---Stanley G. Jensen, USDA-SEA, Northern Grain Insects Research Laboratory, Brookings, SD.

Future Research Needs on BYDV - Virus Strains; Disease Diagnosis

Four vector specific, i.e. *Macrosiphum avenae*-specific, *Rhopalosiphum padi*-specific, *R. maidis*-specific and *Schizaphis graminis*-specific; and at least two vector nonspecific strains of BYDV have so far been recognized in North America. Identity of the strains and their annual variation are known only in a few cereal growing regions of North America. Considerable variations in strain spectrum and prevalence from year to year have been encountered in areas monitored. Disease severity and other effects of different strains vary greatly on different cultivars of oats.

Diagnosis of BYDV in plants on the basis of symptoms is unreliable since similar symptoms can be caused by several other factors. Symptoms may be masked under certain environmental conditions or certain virus strains may cause symptomless infections. Identification of BYDV by virus recovery tests with aphids is cumbersome and time consuming. A highly sensitive serological test employing Serologically Specific Electron Microscopy (SSEM) is now available for rapid detection of BYDV in a variety of plant samples. However, a complete understanding of serological relationships among different strains of the virus present in a given area and different regions is lacking. This makes it difficult at present to cover all of the strains (that may be present) in serological detection tests. Antisera to at least 2 or 3 strains may be required to efficiently detect the virus in field samples.

Future BYDV research needs in these subject areas are: (1) Isolation and identification of BYDV strains, and monitoring of annual variation in strain spectrum in different oat growing regions of North America. This would enable breeding material to be screened against the most prevalent strains. (2) Determination of serological relationships among different strains and production of antisera to serologically unrelated or distantly related strains to enable positive identification of the virus, efficiently and rapidly, in plant samples. (3) Elucidation of the epidemiology of the virus in regions where the role of perennial grasses, winter cereals and migrant aphids, and interactions of these are not fully understood.---Y. C. Paliwal, Chemistry and Biology Res. Inst., Res. Branch, Canada Agriculture, Ottawa, Ontario, Canada.

Future BYDV Research Needs

Excellent sources of tolerance to BYDV in oats have been identified. Some agronomically acceptable varieties such as Otee, Jaycee, Noble, Lang, and Bates have demonstrated a level of tolerance that provides considerable protection under field conditions. The Illinois Agricultural Experiment Station and USDA have recently released 13 oat germplasm lines with excellent tolerance. These lines are believed to represent the highest level of tolerance currently available. This high level of tolerance resulted from transgressive segregation where diverse genes for tolerance from several parents have been combined. Germplasm lots of the tolerant lines are maintained and distributed by the Plant Genetics and Germplasm Institute, U.S. Department of Agriculture, Beltsville, MD 20705. Good sources of tolerance have also been found in the wild oat species *Avena sterilis* and *A. fatua*.

Research to date has shown that BYDV tolerance is highly heritable and is easy to use in an oat breeding program. Simple and effective techniques for evaluating breeding material have been developed and are being used by some oat breeders. Thus, all the necessary ingredients for a successful program of developing tolerant varieties are available for use by oat breeders.

In the future, particularly in areas where BYDV is a significant problem, breeders should direct attention to the utilization of the excellent tolerance that is now available. Continued effort should also be directed to collecting, developing and evaluating new germplasm. In order to do this most effectively, it may be desirable to establish a BYDV testing service for oat breeders. If this is done, it should not be necessary for each breeder to establish a testing program for BYDV.

Another area that should be monitored is the potential threat of different strains or isolates of the virus. We know that strains with different levels of virulence do exist and that an occasional example of oat genotype X virus isolate interaction has been found. The fact that most tolerant lines have maintained their tolerance over a wide area and to a large number of isolates is an encouraging sign from the standpoint of stability of tolerance. However, we must continue and even expand our research on testing material to more virus isolates and over a wider geographic area.---C. M. Brown, Dept. of Agronomy, University of Illinois, Urbana, Illinois.

Discussion included the following topics of major concern:

1. Stability of the tolerant germplasm over wide geographic areas.
2. Latent and masked infections and unrecognized yield losses.

3. Physiological basis for lack of symptom expression in the fall.
4. Disease severity in relation to infection at different stages of plant maturity.
5. Disease resistance and oat quality.

Quality Improvement Needs of the Future

Donald J. Schrickel, Moderator; Vernon Youngs, Lloyd Nelson, and William Ellis, Panel Members

At the American Oat Workers Conference I was Moderator of the panel on "Quality Improvement Needs of the Future." Other members of the panel were Dr. Vernon Youngs, Oat Quality Laboratory, USDA, Madison, Wisconsin; Dr. Lloyd Nelson, Agronomist, Texas A&M University, Overton, Texas; and Dr. William Ellis, Livestock Nutritionist, Texal A&M University, College Station, Texas.

Dr. Youngs discussed the "Improvement in Biochemical Composition of Oats." He discussed briefly the methods of protein and oil determination and commented on starch, fiber, and minerals.

Lloyd Nelson described "Oat Forage Quality and Production" and Bill Ellis described the "Nutritional Value of Oats" with particular emphasis on the value of forage to livestock producers in Texas.

Don Schrickel explained the problem of dark oat groats in the 1977 oat crop and described a plan to conduct an experiment in 1978 to determine how much of the problem is genetic and how much is associated with environment.

OAT GERMPLASM UTILIZATION AND DOCUMENTATION

Panel Members:

D. M. Wesenberg, SEA, USDA, Aberdeen, ID
D. J. Schrickel, Quaker Oats Company, Chicago, IL
J. E. April, IS/GR Director, University of Colorado
D. D. Stuthman, (Moderator), University of Minnesota
J. C. Craddock was unable to attend

Several years ago then AOWC Chairman, C. F. Murphy, appointed a committee entitled Improved Utilization of Oat Germplasm[1/]. The committee consists of D. M. Wesenberg, D. J. Schrickel, D. D. Stuthman and J. C. Craddock, chairman. This part of the program was intended to serve as a progress report of this committee and to solicit input regarding future direction of the efforts to better utilize the World Collection of oats.

Four major areas were covered in the discussion: (1) description of current efforts for maintenance and evaluation of the World Collection, (2) brief description of efforts aimed at generating political and financial support, (3) development of a complete information system including data collection and retrieval and (4) interpretation and evaluation of current draft of list of descriptors.

The seed increases necessary to maintain viable seed stocks are grown at Aberdeen, Idaho under the direction of D. M. Wesenberg. All new entries and selected old ones are grown each year. The choice of old entries to be grown is based primarily on seed needs. All entries are currently evaluated for height, growth habit and yield (per single 10 ft. row). The 10% best yielding entries are grown again the next year in non-replicated 4-row plots. Data for other characters for differing portions of the Collection has been collected by various individuals over time. Unfortunately, most of the data, however collected, is accessible only with difficulty.

Our committee has been working with the National Wheat Improvement Committee (NWIC) to develop a system which will deal with germplasm evaluation and utilization for the entire Small Grains Collection. D. J. Schrickel has been communicating with several groups including The Milling Oats Improvement Association to develop support for including this effort in the next USDA budget proposal.

On September 26, 1977, the USDA signed a specific cooperative agreement with Information Sciences/Genetic Resources (IS/GR) to develop an information system for the wheat portion of the Small Grains Collection. It is our hope that oats will be added at an appropriate time. The role of IS/GR is to develop procedures whereby data, systematically collected whenever portions of the Collection are grown, can be assembled and stored in a manner that will allow easy retrieval. The main responsibility of IS/GR will end once those procedures are developed and operating correctly.

1/ See page 58 of 1976 Oat News Letter for details.

Oat researchers will have to provide the judgements regarding which characters will be evaluated at what location(s) and in what manner, particularly in terms of complementing and extending useful existing data. It was suggested that our committee develop a questionnaire through which oat researchers could indicate their preference of priority of the various parts of this effort. Data regarding origin, species, parentage (when known) and known genes would also be included for each entry. In general, there was consensus to initially emphasize those characters with relatively little genotype X environment interaction.

The following resolution regarding this issue was passed by the conference:

> *That a plant pathologist be added to the subcommittee for the Improved Utilization of Oat Germplasm Collection and that this subcommittee serve as an advisory committee, representing the American Oat Workers Conference, to the Germplasm Resources Information Project (GRIP).*

USDA (SEA) Roles and Interactions with State Experiment Stations

Moderator: C. F. Murphy

Panel: L. W. Briggle, H. G. Marshall, M. D. Simons, D. M. Wesenberg and C. M. Brown

This discussion was preceeded by several other sessions in which concerns were expressed about the visibility of pending decisions in the SEA decision making process. Dr. Briggle initiated this discussion by reviewing recent changes in the administrative structure within USDA. The key change in this structure is the creation of another administrative layer above the office formerly titled, Administrator, ARS. Dr. Briggle praised the quality of SEA personnel and their contribution. He also pointed out the governmental budgetary practices which prohibit the divulgence of projected cuts or increases prior to the routing of these proposals through the SEA, USDA structure and through OMB.

Further discussion showed that the system of National Technical Advisors was evolving - but quite slowly. Little travel money has been available for these activities and the major thrust has definitely been internal (within ARS - SEA) with little emphasis on the role of these positions in state-federal coordination.

Dr. Brown praised the productiveness of past ARS-state cooperative efforts and cited several, e.g. the wheat program at Nebraska. However, fear was expressed that these types of cooperation are no longer considered productive by USDA administrators.

There was general agreement that the old Cereals Branch had offered especially good national leadership and that those research programs (federal, state and private) which had been related to that Branch have been most hurt since the 1972 reorganization. The close liaison between state bench scientists and Department Heads and USDA Investigation Leaders and Branch Chiefs has been lost and the closest state-federal liaison at present is between Experiment Station Directors and USDA Area Directors.

Real concern was expressed regarding the constant erosion of USDA support for oat research, in particular, and commodity related "service" activities in general. It was pointed out that these types of USDA efforts had been most appreciated in Congress and that this reduction in areas of more applied research might well result in even less financial support for agricultural research.

While a wide range of concerns were expressed, there was little optimism with regard to these views being appreciated within the administration of USDA. The need for groups such as the American Oat Worker's Conference to communicate their views directly to USDA administrators and Experiment Station Directors was emphasized.

III. SPECIAL REPORTS

EFFECT OF BRAN AND HIGH PROTEIN CONCENTRATE FROM OATS ON DOUGH AND BREAD PROPERTIES

Bert L. D'Appolonia and V.L. Youngs

The study on the effect of bran and high protein concentrate from oats on dough and bread properties was completed. The investigation was a joint effort between Dr. V.L. Youngs of the Oat Quality Lab, USDA, ARS, Madison, Wisconsin and the Department of Cereal Chemistry and Technology, North Dakota State University.

Effects were studied of bran and protein concentrate from oats on dough properties and on bread. Bran from dry, milled commercial oatmeal increased Farinograph absorption and maintained dough stability to a greater degree than bran from dry, milled oat groats of a pure cultivar. At equal levels of addition, loaf volume was lower for oat than for wheat bran but panelists preferred oat bran bread over wheat bran bread. Addition of protein concentrate from oats also increased absorption and decreased loaf volume and defatting the concentrate increased the detrimental effect. Breat containing 10 or 20% oat bran was better accepted than bread containing the corresponding level of wheat bran.

CARBOHYDRATES OF OATS

L.A. MacArthur and B.L. D'Appolonia

Studies are underway to investigate the carbohydrates present in three oat cultivars of different protein content with the results compared to a hard red spring wheat flour.

More crude non-starchy polysaccharide (CNSP) material was isolated from the oat flour than wheat flour. Analysis of the CNSP of oats revealed high percentages of β glucans in comparison to wheat non-starchy polysaccharides which are predominantly pentosans. The oat flours and brans showed higher and lower reducing and non-reducing sugar values, respectively, than the HRS wheat. Total sugar content was found to be highest in the wheat cultivar. Of the individual free sugars present in oats, sucrose was predominant followed by raffinose. Stachyose was found in oat flour and bran but was not observed in wheat flour. Only minor differences were noted in maltose, fructose and glucose between oats and wheat. Small amounts of an unknown sugar believed to be verbascose were detected in oat bran.

Oat starch exhibited a higher peak height than the Waldron wheat starch but appeared to have less stability and a faster rate of retrogradation.

Oat Quality Laboratory (USDA SEA)

A Report on Protein Analysis

V. L. Youngs and K. D. Gilchrist

Between July 1, 1976 and June 30, 1977, 37,813 samples of oat groats were analyzed for protein concentration primarily by the dye-binding method. Also, 655 of these samples, generally selected at random, were analyzed by the Kjeldahl procedure. Coefficient of correlation between the two techniques was 0.960, and a mean protein value of 20% was obtained from both systems of analysis. Samples were received from 11 states. Between July 1, 1977 and Jan. 20, 1978, protein data on 13,373 samples were returned to oat workers. Approximately 6000 samples were in storage.

A near-infrared analyzer has been purchased, and currently it is being calibrated for protein and oil analysis. Our goal is to thoroughly check the instrument prior to the arrival of the 1978 oat samples, and to use the instrument for analysis of at least part of these samples.

Dark Groats - 1977 Oats Crop

Donald J. Schrickel
The Quaker Oats Company

One of Quaker's primary products is flaked oat groats for human consumption. Because of consumer preference our product standards for groat color permit only a small tolerance of dark flakes. "Weathered" oats are not acceptable for milling since groats are almost always dark or discolored. Early in the harvest of 1977, oats from eastern Nebraska and western Iowa were showing up with dark groats in our processing operation. This situation continued when oats from eastern South Dakota came to market. Numerous truckloads and carloads were rejected because of excessive numbers of dark groats. The usual characteristics of "weathered" oats were not evident in these samples.

Several facts became apparent as more samples were observed:

1. There was a gradation in color from light-colored groats through medium to dark.

2. The discoloration appeared in the outer bran layer of the groat only - it did not penetrate into the endosperm.

3. When the dark groats were flaked, the appearance of the flakes was better than the groats would indicate.

4. There was little or no correlation between hull color and groat color - in many cases dark groats were covered with bright hulls.

A 25 gr. sample of approximately 1,100 groats was selected for determining the "dark kernel count". It soon became apparent that certain shipping stations had numerous rejected samples while others had mostly milling quality samples. An early assumption was that the cause of dark groats was weather related -- probably due to heavy dews or rains as the oats approached maturity or during harvest.

However, varietal samples were obtained from cooperators in several states and it soon became apparent that certain varieties had a tendency to produce more dark groats than others.

TABLE 1

Milling Quality of Selected Varieties from Performance Trials in Eastern South Dakota and Eastern Nebraska - 1977

Variety	Samples Meeting Milling Quality Standards
Spear	All Samples
Lang	Most samples
Burnett	Few samples

This became more evident when samples were checked by the Oat Quality Lab, Madison, Wisconsin.

TABLE 2

Dark Kernel Count of Samples from Uniform Midseason Oat Performance Nurseries (9 locations) - 1977

	Variety	Average Dark Kernel Count in 25 grams
Milling Quality		
	Lang	45
	Clintland	69
	(A parent of Spear)	
Non-Milling Quality		
	Minn 71211	125
	(Portage x Burnett)	
	Orbit	140

Differences in the number of dark groats by location were substantial.

TABLE 3

Average Dark Kernel Count of Samples by Location
Uniform Midseason Oat Performance Nursery - 1977
(30 entries)

Location	Count
Dickinson, ND	9
Ames, IA	47
Winnipeg, Manitoba	65
Lafayette, IN	84
E. Lansing, MI	93
Urbana, IL	103
Brookings, SD	107
Madison, WI	131
Fargo, ND	147 (Badly lodged)

A statistically meaningful experiment will be conducted during 1978 to evaluate this characteristic more completely. We hope to identify the cause and if genetic inheritance is involved, to call on the plant breeder to consider this characteristic in future breeding programs.

WHO "SOWED OUR WILD OATS"

Irvin M. Atkins*

Wild oats, <u>Avena fatua</u> L., is an important weed grass in most of the oat growing areas of the United States. One can understand how it easily arrived in seed of cultivated oats and other grain as the East and North were settled. However, there are some unexplained things about its early distribution in Texas.

The writer has been working on the history of the small grain crops as they came into Texas. In reviewing literature, I suddenly became aware that where it was recorded that oats were planted at a location, it also was recorded that wild oats were observed as growing there. A few examples follow.

Exclusive of the High Plains, Texas was settled between 1830 and 1890, with rapid expansion of populations from 1870 to 1910. Walker (8) relates the experience of a pioneer woman, who came to the Robertson Colony on the Brazos in 1837, (Some 30 miles down river from Waco, Texas). Mrs. Collins wrote, " The men were interested in the tall,luxuriant grasses that covered the river bottoms, acre upon acre, especially the wild oats and wild rye".

Considerant, who led a French Socialist group to settle at the site of present-day Dallas in 1851, states that " I found a superior richness in the soil and wild oats and other grasses growing", Hammond (5). Bealy (2) in a report on Old Fort Belnap (near present-day Albany, Texas), stated that Jesse Stem, Comanche Indian Agent "broke the sod and planted oats and corn to demonstrate that the area was suited to farming". He also observed, "wild oats grow on the tributaries of the Brazos".

During the period 1835 to 1880, the Army moved frequently over the Rolling Plains in expelling the Indians and Forts were set up from the Red River to the Rio Grande. Undoubetly grain was carried as emergency rations for the horses and mules. Wild oats could have been scattered from this grain as it is a well known fact that grain can pass through the alimentary tract of an animal without loss of germination. Haley (4) states that in 1875 the Army bought 240,000 bushels of grain and distributed it by wagon train to the forts.

One can also theorize that wild oats could have been brought in 100 to 150 years earlier. Several Spanish explorations into Texas were made in the 1600's. The Missions of East Texas were established around 1716; and, a few years later, the ones at San Antonio, St Zavier (now the Gabriel river) and at San Saba. Some of these expeditions were tremendous operations. Cabot(3)

* Professor Emeritus, Texas A & M University and U.S. Dept. Agr.

describes the 1689 expedition of De Leon, which started at Saltillo, Mexico, as having 110 troops, 400 horses, 200 cows, 50 long flintlocks, 2000 pounds of gun powder and hundreds of pack animals with provisions, including 150 loads of flour. All Missions were planned to be self sufficient so they took along domestic animals and seeds of crops and vegetables.

After the Apache Indians sacked the San Saba Mission in 1757, Parilla was sent to punish the Indians, Allen (1). With a body of troops, he traveled north from San Antonio to the Red River. They fought a small battle near the Upper Brazos then were defeated by the Indians and French near the Tavayo village on the Red River (Old Spanish Fort north of present-day Bowie-Nacona, Texas). In all these travels one can speculate that the soldiers brought along, secretly or intentionaly, some oats for their favorite horse.

The French settled at Natchitoches, Louisiana on the Red River before 1700. McConnel (7) describes their explorations up the Red River in 1719. They traded with the Tovayo Indians, built a fort, moved a number of families up to present-day Old Spanish Fort and these families lived there until 1759. They grew corn and wheat and built a small mill. Wild oats could have been brought in with this wheat seed.

One must also admit that these observations could all be in error. A layman could well describe a number of the native grasses as being "wild oats". However, the question still is unanswered, Who " Sowed Our Wild Oats".

1. Allen, Henry E. 1940. The Parilla expedition to the Red River., Southwestern Historical Quarterly 43:53-71.

2. Bealy, Earl B. 1954. Fort Belnap on the Texas Frontier, 1851-57. West Texas Historical Yearbook 30:83-114.

3. Chabot, Fredrick C. 1937. With The Makers of San Antonio. Privately printed.

4. Haley, J. Everts. 1952. Fort Concho on the Texas Frontier. San Angelo Standard Times, San Angelo, Texas.

5. Hammond, Wm J. 1958. La Reunion, a French Settlement in Texas. Royal Publishing Co, Dallas, Texas.

6. Heusinger, Edward W. 1930. Early Explorations and Mission Establishments in Texas. The Naylor Co., San Antonio, Tex.

7. McConnel, Joseph C. 1933. The West Texas Frontier. Gazette Printing Co, Jacksboro, Tex.

8. Walker, Oliver Todd. 1944. Esther Amanda Sherrill Collins, a pioneer woman on the Texas frontier. Southwestern Historical Quarterly 47:234-238.

Greenbug Resistance in Oats

Norris E. Daniels

Four-hundred-twenty-six oat selections of the World Collection were tested in the greenhouse for their resistance to biotype C greenbug. Forty to fifty seeds were planted per row in large flats. The plants, when about an inch tall, were infested with greenbugs. After the plants were heavily damaged, ratings of 1 through 6 were made. A rating of 1 = no damage; a rating of 6 = a dead plant.

Of the selections tested, fifteen had ratings from 2.5 to 3.6, Table 1. To date, 4343 selections have been tested.

Table 1. Resistant oat selections, Bushland, Texas, 1977.

P. I. Number	Designation	Source	Rating
197724	Storm Oc-ulhaure II	Sweden	3.6
197837	Mesdag	Sweden	3.6
197838	Norun	Sweden	3.6
197840	Yliternio	Sweden	3.5
198227	Urugland 50-2779	Argentina	3.6
221289	Novi Sad 4116	Yugoslavia	3.5
221290	Novi Sad 4120	Yugoslavia	3.5
251580	Von Lochow	Yugoslavia	3.0
251581		Yugoslavia	3.4
251582		Yugoslavia	3.2
251896	No. 49K4649		2.5
251898	No. 52K8257 S		2.7
258612	Khasan		2.8
258637			3.0
258644			2.8

Studies of Resistance to the Cereal Leaf Beetle

Robert Steidt, Carrie Young, J. A. Webster, and D. H. Smith

Progeny lines of a seven-parent diallele have been tested in the field and greenhouse for cereal leaf beetle resistance. Parents in the diallele were: CI 521, CI 1625, CI 4867, CI 4893, PI 311677, 'Froker' and 'Korwood'. Froker and Korwood are susceptible to the insect and the other parents had been rated as moderately resistant in several years of field screening. PI 31677 is a collection of _Avena sterilis_.

Using larval weight as an index of antibiosis in these parental lines, and their F_2 progeny against freshly hatched first instar larvae, has shown that PI 311677 and progenies of crosses with this line have this type of resistance. Analysis of the diallele shows that this resistance is recessive in nature.

Field studies of the F_3 generation and the parents of the diallele were made using a cage to contain the insects on the plant rows. The cage consisted of a 100' x 12' tobacco plant bed cover attached to 2" x 6" plants which formed the base of the cage. The cover was supported by a network of wire supported on wood stakes. When the plants were in the five-leaf stage, 4000 adult cereal leaf beetles were introduced into the cage and allowed to feed for 12 days. Larval feeding damage ranged from 10 - 80%.

Leaf samples were taken, cleared and examined for pubescence. Trichomes were present on crosses having _A. sterilis_ in their parentage, but in very low numbers.

MORE ON SMUT IN WISCONSIN

D. C. Arny, C. R. Grau

In its 1977 survey of oat diseases, the Wisconsin Department of Agriculture found smut in 35 of the 79 fields observed, with an average of 1.9% infection. In these randomly picked fields the highest infection was 23%.

In looking for the worst infections, we found two fields with about 70% and a number with 30 to 40%. For this amazing amount of smut to develop there must have been a rare combination of favorable conditions when the seed was harvested and again at planting time. We did have a dry and unusually warm spring. Some of the 30-40% fields were planted with certified Froker from a neighboring state (high infection had been noted in the inspection of the certified seed field).

We are confident that Wisconsin Certified seed can be kept free of smut, even in varieties susceptible to the present smut strains, with careful field inspection and by the treatment of breeders and foundation seed as needed. Seed from a field that had more than 1% smut now must be treated before it can be sold as Wisconsin Certified seed. Only one 1977 field came under this rule.

In our tests, reactions of named varieties remain much as listed in the 1976 ONL. Not listed there are Lyon which is resistant to both old and new strains, and Terra which is susceptible to both.

From tests of several collections on the smut differentials and a few current varieties, it appears that we have at least five different "strains" of smut in Wisconsin as seen in the table.

Some varieties resistant to our "old" collection were generally susceptible to the new ones, i.e. Gothland, Dal, Lodi and Wright. The Lodi collection was highly virulent on Victoria. When the Lodi collection was increased on Victoria, it apparently lost its virulence on Monarch, but Dal, Lodi and Wright were more susceptible. The Wright collection was highly virulent on Wright and somewhat on Dal, but not on Victoria. Victoria was also resistant to the two county collections. The Grant Co. collection gave a somewhat higher infection on Navarro and Clintland 64, and the Green Lake collection gave the highest infection on Clintland 64. Thus it appears that considerable variation is present in the smut population, and an old problem is still with us.

1977 Smut Test - Madison

Variety	Percent smut with given inoculum source:[a]					
	Old[b]	Lodi[c]	Lodi on Victoria[d]	Wright on Wright[e]	Grant Co.[f]	Green Lake Co.[f]
Anthony	68	80	88	85	70	87
Black Diamond	27	60	40	62	41	56
Black Mesdag	28	30	50	37	40	34
Camas	0	2	0	0	0	0
Clintland 64	1	0	8	11	21	37
Fulghum	Tr	1	0	10	1	5
Gothland	0	47	74	10	55	43
Markton	0	0	0	0	0	0
Monarch	23	34	0	0	1	9
Navarro	0	5	9	9	18	8
Nicol	0	0	3	11	7	12
Victoria	0	68	93	0	0	1
Victory	64	74	73	49	70	54
Dal	0	5	22	33	2	7
Lodi	0	25	78	74	17	34
Wright	0	12	52	69	16	14

a) Vacuum inoculation. Average of two replications.
b) Maintained on States Pride for a number of years.
c) Smut from Lodi and maintained on Lodi.
d) Lodi smut collected from Victoria in 1976.
e) Smut from Wright in 1975 and maintained on Wright in 1976.
f) Variety unknown.

Tests for Increased Aggressiveness in Isolates from the 1977 Epidemic of Oat Stem Rust

J. B. Rowell and A. P. Roelfs

Race 31 of *Puccinia graminis* f. sp. *avenae* has been prevalent in the United States since 1965. The commercial cultivars in use since then have had no effective resistance against this race. Nevertheless, race 31 had not been epidemic in the U.S. until 1977 except for a minor outbreak in a few late-planted fields in northern Minnesota and North Dakota in 1970. The question existed whether the forms of race 31 present in the 1977 epidemic differed in virulence or aggressiveness from previous forms of this race. Tests on the differential oat lines with single genes and eight other resistant oat lines indicated no unusual virulence in the 1977 isolates of race 31. We have attempted to detect major differences in the aggressiveness of some 1977 isolates from that of an older stock isolate of race 31 used routinely since 1968 at the Cereal Rust Laboratory by tests of infectivity under a variety of temperatures and of the rapidity of appressorial formation.

The cultures tested were 77-21-605, 77-32-975, and 77-39-976 from collections made in severely rusted fields in Big Stone County, Minnesota; Cass County, North Dakota; and Brown County, South Dakota, respectively. Freshly collected spores from rusted plants in the greenhouse were used in all trials made from October through November. During this period, the cultures were propagated through six increase generations. All rust increases and experimental tests were made on Marvellous oat seedlings inoculated 7 days after planting. Uredia on test plants were counted at 12 to 14 days after inoculation. Test plants were inoculated in a spray chamber with 0.2 ml/pot of a suspension of 1 mg uredospores/1.5 ml of light mineral oil. Six replicate pots, each containing six seedlings, were used per isolate in each test environment. Infection success in two dew chambers set for different temperature regimes was determined simultaneously. One chamber served as a control and was set for a 12 hr dew period in darkness at 18°C, followed by a 4 hr dew period in light about 1,000 ft-c during which the temperature gradually increased to 26°C. In our experience this regime has been the optimal environment for initiating infection with uredospores of *P. graminis*. The second dew chamber was used to test various other regimes of temperature during the dark and light periods. On removal from the dew chambers, all plants were incubated in an environmental chamber with a 12 hr dark period at 18°C and 12 hr light period with fluorescent light at about 1,200 ft-c and temperature at 21°C. In two preliminary trials of the stock culture of race 31 with the test chamber set for the same environmental regime as the control chamber, the number of infections on the plants from the test chamber was 86 and 129% of that for the control chamber. These differences were within the range of variability generally encountered with our method of inoculation.

We tested several temperature regimes below the optimum for *P. graminis* for evidence of more aggressiveness in the infection process under stressful conditions. All cultures gave similar infection in the control chamber where the average number of infections at the inoculum concentration of 1 mg/1.5 ml for nine trials was 18.1, 18.0, 16.7, and 16.1 uredia/leaf for the respective cultures of the stock isolate, 77-21-605, 77-32-975, and 77-39-976. Therefore, the data in Table 1 give infection for several test regimes as the percent of the number of infections for each isolate in the control chamber. These tests failed to detect any major differences in aggressiveness among the cultures because none was consistently more infective than the others in the test regimes. Although 10°C is considered to be the minimal cardinal temperature for infection by P. graminis, note that appreciable amounts of infection were obtained with all cultures at dark cycle temperatures of 6 to 7°C. Attempts to test lower temperatures were prevented by heavy ice formation on the cooling coils in the test chamber.

Table 1. Comparison of infection success of 1977 isolates and a 1968 stock culture of race 31, P. graminis f. sp. avenae, with different temperatures during the dew period. (Data expressed as percent of the infection obtained with each isolate in a control chamber set for 18°C in the dark and 26°C in light.)

Isolate		Temperature regime (12 hr day)		
	Dark	10°C	6°C	7°C
	Light	18°C	21°C	9°C
		(Percent of controls)		
Stock		73	61	61
77-21-605		90	50	48
77-32-975		72	81	42
77-39-976		89	66	59

In other tests the isolates were compared for the rapidity of appressorial formation as an indicator of differences in vigor of the infection process. Plants were inoculated as before but with 0.2 ml of a suspension containing 10 mg of uredospores/ml of oil. After the dew period, spore germination and appressorial formation were determined by the method of Anderson and Rowell (Phytopathology 52: 909-913, 1962). Here a second set of plants was placed in the dark dew chamber at 18°C 2 hrs after the dew period was started for a first set and infection process was halted for both sets by rapidly drying all plants at the same time. Previous experience with P. graminis had shown that the percentage of appressorial formation was constant after 8 hrs of dew in the dark at 18°C. The data in Table 2 give the percentage of spores producing germ tubes and appressoria for dew periods of 4, 6, and 8 hrs. Again no isolate differed consistently in frequency of either germination or appressorial formation.

Table 2. Frequency of germination and appressorial formation by 1977 isolates and a 1968 stock culture of race 31, P. graminis f. sp. avenae, after dew periods of various durations at 17°C in the dark.

Isolate	Trial I		Trial II		Trial III	
Duration (hr):	8	6	6	4	6	4
	Percent of spore germination					
Stock	99	97	90	95	91	91
77-21-605	97	96	95	94	92	90
77-32-975	97	98	96	90	92	87
77-39-976	97	97	-	-	90	87
	Percent of spores with appressoria					
Stock	64	43	21	10	22	11
77-21-605	58	48	38	13	21	11
77-32-975	63	43	38	12	21	12
77-39-976	59	47	-	-	26	9

The absence of any evidence in our tests for any major change in either virulence or aggressiveness in the 1977 isolates of race 31 suggests that circumstances other than a change in the pathogen caused the stem rust epidemic on the 1977 oat crop.

Available Oat Germplasm with Stem Rust Resistance

P. G. Rothman

Two new stem rust isolates were identified at the Winnipeg Rust Laboratory in 1977 with virulence on CI 9139. This had been an effective resistant line to all stem rust races previously identified and has been used in some breeding programs. Remnant seed, of single plant selections that were included in the composite line CI 9139, were screened with these two new rust isolates. Fully resistant plants were found among some selections which suggests that several modifying genes are probably involved along with the seedling gene pg 12 in line CI 9139.

Other oat lines with resistance to these two new rust isolates as well as race 31, 87, and 94 available for distribution include:

Minn. Selection No.	Pedigree
5403-2	A. sterilis/Kyto//Kyto
6591	CI 8091/Kyto
6604	CI 9139//CI 3034/Kyto
776727	CI 9139//Gopher/RL 2629/3/FLG/FLA 500
777102	Dal/CI 9139
779532	Wisc X1588-2
779773	CI 9139

Cereal Rusts of Oats in 1977

A. P. Roelfs, D. L. Long, and D. H. Casper

Oat crown rust -- Crown rust was light in the southern states and much less in 1977 than in recent years. The low level of crown rust was due to the freezes in January that killed much of the crop's top growth, which reduced the amount of rusted tissue, and the use of the resistant cultivars TAM-O-301, TAM-O-312, and Coker 234.

In southern Wisconsin heavy aecial infection appeared on buckthorn during the second week of May. This disease development was 2 weeks earlier than normal, but due to the advanced stage of crop maturity there were only trace losses. Crown rust was light throughout the central U.S. oat-growing area. It only occurred in trace amounts on highly susceptible cultivars and late fields of oats.

Oat stem rust -- Oat stem rust was first observed during 1977 in mid-February at Beeville, Texas. Oat stem rust overwintered as far north as southern Oklahoma but in only trace amounts. A very cold winter and removal of infected tissue by grazing reduced the host tissue and thus the amount of stem rust overwintering. However, the lack of crown rust due in part to the use of highly resistant cultivars certainly provided sufficient host material for stem rust to increase readily without competition in the spring, when conditions became more favorable. Stem rust spread into the Texas panhandle in 1977 for the first time in recent years. By the end of the first week in July, oat stem rust was widespread in the north-central states but the crop was in the dough stage because of a very early season. Thus, there appeared to be no chance of a stem rust problem. During the second week in July, a routine cereal rust disease survey was made of Minnesota and the eastern Dakotas, and in western Minnesota a field of oats was observed with 30% stem rust severity. This was determined to be the eastern edge of an area of severely rusted oats that stretched 50 miles either side of a line from Brookings to Milbank, South Dakota. Approximately 10% of the oats in this area were still in the milk stage. Thus, losses varied from a trace to 5% in the early fields to up to 30% in late fields. Over the period of the next 2 weeks, the disease exploded (Table 1). Late fields were severely rusted at maturity in a fan-shaped area. This area extended from Brookings, South Dakota to the point where the borders of Saskatchewan, Manitoba, and North Dakota meet to Duluth, Minnesota. The most severely rusted area was 50 miles either side of the North and South Dakota border with Minnesota. Reports of test weights for these late fields range from 18-24 lb/bu.

Table 1. Oat stem rust severity and prevalence during the 1977 epidemic.

Week of	South Dakota Northeast Severity	Prevalence	North Dakota Southeast Severity	Prevalence	North Dakota East-central Severity	Prevalence	North Dakota Northeast Severity	Prevalence
6/27	Tr	Tr	-	-	-	-	-	-
7/04	10	100	-	-	-	-	-	-
7/11	25	100	5	100	Tr	Tr	Tr	Tr
7/18	60	100	35	100	20	100	Tr	10
7/25	harvested		harvested		60	100	30	100

In Canada severities of 60-80% were common in many fields, involving an area of 2 million acres. Of this acreage, approximately one-third escaped with little damage due to early planting. The rest of the crop suffered losses of 5-60%, averaging 30%. We believe this oat stem rust epidemic was related to the following:

1. Very little competition by crown rust.
2. Initial stem rust infection a few days earlier than normal.
3. Early warm temperatures (Table 2).
4. Frequent light rains in June. For example, Brookings had 10 days with rain in June.
5. Heavy rains in mid-June in the original "hot spot" of the epidemic; i.e., Brookings received 5.71" of rain June 15-16, and 1-2" of rain fell per week in late June and early July in eastern North Dakota.

Table 2. Temperature departure (°F) from 30 year mean in the area effected by the oat stem rust epidemic of 1977.

Area	° Fahrenheit		
	May	June	July
Northeast South Dakota	+8	+ 9	+2
Southeast North Dakota	+7	+11	+2
East-central North Dakota	+6	+12	+2
Northeast North Dakota	+6	+12	2

This epidemic increased at a rate near or at the maximum measured for this disease. Similar conditions can be expected to reoccur. Furthermore, the situation would have been much more severe in both the U.S. and Canada had most of the spring planting been done at a normal time.

Oat stem rust races in the U.S. have been relatively stable for 12 years (Table 3). Most of the commercial cultivars have been susceptible throughout this period to the predominant race 31 (Table 4). However, Table 3 shows that there was a significant increase in race 31 in 1977 compared to the past 5 years. This is not surprising after noting the data in Table 4 that show many of the current cultivars in the north-central area are susceptible to race 31 but not race 61. Races 31 and 61 were the major races present throughout the country in 1977 (Table 5). Only in California, Florida, Pennsylvania, South Dakota, Texas, and Wisconsin were other races found.

Table 3. Comparison of physiologic races of oat stem rust identified during the period 1965-1977.

Year	Percentage of races		Year	Percentage of races	
	31	61		31	61
1965	40	0	1972	47	27
1966	58	0	1973	64	25
1967	72	0	1974	76	9
1968	74	4	1975	67	28
1969	72	2	1976	66	28
1970	63	2	1977	95	3
1971	63	3			

Table 4. Resistance of oat cultivars grown in the north-central U.S.A. to stem rust.

Cultivar	Race 31	Race 61
Froker	MS	R
Hudson	MS	R
Lyon	S	R
Stout	S	R
Lodi	S	R
Chief	S	R
Spear	S	S
Noble	S	R
Burnett	S	R

Table 5. Physiologic races of oat stem rust identified from collections made from oats in 1977.

State	Source	Number of Collections	Number of Isolates	Number of isolates of each race: 1	2	8	18	31	61	77	87	94
Alabama	Nursery	3	9					9				
California	Nursery	1	3			3						
Florida	Nursery	2	6		3			3				
Illinois	Nursery	1	3					3				
Iowa	Field	17	48					47	1			
	Nursery	7	14					14				
Kansas	Field	15	36					36				
	Nursery	2	6					6				
Louisiana	Nursery	4	12					9	3			
Michigan	Field	2	6					6				
	Nursery	1	3					3				
Minnesota	Field	142	422					422				
	Nursery	74	217					209	8			
	Wild oats	12	28					27	1			
Missouri	Nursery	1	3					3				
Montana	Field	2	4					4				
	Nursery	1	3					3				
	Wild oats	2	0									
Nebraska	Field	18	49					48	1			
	Nursery	11	33					32	1			
	Wild oats	1	3					3				
N. Dakota	Field	89	247					247				
	Nursery	35	103					103				
	Wild oats	38	89					80	9			
Oklahoma	Field	1	3					1	2			
	Nursery	1	3					3				
	Wild oats	1	3					2	1			
Pennsylvania	Field	1	1									1

Table 5, cont.

		Coll.	Iso.	1	2	8	18	31	61	77	87	94
S. Carolina	Nursery	3	9		7			2				
S. Dakota	Field	22	62					62				
	Nursery	14	41					36	5			
	Wild oats	8	17					17				
Texas	Field	8	23		4			11	8			
	Nursery	126	367		13			325	23	5	1	
	Wild oats	1	3					3				
Wisconsin	Field	82	230					229			1	
	Nursery	7	21					21				
U.S.A.	Field	399	1131		4			1113	12		1	1
	Nursery	294	856		23	3		784	40	5	1	
	Wild oats	63	143					129	14			
	TOTAL	756	2130		27	3		2026	66	5	2	1
	%				1	*		95	3	*	*	*
Canada	Nursery	19	55					55				
Mexico	Field, %	1	3					100				
	Nursery, %	7	21		5		5	81	10			
	Wild oats, %	3	7	57				43				

* Less than 0.6%.

We wish to thank Drs. Dale Reeves, John Martens, Milton McDaniel, Paul Rothman, and Mr. Virgil Jons who provided some of the data for this report.

The Animal and Plant Health Inspection Service, USDA, has terminated support of the programs on stem rust race identification, field surveys of rust incidence, and the distribution of the Cereal Rust Bulletin at the Cereal Rust Laboratory. These activities at the Laboratory will be continued with ARS support under the supervision of Dr. Alan P. Roelfs. Former APHIS employees David L. Long, Plant Pathologist, and David H. Casper, Agricultural Research Technician, are now ARS employees at the Laboratory.

Fifty Years of National and International Oat Rust Nursery Testing--The Past and A Proposal for the Future

R. A. Kilpatrick

The oat rust nursery program, coordinated by the USDA in Beltsville has been operating since 1923. Although not as old as the Uniform Spring Wheat Rust Nursery (USWRN) it has benefited from the experiences of standardized procedures of nursery testing developed for the USWRN. Little is known of the 1923 nursery although we find references to the 1923 results and that crown and stem rust were potential hazards to oat production.

The objectives of the UORN of 1925 were patterned after the Uniform Spring Wheat Nursery of 1919. These were to determine: 1) the varietal reaction in different areas; 2) number and identification of biologic forms; 3) compare greenhouse with field reaction and 4) adaptability of cultivars. During the past 20 years, emphasis in objectives has shifted to determining new genes or combination of genes conditioning resistance to rusts and other diseases throughout the world; and 2) to test new cultivars and promising selections for reaction to rust fungi.

The Uniform Oat Rust Nursery (UORN) of 1925 contained 16 entries and was planted at 45 locations in the U.S. and Canada. During each of the next 53 years, the nurseries contained from 29 to 90 entries and were planted at 14 to 59 locations. Stem and crown rust data were obtained in all but eight of the 53 years.

The early nurseries contained two classes of entries. These were the perpetual and the alterable classes. The perpetual class contained the entries used for comparing severities of stem and crown rust epidemics, not only for seasonal variation, but also for varietal grouping. That class is now known as the differential entries used for studying genes within the host and pathogen. The alterable class was the cultivars or selections submitted by breeders and pathologists for obtaining disease reaction and to some extent adaptability. The cultivar 'Markton' has served as the susceptible control in each of the nurseries.

In 1954, the uniform oat rust nursery was incorporated into the International Oat Rust Nursery Program (IORN). The IORN was grown world-wide. Therefore, entries were tested to natural and artificial rust populations in many countries. The greatest contribution of the International oat rust nursery program has been the diversity of rust resistant germplasm within the nursery, and the development of international cooperation between scientists for developing rust resistant oat varieties. Table 1 lists information relative to the rust nurseries.

Entries for nurseries have been submitted from many countries. Through 1976, entries have been submitted from 22 countries and 16 states. The primary source of entries has been the Small Grains Collection at Beltsville.

The make-up of the uniform and international rust nurseries has varied. The uniform contains advanced lines with known rust resistance. The international nurseries contained entries for general testing in addition to the uniform nursery. All entries in the two nurseries from 1925-1966 had been assigned C.I. numbers.

Since 1966, the number of entries with C.I. numbers has fluctuated from 49 to 84%. The following is the policy regarding the use of entries in the nurseries. Entries used in breeding programs should be properly credited. Permission should be obtained from the breeder or institution that submitted the entry before it is used for commercial purposes. We will supply names and addresses of those who submit entries.

The sources of entries in the International Oat Rust Nursery (IORN) has been of concern. Since 1970, the entries have come primarily from breeders and pathologists in the U.S. In 1970, 77% of the entries were from the U.S., and from 1973 to 1978, the percentages varied from 86 to 88%.

The IORN has contained few entries from international sources in recent years. From 1970 to 1978, the number of sources of new entries decreased from 13 to only one. The UORN and the IORN have been planted at about the same number of locations each year for the past 10 years. The severity of rust has fluctuated from year to year. Between 1970 and 1976 the number of locations reporting usable data for reports varied from 15 to 37.

The nurseries have made several outstanding contributions. Breeders have observed and compared the disease reaction of their lines with those developed by other breeders. Rust resistant germplasm has been incorporated into many programs. An 'Elite bank of rust resistant oat germplasm' has been developed. Outstanding rust resistant germplasm has been furnished from the 'elite' bank to individuals not receiving the nurseries. Germplasm with new genes for rust resistance has been tested and identified. Entries have been compared for desirable agronomic characters. Entries in nurseries outstanding in other countries have been relased jointly with the original breeder.

During the past few years it has become apparent that we were not fulfilling our objectives. The lack of new entries, time and effort required of the IORN program led to meetings with L. W. Briggle, J. G. Moseman and myself about the overall oat rust nursery program. The implications of eliminating the IORN and modifying the UORN received much thought. The proposal for eliminating the IORN was discussed with both M. D. Simons and P. G. Rothman. Alternatives were suggested. We are suggesting the elimination of the IORN and modification of the UORN. The UORN will be strictly a pathologist's nursery for determining virulence of genes within the rust populations and effectiveness of genes. Location of plots would be at the suggestion of specialists.

Entries for the UORN would be on the advice of either P. G. Rothman, M. D. Simons, or the coordinator of the UORN in Beltsville. We, in Beltsville, would continue to operate the programs by increasing, assembling and distributing seed, compiling and distributing data and reports and other information relating to the program. Breeders and pathologists desiring information on reaction of selections and effectiveness of genes would contace either Drs, Simons or Rothman for information and sending seed for screening. We feel the amount of time gained by all involved in the IORN program would justify elimination of the IORN and modification and continuation of the UORN program.

The rust nursery program is a cooperative program. Without your help, we cannot effectively help you in your program.

Table 1. Information Pertinent to the Oat Rust Nursery Program

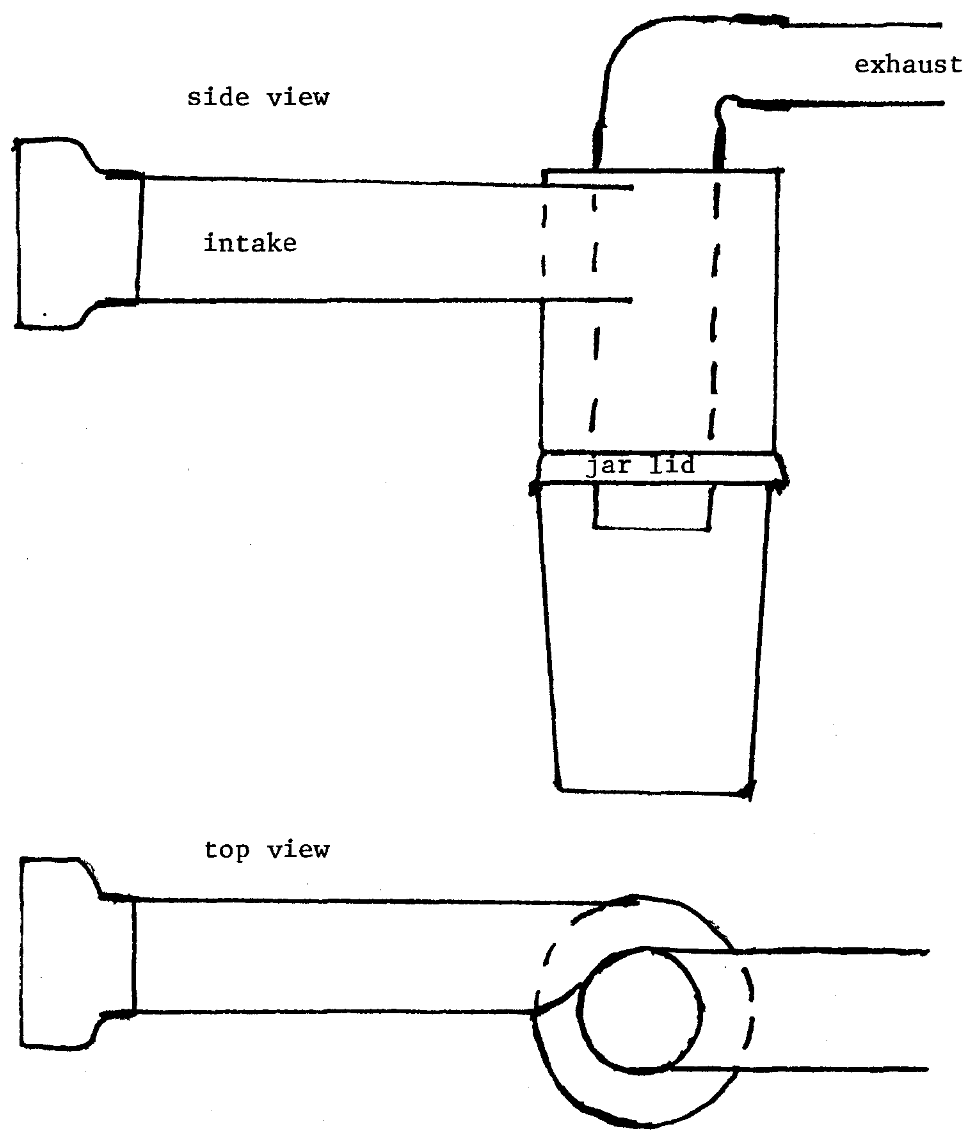
	Year								
	70	71	72	73	74	75	76	77	78
Number of nurseries									
UORN	48	32	24	24	24	32	32	32	32
IORN	40	48	48	48	48	48	48	48	48
Number of entries									
UORN	38	65	40	68	56	55	50	50	50
IORN	129	101	90	108	110	108	123	127	48
Number of data sheets returned									
URON	9	13	17	17	19	16	7	25	
IORN	34	38	30	30	31	30	24		
Countries	16	18	15	13	14	17	14		
U.S. - States	6	8	10	8	11	6	7	18	
% of entries in IORN from U.S.	77	82	87	88	88	88	88	86	87
Number of new entries (IORN)	72	22	28	32	32	12	34	6	2
Locations submitting new entries	13	10	8	10	3	4	5	3	1

	Year										
	60	66	70	71	72	73	74	75	76	77	78
% of entries with C.I. number	100	100	49	57	83	69	77	64	72	55	48

An Inexpensive Spore Collector

by Leonard Michel

A do-it-yourself vacumn spore collector was built using copper pipe and a half-pint jam jar. The apparatus was built to fit the vacumn that was available. We had the plumbing shop cut the pieces listed below. Rosen core solder and a propane torch were used to assemble the pieces. We also had the plumbing shop drill the hole off-center in the 2½" pipe that serves as the body of the collector. Parts used (one each) were: 1¼" X 7" copper pipe; 1¼" X 6" copper pipe; 1¼" X 3" copper pipe; 1¼" elbow; 2" X1¼" reducer; 2½" X 3" copper pipe; 3" X 3" copper sheet; half-pint jam jar & lid. The purpose of the off center hole for the intake pipe is to swirl the spores to the outside of the jar where they settle to the bottom. I'll be glad to give further instuctions if desired. Special thanks to Dave Lewis, Bot. & Pl. Path., ISU, who assembled the collector and to Dr. Michael T. Turner, Funk Seeds International, Bloomington, IL who provided the idea of using copper pipe instead of brass.



IV. CONTRIBUTIONS FROM OTHER COUNTRIES

Behavior of Oats, Barley, Wheat and Triticale Under Conditions of Low pH and Mild BYDV Infection.

A Comeau and J. P. Dubuc
Quebec, Canada

In a test seeded on the Laval University Campus, the lime application was insufficient, resulting in a soil pH ranging from 4.8 to 5.5. Then a BYDV epidemic of minor importance came in. As this test contained oats, barley, wheat and triticale, it was decided to harvest the test anyhow. It is of interest that oat line O.A.236 displays field tolerance to low pH, as evidenced by a better establishment of stands in the most acid spots. The O.A.236 line was already known as tolerant to BYDV. Alma appears to be somewhat tolerant to pH but not very tolerant to BYDV. Q.O.158.16 is known as very tolerant to BUDV but appears here as susceptible to low pH.

In the other cereals, the good performance of A-14 tricicale is noteworthy. Next down the scale comes Rosner triticale and Opal wheat. Finally, the most damaged were barley and other wheats (Table 1), confirming the poor tolerance of barley and wheat in acid environment.

Effect on cereals of a combination of stresses: low pH and BYDV.

	Straw yield		Grain yield	
	Rank	kg/hl	Rank w/in species	kg/hl
Oats				
O.A.236	1	5644	1	1871*
Alma	2	5110	2	1542*
Q.O.158.16	3	4165	3	1279*
Garry	5	3658	4	961*
Wheats				
Opal	7	1904	1	624
Glenlea	10	1046	3	313
AW 2-4	14	806	4	209
Cal. 15	8	1607	2	507
Barleys				
Laurier	11	1013	2	341*
Loyola	12	924	3	310*
OE-29	13	872	4	251*
Sutter	9	1207	1	354*
Triticales				
Rosner	6	2760	2	568
A-14 de Bronco-X	4	4136	1	1131
Maan		2489		
C.V.		24.5%		
F-value (13,221 df)		72.7		

*Oats and barley suffered considerable bird damage.

OAT YIELD-MATURITY RELATIONSHIPS IN NORTHERN ALBERTA

D.G. Faris
Alberta, Canada

Because of the short, cool growing season in northern Alberta early maturity is an essential characteristic of oat cultivars developed for the area. Unfortunately, early maturing cultivars tend to be at a yield disadvantage (Kaufmann 1961). This means that early maturing lines have a high chance of being discarded if selection is made on yield alone. One way to insure the retention of the best yielding early maturing lines is to yield test lines selected for early maturity. When using a plot combine this procedure has the advantage of making it possible to harvest a complete test at once as most of the lines will mature at about the same time. However, this system does not permit direct comparisons of lines if they have different maturities. The comparison of lines with different maturities is important as later maturing varieties can be safely grown in the more favoured areas of northern Alberta.

At the Beaverlodge Research Station the yield "efficiency" of lines with different maturities has been compared using a yield: maturity index (Table 1) (Guitard et al. 1960). This index is calculated by dividing the yield per area by the number of days from seeding to maturity. To facilitate the selection of superior lines from a large group the mean yield:maturity index for the group can be subtracted from each entry. This gives the deviation from the mean. The task of choosing the best lines can be further simplified by listing the lines in order by days to mature (Table 1).

Similar results to deviations of the yield:maturity indices from the mean can be obtained by calculating the deviation of yield from the regression of yield on days to mature (Table 1). The regression can be calculated using all entries or by using only the standard check cultivars in the test. The ultimate method of choosing superior lines is by locating entries on a graph with axes "days to ripe" and "yield" and drawing the regression lines (Fig. 1). When all entries in a test are used for calculating the regression line the line may have little or negative slope. This can happen if there are many low-yielding, late maturing or high-yielding, early maturing entries in the test. This low slope puts early maturing lines at a disadvantage when compared with standard check cultivars. This situation can be avoided by using only well adapted check cultivars with a range of maturities for calculating a "check" regression line. In this report the "check" regression line was determined using the cultivars Cavell, Random and Grizzly. OT 725 (Table 1, Fig. 1) provides a good illustration of the effect on an early maturing line of calculating the regression by each of the two methods.

Table 1. The maturity, yield, yield:maturity index and yield deviation from the yield-maturity regression lines for all entries and for checks Cavell, Random and Grizzly in the 1977 Alberta Oat Regional Test grown at seven locations.

	DTM	Yield q/ha	Yld:Mat Index kg/ha/day	Yld:Mat Index Dev	Yld dev from reg Total	Yld dev from reg Check
CULTIVARS						
Cavell	109.8	40.8	37.2	-.4	-.6	-.1
Sioux	110.0	39.8	36.2	-1.4	-1.7	-1.2
Random	112.0	42.2	37.7	.1	.1	.2
Gemini	113.6	41.9	36.9	-.7	-.8	-1.0
Harmon	114.0	39.8	34.9	-2.7	-3.0	-3.3
Rodney	114.6	39.2	34.2	-3.4	-3.8	-4.2
Hudson	115.2	43.8	38.0	.4	.6	.1
Fraser	115.4	41.7	36.1	-1.5	-1.5	-2.1
Victory	116.0	41.4	35.7	-1.9	-2.0	-2.7
Grizzly	117.4	44.8	38.2	.6	.9	-.0
Mean	113.8	41.5	36.5	-1.1	-1.2	-1.4
LINES						
OT 725	105.2	40.4	38.4	.8	.5	1.9
366-94	108.8	40.6	37.3	-.3	-.5	.2
366-72	109.2	43.9	40.2	2.6	2.7	3.3
366-22	111.0	41.5	37.4	-.2	-.3	-.0
Heikki	111.4	43.8	39.3	1.7	1.9	2.1
NRG 0773	112.4	44.1	39.4	1.8	1.8	1.9
Reima	112.4	43.9	39.1	1.5	1.6	1.7
OT 728	112.4	38.4	34.2	-3.4	-3.9	-3.9
366-96	113.0	42.8	37.9	.3	.3	.2
OT 727	113.2	42.4	37.5	-.1	-.1	-.3
366-203	114.0	39.9	35.0	-2.6	-2.9	-3.2
OT 726	114.4	47.4	41.4	3.8	4.5	4.1
OT 729	115.4	45.7	39.6	2.0	2.5	1.9
NRG 0774	116.0	47.1	40.6	3.0	3.7	3.0
Mean	112.1	43.0	38.4	.79	.84	.9

The 1977 Alberta Regional Oat Test was grown at 7 locations in central and northern Alberta. The results from this test indicate that there are presently many advanced lines which are superior to existing cultivars in combining yield with early maturity. On the average the lines in the test were earlier maturing and higher yielding than the licensed cultivars (Table 1). This resulted in an average increase of 2 kg/ha/day in the "efficiency" of the lines compared with the cultivars.

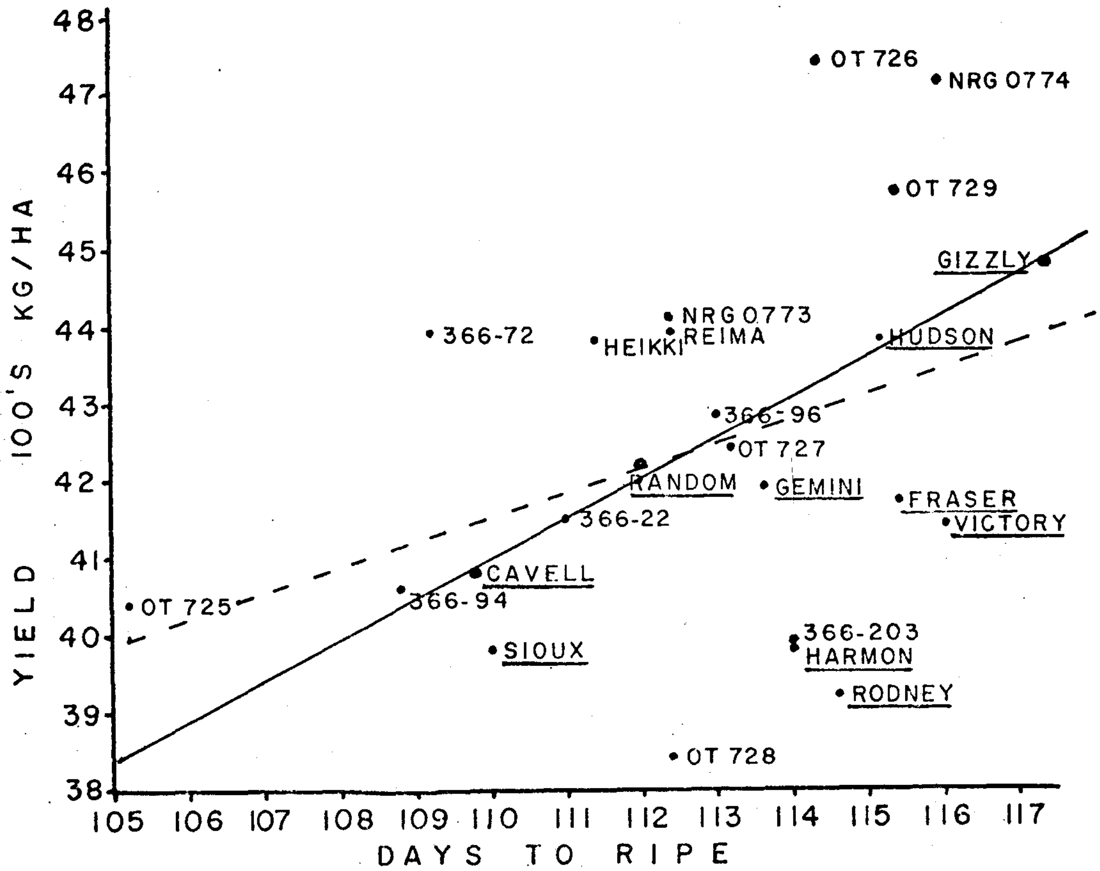


Fig. 1. Yield-maturity relationship of entries in the 1977 Alberta Regional Oat Test. Licensed cultivars have been underlined. The solid line is the regression determined using the check cultivars Cavell, Random and Grizzly. The broken line is the regression using all entries.

Examination of the graph (Fig.1) shows that none of the licensed cultivars is substantially better than the "check" regression line and over half are well below the line. On the other hand, over half the "lines" are well above the "check" regression line. The very early maturing line of OT 725 yielded about 5%, the medium line 366-72 about 7.5% and the late line OT 726 about 9% above the "check" regression line. Both OT 725 and OT 726 are to be proposed for licensing this year.

GUITARD, A.A., KAUFMANN, M.L., and MCFADDEN, A.D. 1960. A note on the value of the yield:maturity ratio as an index of yield efficiency of cereal varieties. Cereal News 5:3-6.

KAUFMANN, M.L. 1961. Yield-maturity relationships in oats. Can. J. Plant Sci. 41:763-771.

Evaluation of a Seedling Screening Test for Predicting Relative Groat Protein Content in Oats

Leslie P. Shugar and E. Reinbergs

A seedling senescence test has been described by Holmes and Burrows (Euphytica 25:51-64, 1976) to predict per cent grain protein in oats. In this test, the apical 4-cm sections of primary oat leaves are excised, treated with a 0.1 ppm kinetin solution, placed in the dark for 96 hours and visually assessed for the amount of greeness left in the tissue.

The relationship of this test to relative per cent groat protein was investigated in

- three licensed oat cultivars grown at six locations in Ontario in 1975 and 1976.
- 20 advanced strains selected for high and low protein and grown together with 5 check cultivars at two locations in 1975 and one location in 1976.

The differences in protein values among the cultivars and locations were significant in the first part of the study. There was a profound location effect on the protein percentage but the senescence test was affected very little by the environment. The test detected the protein differences among the three cultivars in 1975 but the senescence values did not mimic the fluctuations in protein percentages from location to location in both years.

For the 25 selections, the protein values in 1975 ranged from 12.1 - 22.0% and from 13.9 - 20.4% in 1976. The mean per cent protein between locations was significantly different ($P<0.01$) whereas the mean senescence value was not, in 1975. Among cultivars, there was a significant correlation between locations ($r=+.80$) and years ($r=+.85$) for per cent protein and a significant correlation between locations in 1975 ($r=+.71$) and years ($r=+.77$) for the senescence test. There was a significant correlation between per cent protein and the senescence values ($r=+.58$) for both years combined. However, four of the highest protein lines had the lowest senescence values and would have been missed in a selection process based on the senescence test.

Studies have been initiated to investigate the value of the seedling senescence test in segregating oat populations.

INHERITANCE OF KERNEL WEIGHT IN OATS

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Kent, an oat cultivar with an average kernel weight of 45.3 mg, was backcrossed twice to Kelsey (average kernel weight = 32.1 mg) and the progeny were inbred for four generations by single seed descent. From this material, 37 inbred-backcross lines and the two parents were tested for kernel weight in a series of five experiments. The experiments included a single plant experiment in the growth chamber (5 replicates), hill plot experiments in 1975 (5 replicates) and in 1976 (2 experiments of 5 replicates each) and in rod row plots in 1976 (3 replicates). Since an unweighted analysis of variance (Table 1) indicated a significant genotype x experiment interaction, the interaction mean square was used to calculate the standard error of a genotype mean (0.94 mg).

Table 1. Analysis of kernel weight for 37 Kent-Kelsey inbred-backcross lines grown in five experiments.

Source of variation	d.f.	Mean square
Experiments	4	732.2**
Genotypes	38	64.9**
Interaction	152	5.0**
Pooled error	684	1.5

The distribution of line means (Table 2) indicated that 24 lines did not differ significantly from Kelsey, one line did not differ significantly from Kent and 12 lines were intermediate to the two parental cultivars. Inbred lines from a second backcross are expected to segregate in a ratio of 7:1 at each locus. For two independent genes, one would expect 49/64 to be like the recurrent parent, 1/64 like the donor parent and 14/64 intermediate. The observed 24:1:12 distribution showed a good fit to the ratio expected if two genes affect kernel weight in this cross. Residual genetic variation within the low and intermediate classes indicated that, in addition to two major genes, one or more minor genes also affect the difference in kernel weight between Kent and Kelsey oats.

Table 2. Distribution of mean kernel weights of 37 Kent-Kelsey inbred-backcross lines.

	Class midpoint	Number of lines	
	29 mg	1	+ *
	30	3	+ * * *
	31	7	+ * * * * * * *
(Kelsey)	32	5	+ * * * * *
	33	5	+ * * * * *
	34	4	+ * * * *
	35	2	+ * *
	36	2	+ * *
	37	4	+ * * * *
	38	1	+ *
	39	1	+ *
	40	1	+ *
	41	0	+
	42	0	+
	43	1	+ *
	44	0	+
(Kent)	45 mg	0	+

Oats in Western Canada 1977

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

According to Statistics Canada 4.97 million acres of oats were sown in Western Canada and 4.22 million acres harvested for grain. There were 1.1, 1.8 and 2.0 million acres in Manitoba, Saskatchewan and Alberta respectively and 70,000 in British Columbia. Yields estimated in the four provinces were 55.2, 51.6, and 58.6 bushels per acre.

The season started off early and extremely dry across almost the entire area but widespread heavy rains beginning in May and continuing through most of the summer produced a very excellent crop which was later damaged by rust in the eastern areas and by heavy rains during harvest over much of the area. The quality of the grain finally harvested was often poor.

Oat Stem Rust

The 1977 oat stem rust epidemic in Manitoba and eastern Saskatchewan was the worst in several decades and it caused an estimated 25 million bushels (385,000 tonnes) in crop losses. The rust was first observed in southern Manitoba on July 11th (somewhat earlier than usual) and developed explosively, resulting in infections of 60-80% over large areas of Manitoba. About one-third of the oats in the rust area of Manitoba and eastern Saskatchewan escaped due to early planting. The remainder suffered losses estimated at from 5% to near total loss and averaging about 35%. The commonly grown cultivars Harmon, Kelsey, Random, Terra are susceptible and suffered serious damage but Hudson is moderately resistant and sustained considerably less damage. The acreage of Hudson is expected to rise sharply from its current 12% of the planted acreage in Manitoba. There have been no important changes in rust races; physiologic race C23 (U.S. 61) which attacks Random and Terra, and race C 10 (U.S. 31) which attacks all commercial cultivars except Hudson, continued to predominate.

Oat Crown Rust

Oat crown rust infections were very light in western Canada in 1977. Although the first infections were observed by mid-July and conditions for rust development during the growing season were favorable, a combined early crop and light influx of inoculum prevented the development of more extensive infection. However, in Ontario some instances of severe crown rust infection were observed. Generally the severity of crown rust infection was related to the proximity of *Rhamnus cathartica*. Where no buckthorn was found near the oat fields infection was generally very light, indicating that crown rust infections are largely generated locally from aecia on buckthorn. Races 295 and 326 continued to predominate in western Canada, and race 210 in Eastern Canada. Combinations of genes Pc38-39 and Pc55-56 have remained highly effective against all Canadian isolates of crown rust.

Vernalization Requirements in Spring Oats

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Germany

In Germany only spring oats are cultivated; early sowing is recommended because late sowing leads to reduced yields. It was assumed that also for spring oats there is a need for a cool period during germination and a vernalization test was carried out with two cultivars last year. The duration of seed vernalization at 2° - 4°C has veen one to four weeks. Sowing has veen carried out at the end of April and this is about four weeks later than the usual sowing date.

The treated seeds were placed in rows with a distance of 20 cm between and 5 cm within the rows. 24 plants per treatment were grown and four replications were used.

The growing season has been very dry and the development of the plants was quite poor, especially the tillering remained below the normal values. Nevertheless it was shown by periodical counting of shooted tillers that the vernalization had been effective. The shooting took place considerably earlier, compared with the control. The final number of mature tillers, the kernel yield per plant and the 1000-kernel weight are listed in the following table.

	Vernalization in weeks									
	0		1		2		3		4	
	abs.	rel.	abs.	rel.	abs.	rel.	abs.	rel.	abs.	rel.
	yield per plant in q									
Arnold	5.6	100	5.3	93	6.7	119	5.3	94	7.7	137
Erbgraf	3.5	100	4.9	133	7.4	2.5	7.2	209	8.0	234
mean	4.6	100	4.9	108	7.1	155	6.3	138	7.9	174
	tillers per plant									
Arnold	2.2	100	2.6	116	2.7	122	2.5	110	3.2	142
Erbgraf	2.2	100	3.0	139	3.9	179	3.9	179	3.6	165
mean	2.2	100	2.8	127	3.3	150	3.2	144	3.4	153
	1000 - kernel weight									
Arnold	30.9	100	31.7	103	35.8	116	35.9	116	36.2	117
Erbgraf	32.8	100	32.0	98	34.7	106	34.5	105	35.3	108
mean	31.9	100	31.9	100	35.3	111	35.2	110	35.8	112

The effect of the vernalization on these parameters is statistical significant, but not the different reactions of the two cultivars. However, it would be of importance for oat breeding to detect a genetic variation for the vernalization requirement.

Oat Breeding at Pantnagar, India

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Oat breeding at Pantnagar was started by the senior author in 1972 after obtaining initial materials from Dr. Hazel L. Shands of the University of Wisconsin and Dr. K. J. Frey of Iowa State University, Ames. Since then we have collected several materials from all over the world particularly from Dr. J. C. Craddock of the USDA, Beltsville, Maryland. In the initial phase certain promising selections were made from the germ plasm and these were tested at various locations, these selections are doing very well under yield tests. Now we have produced several advanced lines (F_6) of four promising oat crosses and these seem to replace certain old varieties being grown presently.

At this station we are putting more emphasis in the production of multiple crosses to incorporate genes from several parents into one. Also we are utilizing biparental and N.C. Design-II crosses for the production of better recombinants by using desirable F_2s as foundation material. With this approach we have been able to recover certain most promising materials which are in the F_5 stage. One of our recent approaches has been to use F_2 bulk pollen of selected plants for the production of still superior types.

Recently we have opted for sending our remnant F_1, F_2, and F_3 seeds to the World Oat Gene Bank maintained by USDA, Beltsville, Maryland. Interested oat workers can also receive such seeds on request.

Our breeding program is concerned solely with producing spring type oats and is primarily based on pedigree method. The major objectives in the breeding program are: Early to medium maturity, leaf blight and crown rust resistance, high green forage and seed yield, fast regrowth in multicut types, and kernel plumpness. Our yield testing begins at the F_5 stage and is continued in subsequent generations.

The oat acreage is gradually increasing in India for green forages but remains behind in grain production and its utilization. It is most suited to the north Indian conditions where an appreciable winter prevails. It is hoped that its acreage in India will increase for green forage, hay, and grain.

Variability for Seed Setting in Diallel Crosses of Oats

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Success in the production of F_1 seeds in oats by hand emasculation and pollination has been generally very low, and it is so under the Indian conditions also. Two major reasons are generally given. The first and foremost is the environmental conditions such as atmospheric temperature and wind velocity, and the second one is the variety and the vigor of the female parent. These two factors have been observed to be the major determiners for success in the artificial hand crossing in oats. Differential response of the variety and the vigor of the female as well as the male parent was obtained in an 8x8 diallel crossing program made during 1976 and 1977. The data on average number of seed set (in %) has been given in Table 1. A range of 5% to 57.8% was obtained in average seed set in the crosses between Burt x Portal and Portal x Indio, respectively. It has been observed that certain cross combinations produced more seed than the others e.g., Burt x Portal produced only 5% while Burt x Orbit produced 26.3%. Similarly, Bingham x Rapida produced only 9% while Bingham x Indio produced 37.5% seeds. These and certain other cases (Table 1), when we take the female parent as constant, demonstrate that it is the male parent also that determines the success in the artificial production of the F_1 seeds. This male factor may be attributed to its pollen producing ability and specific compatibility with a particular female parent.

Table 1. Percent seed set in 8x8 diallel crosses of Oats.

	Female						
	Montezuma	Indio	Orbit	Portal	Bingham	Burt	Kent
Male							
Rapida	45	19	10.5	22	9	20.4	28.5
Montezuma		9.4	8.5	18	15	19.5	26.3
Indio			9.4	57.8	37.5	20.5	29.5
Orbit				12	28.1	26.3	6.8
Portal					19.5	5	15.5
Bingham						23	26.5
Burt							52.6

General Mean = 22.2%

The Possibility of Protein Content Increase Through Interspecific Hybridization

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Besides their remarkable disease resistance, the wild tetraploid oats A. magna and A. murphyi have big groats with protein content of 30% and 27%, respectively. The study of the course of introgression between these species and the cultivated hexaploid oat shows that this high protein content can be exploited for breeding purposes.

The wild oats A. magna and A. murphyi were crossed readily with A. sativa but the F_1 hybrids were totally male sterile due to irregular chromosome paring in meiosis. These hybrids, however, were partially female fertile and set a few seeds when backcrossed to their parental species. The chromosome number in these viable female gametes varied from 12 to 30 in the hybrids involving A. murphyi and 14 - 48 in the hybrids with A. magna.

Chromosome pairing in meiosis and fertility were improved in the backcross generation. Among the plants derived from backcrossing to the hexaploid parents, some with 2n=42 were selected. A few of them had almost regular meiosis and seed set of up to 60%. Introgression from the wild oats was evident at that stage by partial lemma hairiness, short straw, and high protein content (25 - 30%). Fertility was further improved in the F_2. Some selected lines had 26% protein and this level was retained in the F_3.

Generally chromosome pairing was less regular in the plants derived from the backcross of the pentaploid F_1 hybrids to the tetraploid species. Also the fertility was reduced in comparison with the plants derived from backcrossing to the hexaploid parents. Nevertheless, also here some relatively meiotically stable and partially fertile plants were selected. In the F_2, fertility was further restored, and types with 2n=28 and non-shattering seed were selected. Some of them could not be separated from the hexaploid on morphological grounds. A wide range (22 - 30%) of protein content was found among these new tetraploid types. In F_2 these values were retained in some of the lines but were reduced in the others.

Already at this stage the following conclusions can be drawn from the pattern of introgression between the cultivated oats and the wild tetraploids.

a) The chromosomes of A. sativa have homoeologous segments in the genomes of A. magna and A. murphyi. Crossing over between these segments insures effective introgression.

b) The genetics of several characteristics is apparently similar in A. sativa, A. magna, and A. murphyi.

c) The genes controlling protein content in A. sativa, A. magna, and A. murphyi are located on homoeologous chromosome segments.

d) The high protein content of the wild species is apparently controlled by a relatively small number of genes and therefore should not be difficult to transfer to the hexaploid level.

It seems to us that the road for transferring the protein contents of the wild tetraploid to the hexaploid varieties has already been paved. No doubt, further attempts in this direction might be rewarding. The possibility of establishing a new tetraploid oat is also worth some consideration. Such new types might play in oats a similar role to that of the durum wheat in Triticum. If indeed these new tetraploid oats are found to be advantageous in some areas, their further improvement could be facilitated by introducing additional traits from the hexaploid oats.

The Mexican Oat Breeding Program

Dr. Manuel Navarro, Ing. Carlos Jimenez and Philip Dyck

Introduction

The dryland region of Cuauhtemoc Chihuahua; considered as the largest concentrated oat growing area in the western world with 100,000 hectares seeded annually. In Zacatecas, a region ecologically similar to Chihuahua, 5,000 hectares are seeded and more or less 10,000 hectares in the states of Puebla Hidalgo, Mexico, Tlaxcala, and Morelos, for a total of 115,000 hectares. The yield varies from 700 to 3,000 kilograms per hectare depending on the amount of rainfall and varieties seeded.

About 80% of the oats grown is used as animal food in the form of grain, hay or green feed, and 20% for human food.

The principal factors limiting the yield in Chihuahua and Zacatecas are the short spring growing season (82-88 days) and the low rainfall; an average of 14 inches during the oat growing season that usually begins in July and ends in October. This low rainfall limits the development of stem rust, which is the main problem in the other regions where oats is grown in Mexico.

Oat Improvement Initiation

The variety Burt, known locally as Texas was introduced by the Mennonite immigrants in 1924. The 'Instituto Nacional de Investigaciones Agriocolas' started oat improvement in 1960. The variety Burt was susceptible to stem rust, lodging and shattering and therefore produced low yields.

Considering the limiting oat growing conditions, the chief goal in oat improvement was to produce highly nutritious early, high yielding commercial varieties resistant to stem rust, lodging and shattering, and with a height of more than 1 meter because the straw is an important forage crop.

Improvement Methods

In the beginning an evaluation was made of the world oat collection selecting varieties best adapted to this low rainfall region and that had a high yield potential.

At the same time an accelerated hybridization program had started taking into account the fact that in Mexico it is possible to get 2 generations per year, that is one generation seeded in spring in Chihuahua and the high valleys of Tlasxcala, Hidalgo Pueblo and Mexico during the rainfall season and another generation under irrigation in the winter at the lower valleys like Roque, Guanajuato and Delicias, Chihuahua. By selecting lines in these different environments, it was expected to obtain varieties with a wide range of adaptation similar to the results obtained in the Mexican wheat improvement program.

Results

The first improved varieties Cuauhtemoc and Chihuahua, were released in 1967 for the dryland region of Chihuahua with experimental yields of 40% and 22%, more respectively than the variety Burt.

These two new varieties, however, had defects. The variety Cuauhtemoc has a longer growing period in comparison to Burt being therefore affected by early frosts which frequently occur in this dryland region by the end of September or early October. The variety Chihuahua, even though it has a growing cycle similar to Burt, is shorter rthan this variety and because of this it does not grow high enough to harvest easily in low rainfall years. On the other hand both varieties are moderately susceptible to stem rust which affects their yield in high rainfall seasons.

Seeing these disadvantages, an effort was made to develop a new variety earlier than Burt with the same height and resistance to stem rust. In 1972, the variety, Guelatao, was released that yielded 13% more grain than Burt, even though its yield was less than Cuauhtemoc or Chihuahua. It grows as tall as Burt and is 5 days earlier.

Since the varieties obtained until 1972 were susceptible to *Puccinia graminis avenae*, attempts were made to incorporate genes for rust resistance as well as higher levels of protein, lower hull percentage and high yield potential.

In 1975, the following varieties were released: Diamante R-31, Huamantla, Paramo y Tarahumara. The last two varieties have shown better adaptation in the Chihuahua region.

The following table shows the experimental yields, and the agronomic traits as well as protein content of the five improved varieties as compared to Burt.

Year released	Variety	Yields kg/ha	Ht. cm	Stem rust reaction	Prot. %
1975	Paramo	2778	100	MR	21.4
1967	Cuauhtemoc	2528	110	MS	20.9
1975	Tarahumara	2455	90	MR	23.1
1967	Chihuahua	2321	100	MS	17.9
1972	Guelatao	2234	105	MS	17.6
	Burt (Check)	2020	115		15.6

Even though it has been possible to increase yields of this crop by using new varieties, herbicides, and fertilizer, it is still necessary to obtain varieties with high yields and to improve farming practices.

Difference in Virulence of Barley Yellow Dwarf Virus from Different Hosts

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In New Zealand selection for BYDV resistance in oat breeding, relying on field screening, has been successful. Selections from the cross Milford/Rodney/Avon have shown as high a level of tolerance as any oats in all tests in New Zealand and Canada, and one of those (named Omihi) has been released in New Zealand (1976 Oat Newsletter, p. 70).

The field screening has depended on natural infestations of alate viruliferous Rhopalosiphon padi that come from the pasture grasses.

These grasses provide a source of BYDV that appears to be highly virulent over a range of cereal genotypes. From some of the studies we are currently involved in it appears that BYDV is much more virulent when it is obtained from grasses than when it is isolated from cereals.

Recently we have studied the infectivity of R. padi flying from pasture in the spring and found it to be much higher than in the same aphid in autumn flights.

In a further trial R. padi was a very much more effective vector than Sitobion miscanthi in transmitting BYDV more rapidly and more severely from grass and cereals to Clintland 60 oats. It was also found in this trial that transmission of BYDV by R. padi was more effective and symptoms more severe from Canary grass (Phalaris minor) than from wheat or wild oat plants.

Symptom expression (0-4 scale) 28 and 50 days after feeding was as follows:

		Inoculum source			
Vector	Days	Canary grass	Wheat	Wild oats	Non-infected
R. padi	28	4.0	2.5	2.0	0.0
	50	4.0	3.3	2.7	0.0
S. miscanthi	28	0.0	0.0	0.0	0.0
	50	0.6	-	1.0	0.0

After inoculation with R. padi, symptoms of BYDV were first observed in 7 days, while with S. miscanthi none were visible until 35 days.

It is suggested that grass hosts are the most effective source of virus for oat BYDV resistance breeding programmes and that the resistance so obtained is better, more widely effective, and not strain specific.

Spring Oat Breeding in Norway

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Spring oats makes up about 1/3 of the 300,000 ha of small grains in Norway.

Oat production in Norway during the period 1974-1976 is summarized in the the table below:

Years	Acreage in ha	Yield-kg/ha
1974	103,000	3920
1975	103,000	2520
1976	102,000	2820

The principal varieties grown are Mustang, 48% (Netherlands) and Titus, 35% (Sweden). Most of the oat production is used for feeding.

A breeding program in spring oats was started in 1975. This program is part of a larger governmental small grain breeding program, financed by funds obtained through the Norwegian Agricultural Research Council.

Following characters are emphasized in the Norwegian spring oat breeding program:

a) earlier varieties
b) shorter and stiffer straw
c) medium level of dormancy
d) improved nutritional quality, i.e. increased protein content.

Diseases are no serious problem in oats in Norway. Due to late planting BYDV caused significant reduction in oat yields in 1977, however. Regularly BYDV causes problems only on marginal oat land.

Oat crossing is performed in greenhouses in fall and winter and in the field during summer using the approach method. The average seed set last year was 54%.

Parental material for the breeding programe are high yielding varieties well adapted to our climate. A local variety Pol is used as source for earliness. Protein-rich _A. sterilis_ lines are used as sources for high protein content. High levels of dormancy are introduced into _A. sativa_ from _A. fatua_.

Oat Breeding in Turkey

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According to the statistical information for 1974, the total area sown in oats is 275,000 ha and the total production is 380,000 metric tons in Turkey. The average yield is 1382 kg per hectare.

Oat-breeding work in our Institute has been carried out on winter and spring oats. Winter oats are sown in October, and spring oats in the beginning of April. Harvest is generally in August. Last year because of very hard winter, most of the varieties in the screening nursery that were sown in fall died out of winter cold. Very few varieties emerged because of the hard winter. This year, these varieties were planted in the screening nursery again. The yield trial, also sown in fall, was very good because it consisted of the varieties previously selected and brought to this point. 2-3 Apak, a certified variety selected in our institute, was used as standard. Among the varieties used in the yield trial, Cimarron, 66A/76, 66A/85, 66A/84, and Mustang yielded over the standard. Because the weather was too hot and dry, compared to seasonal averages, and because no rain fell for a long period, the spring-sown screening nursery did not show a normal emergence. Since this drought continued through the vegetation period, plants didn't develop well. No disease symptoms were observed (stem rust, crown rust, etc.). Only yellowings were seen on the leaf tips because of the drought.

Because of the ecological characteristics of our region, our main goal is to obtain varieties with better resistance to cold and drought than present. We have been short of breeding material for these purposes, and would appreciate receiving potentially useful germ plasm from anyone who has it available.

V. CONTRIBUTIONS FROM THE UNITED STATES

ARKANSAS

F.C. Collins, J.P. Jones, and W.T. McGraw

Farmers in Arkansas planted more acres of oats in the fall of 1976 than they had in previous years but they only harvested 50,000 acres with a state average of 70 bu/A. Considerable acreage was lost due to winter killing; a sizeable acreage was planted to varieties lacking in winter hardiness. The culprit was the unusually cold and early winter weather.

No substantial outbreaks of disease were observed during the 1976-77 season. A localized epidemic of halo blight occurred in the Uniform Central Winter Oat Nursery at Stuttgart with the least disease development in Ark 99-190 followed closely by TX 72C3034, Coker 76-16 and Firecracker. Several systemic fungicides were found to be very effective in the oat smut seed treatment tests. The compounds Vitavax, Furavax, Benlate, Bayleton and coded products KGW-0519 and RH-2161 gave complete control with applications of less than one ounce per hundredweight of seed.

The Ark 99-190 selection was named'Bob' in honor of the late R L (Bob) Thurman who released Ora and Nora oats in the mid 1960's. Seed was released to seed growers during the summer of 1977. It has continued to yield well in our varietal tests; in addition, its test weight, protein level in the seed, and crown rust resistance are better than either of its parents, Nora and Florida 501.

Nur M. Miah has completed a PhD dissertation in which he studied the use of Powers' partitioning method of selection for improvement in yield, seed size, and kernel protein level. He is preparing a manuscrip for Crop Science.

Surapong Sarkarung will complete his dissertation on oat pubescence by May, 1978. He has been studying the genetic and environmental variation in leaf blade pubescence. His sources of pubescence are PI295919, PT320793, Tam 0-301, Ark NCRR3, and a Purdue selection.

Tracy McGraw will complete a thesis in which he has been studying dwarfism in oats. He has been using Dwarf O.T. 184, Dwarf Palestine, NC2469-3, Ark 56-2-16-9 and Nora for genetic studies and for measuring response to gibberellin, temperature, and photoperiod.

Florida

R. D. Barnett

A group of 174 oat lines from our 1977 crop were evaluated for protein content of the groats. Protein content averaged 19.5% and ranged from 14.5% to 24.0%. The highest protein value obtained was for the Hinoat cultivar from Canada.

Two oats from our breeding programs were released as new varieties in New Zealand. Florida 501 and FL67AB113 were the two strains involved in the release announced by Dr. A. O. Taylor of the Department of Scientific and Industrial Research, at Palmerston North, New Zealand.

The Summary Report of the 1976-77 Small Grain Forage Screening Nursery is available for anyone who would like a copy. Nineteen oat lines were included among the 116 entries of the test which was grown at 21 locations in 12 states. Information on forage potential, winter hardiness, and crown rust resistance was obtained. Coker 76-16 had the best forage rating. All the oats were damaged by the cold winter but MO 06174 and NF 113 proved the most hardy and FL70Q1153, Florida 501, and TAM O-301 the least hardy. The 1977-78 Small Grain Forage Screening Nursery includes 15 oats among the 106 entries. The summary report of this nursery report will be available in August of 1978.

GEORGIA

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

The Georgia Crop Reporting Service has estimated the 1978 oat acreage to be 130,000 acres, or the same as last year (1977). Total production will depend upon seasonal conditions, some loss of acreage from total grazing and possible abandonment. Georgia usually produces more than 4 million bushels of oats each year. Grazing has been good up until mid-January 1978, however considerable winterkilling occurred during January 1978 in the Central Area Winter Oat Nursery at Athens, Georgia. Most entries in the Uniform Oat Rust Nursery (spring types) were killed by January cold at Tifton.

Morey and Brown are cooperating on an inheritance study involving the leaf angle of oats. Dr. Morey made the original crosses at Tifton and the F_1's were grown at Aberdeen during the summer of 1977. The F_2 plants are being grown in the field at Athens during the winter of 1977-78.

The previous season (1977) was marked by little disease or insect problems and reasonably good production. No changes have been made in varietal recommendations. The varieties most planted in Georgia are Florida 501, Coker 227 and Elan oats.

Indiana

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

Production: Oats production for Indiana in 1977 was estimated by the Indiana Crop and Livestock Reporting Service at 7.95 million bushels harvested from 150,000 acres.

Most of the oats were seeded by April 10. Rainfall during the early spring months replenished subsoil moisture by the first week in May. Growing conditions were very good for oats production through mid-May. However, oat yields were reduced due to very warm and dry weather conditions during flowering (last week in May through first week in June).

Barley yellow dwarf virus (BYDV) symptoms, although not severe, were apparent beginning at about the flowering stage and may have contributed to some yield reduction. An insignificant amount of crown rust and stem rust appeared late in the season.

Noble, Clintford and Otee were grown on 24, 19 and 15% of the oat acreage in Indiana.

Certificates for plant variety protection in accordance with Title V of the Federal Seed Act were issued for Noble (No. 7400063), Stout (No. 7400064) and Allen (No. 7500093).

Research: Breeding and selection efforts were continued to incorporate resistances to crown rust and good tolerance to barley yellow dwarf virus (BYDV) into productive oat cultivars. Several lines with crown rust resistance and/or BYDV tolerance looked very promising in advanced yield tests.

Preliminary studies (Fall 1977) showed that screening for oat genotypes with reduced BYDV symptom expression in the greenhouse may be useful in a breeding program. Differences in severity of symptom expression between Stout, Noble and Ill 70-1468, CI 9312, were very distinct in seedling stages. Also, differences in symptom expression among F_2 seedlings from the cross: Noble/Ill 70-1468 were distinct. This system could be used to identify the most tolerant plants in a population or to eliminate intolerant lines in a breeding program.

Personnel: Mark Iwig completed requirements for the Ph.D. degree. He is with Pioneer Hi-Bred International, Inc. as soft winter wheat breeder stationed at Tipton, IN.

David Harper joined the small grains project in July as a graduate research assistant working toward his M.S. degree. He is studying the inheritance of BYDV tolerance in oats.

Publications

Day, K.M., F.L. Patterson, O.W. Luetkemeier, H.W. Ohm, Kim Polizotto, J.J. Roberts, G.E. Shaner, D.M. Huber, R.E. Finney, and R.L. Gallun. 1978. Performance and adaptation of small grains in Indiana. Purdue Univ. Agr. Exp. Sta. Bull. No. 182.

Iwig, M.M., and H.W. Ohm. 1976. Genetic control of protein from *Avena sterilis* L. Crop Sci. 16:749-752.

IOWA

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

The area in Iowa harvested for oat grain and oat silage has stabilized since 1970 at 0.7 to 0.8 million ha (1.8 to 2.0 million acres). The estimated Iowa average yield for 1977 was 2.1 tons/ha (59 bu/acre), and total production was 1.2 million metric tons (81 million bushels). No official variety survey has been conducted in Iowa recently, but from a field count by oat project personnel, it is obvious that varieties in the Multiline E series are grown on a high proportion of the area sown to oats. Stout, Lang, and Noble are popular varieties, also.

We have spent considerable effort on researching *Avena sterilis* as a source of useful genes for improving oats for midwestern agriculture. Twelve major genes that condition resistance to crown rust have been backcrossed from collections of *A. sterilis* into cultivated genotypes, and eight of these are being used commercially in Multiline E and Multiline M varieties. One high-yielding genotype with "productivity" genes and one line with high-protein genes from *A. sterilis* have been placed in the Early Maturing Uniform Oat Nursery in 1978.

Dr. Majid Rezai (Dissertation microfilm no. 78-5968) measured 17 traits on ca 500 *A. sterilis* collections from 16 countries. Traits measured were: (a) length and width of flag leaf, (b) weight of 10 caryopses, (c) protein percentage of groats and straw, (d) oil percentage of groats, (e) length and width of caryopses, (f) number of spikelets per panicle, (g) growth habit of seedlings, (h) date of heading, (i) plant height, (j) response to vernalization, (k) photoperiod response, and (1) reactions to six races of crown rust. The variation for each trait was enormous among the *A. sterilis* collections. By using multivariate analysis techniques, Rezai found his collections represented three distinct geographical centers of diversity: (a) the Mediterranean area, (b) Central Asia and the Middle East, and (c) Israel. Printouts of these data by *A. sterilis* P.I. number and country of origin can be had upon request.

During the past three years, we have introgressed germplasm from 25 *A. sterilis* collections into breeding populations of oats. The general crossing plan was as follows:

A. sativa (C) 3X *A. sativa* (B) 2x *A. sativa* (A) x *A. sterilis*,

where *A. sativa* (A), (B), (C) represent different genotypes. Twenty-five hundred bulk F_1-derived populations in F_3 are available for selection. We can supply seed of these populations to anyone interested in using them for selection purposes.

In 1977, Robert Segebart, Abdolmajid Rezai, and Kathy Politowski completed Ph.D. degrees from the Iowa oat project, and Jimi Adegoke and Susan Behizadeh completed M.S. degrees. Dr. Segebart is a corn breeder with Pioneer Hi-Bred, International, Princeton, Illinois; Dr. Rezai is Assistant Professor of Crop Science, Arya Mehr University of Technology, Isfahan, Iran; Dr. Politowsky is a plant pathologist with Pfizer Genetics, St. Louis, Missouri; and Mr. Adegoke and Ms. Behizadeh are continuing to study for Ph.D. degrees. Dan Rodgers and Karen Kuenzel are new graduate students studying for Ph.D. degrees, and Mark Millard is a new student studying for an M.S. degree, all in plant breeding.

KANSAS

E. G. Heyne

The oat acreage in Kansas has reached a low plateau. During the past 10 years the seeded acreage has been between 240 and 300,000. In 1977, 285,000 acres were seeded and 210,000 acres harvested for grain. There was adequate to excess moisture during the growing season which resulted in the highest yield recorded in Kansas of 45 bushels per acre. The 1971 Kansas oat crop also yielded 45 bushels per acre. Diseases were not a damaging factor in oat production. Crown rust became common late in the season. Some acreage was lost due to too much rain and weeds. Late cultivars like Lodi and Kelsey are being used for pasture and hay.

Certified seed of Andrew, Bates, Kelsey, Lang, Lodi, Pettis, Spear, Stout, and Trio were produced in Kansas in 1977.

We do not have a breeding program. Our tests show that Lang and Bates are the most promising new cultivars, especially when BYDV is present.

We do test the uniform winter oat lines for hardiness. The 1976-1977 season at Hutchinson, KS gave nearly 100% kill. The previous four years had given good yields and winter survival. There are no winter oat cultivars hardy enough for certain production in Kansas.

MINNESOTA

D. D. Stuthman, H. W. Rines, R. L. Thompson, and R. D. Wilcoxson

Production. Early in the spring of 1977 oat production prospects appeared to be dismal. The previous year had been very dry, and oat yields were the lowest in almost twenty years. Further, no appreciable amount of moisture had been received since the 1976 harvest. However, timely precipitation thoughout the 1977 season resulted in a record yield of 68 bushels per acre on nearly 2 1/2 million acres. The entire season from planting through harvesting was about two weeks ahead of normal. Smut continued to be a problem and stem rust was present in significant amounts for the first time in nearly 20 years. Crown rust was relatively light.

Varieties. Lyon was grown by certified seed growers (about 4,200 acres) for the first time. Response to an evaluation survey indicates that it was very well received by these growers. Final seed increases prior to release to seed growers will be made for MN 73231 and 71211 in 1978. In a 1977 variety survey, Froker was the leading variety (18%) followed by Rodney (16%), Lodi (12%), Chief (11%), Noble (9%), Harmon (5%), Early Multiline (5%), and a number of others at 2% or less. In the last ten years Garland and Lodi have dropped from a total of 60% to 14% while Rodney has remained at 16% during this period. In the last five years Froker has not changed (19 vs. 18%) but we expect it to drop in the near future because of its smut susceptibility.

Research. Our breeding program continues to emphasize grain yield, protein yield, lodging resistance and smut and crown rust resistance. A study of possible interactions between oat and alfalfa varieties in a cover crop management system is a new area of research.

Among 483 *A. fatua* collections initially tested for barley yellow dwarf virus (BYDV) tolerance in cooperation with H. Jedlinski, USDA-ARS pathologist at Illinois, 34 have shown high levels of tolerance (ratings of 1-3 on a 0-9 scale) in replicated repeat testing of initially promising lines. These represent a major increase in the sources of BYDV tolerance available to oat breeders. We will gladly share seed of these and other collections of *A. fatua* with cooperators for evaluation or breeding purposes.

In studies on influence of genotype, media composition, and growth conditions on tissue culture establishment and plant regeneration, Lodi and its related lines have continually provided the best cultures. Cytogenetic stability as related to time in culture is also being investigated. Ethyl-methanesulfonate, sodium azide, and ethidium bromide are being compared as mutagens in oats, particularly in searching for male sterility.

Several new morphologically distinct mutants recovered by D. C. Cummings in his recently completed thesis work are being utilized in further investigations. The dominantly-inherited viviparous, (pre-harvest germination) mutants are of particular value in crossing studies because the _Vi_ gene can be detected directly in the newly formed seed in hulless types. Another mutant, blunt spikelet (_bls-1_), in addition to having a compact panicle and short plump kernels, is characterized by potentially useful traits of upright leaves and stiff straw.

Personnel. Donn Cummings completed his Ph.D. with a thesis entitled "Studies Relating to Development of a Selection System for Lysine Overproducer Mutants in Oats". Dr. Cummings is now a Station Manager and Corn Breeder for Pfizer Genetics Inc. Rob Bertram will be completing his M.S. with thesis research on the relationship of harvest index of spaced plants with grain yield in competitive seedlings. Ted Schiele will also complete his M.S. soon and his research is a comparison of the root development of _Avena sativa_ and _A. fatua_. Ken Ziegler is now employed by Iowa Crop Improvement Assn. Robert Nielsen is a new graduate student from the University of Nebraska.

Dr. Robert Wych recently joined our staff in the area of small grain physiology replacing Dr. Dale Moss.

MISSOURI

Dale Sechler, J. M. Poehlman, Paul Rowoth and Matt Renkoski (Columbia),
Boyd Strong (Mt. Vernon), and Lewis Meinke (Spickard)

Production: Approximately 220,000 acres of oats were seeded in Missouri in 1977, according to the Crop Reporting Service, of which 145,000 were harvested for grain. This was the largest harvested acreage reported in recent years and the average yield of 50 bu/acre was a record high for the state. Weather and soil conditions were such that the crop could be seeded early. Under the favorable growing conditions, spring oats matured two weeks earlier than normal. Both spring and winter oats ripened at about the same time which is very unusual.

Diseases: Oats were more disease free than they had been for many years. Symptoms of the BYDV disease, which is normally very damaging, were rarely noticed. Since most BYDV infection apparently occurred in the fall of the year, symptoms were more prevalent in winter than in spring seeded oats. Halo blight caused some leaf damage early in the season but the crop showed little permanent damage from this problem. Smut is being observed in increasing amounts in a number of the more widely grown varieties. Crown rust was seen occasionally but it came in late and damage was minimal.

Varieties: The Mo. 06072 selection was jointly released by the Missouri and Nebraska Agricultural Experiment Stations under the name of 'Bates' in February, 1977. The variety was well received by growers. Bates has good resistance to BYDV, smut and the common races of crown rust. Yield and quality of the grain have also been very good.

Registered seed was produced in 1977 of the new Bates and Lang varieties while both registered and certified seed were produced of the Otee variety. While seed is available and more farmers are growing improved varieites, there are still many small acreages seeded to 'feed' oats with no concern as to variety. These acres often are relatively unproductive and the oats are cut for hay or are turned under and the land seeded to a summer crop.

NEBRASKA

John W. Schmidt and Gary E. Martin

Oat acreage in Nebraska continues to increase slowly. In 1977, 800,000 acres were planted of which 670,000 were harvested for grain. Grain yield was a record 58 bu/a. Although moisture was limiting, the rains were timely and the hot winds that we had in 1976 were absent in 1977. For the first time in years stem rust developed to damaging proportions in our nurseries. All entries in the UEOPN and UMOPN were rated as susceptible but with considerable range in severity.

Of the newer cultivars, Bates and Lang in the early maturity group and Lyon and Wright in the medium-late maturity group performed well statewide. Bates will be available to certified growers for the first time in 1978, but certified seed of Lang should be plentiful and we expect this cultivar to be widely planted in 1978.

NEW YORK

Neal F. Jensen

Dr. Mark Sorrells will be joining the cereal breeding project and the Department of Plant Breeding and Biometry as Assistant Professor on May 1, 1978. Mark is a native of Illinois and is currently on a post-doctorate appointment at the University of Wisconsin. He holds degrees (BS and MS) from Southern Illinois University and Ph.D. from the University of Wisconsin.

Observations on Astro at Mesa, Arizona show it to have either very wide adaptation or perhaps it has the light insensitive gene. It was the only variety among several that compared with Mesa (variety) in vigor.

All oats in the breeding and testing program are now routinely tested for protein (lysine) using the dye binding technique. It is too soon for any variety results, however, the important point is that the breeding project is taking the protein trait very seriously.

We hope to make semi-final selections towards a new variety during 1978. The group of top-ranking performers will be put through a local screening process, including display at the annual field day. It has been difficult, however, to find superior <u>yield</u> characteristics above the averages of Garry, Orbit and Astro.

NORTH CAROLINA

C.F. Murphy and T.T. Hebert

The winter of 1976-77 was disastrous for the North Carolina oat crop. All time record low temperatures essentially eliminated the piedmont oat crop and severely damaged oats in the coastal plains. Many piedmont farmers planted "spring oats" after fall seedings had been totally lost. We have very little information as to the best varieties for spring seeding. Some farmers planted our adapted winter oats and others used any midwestern spring oat that happened to be available. The season was such that all spring-seeded oats did relatively well if planted early (mid to late February) and all did very poorly if planted later than March 1. One of our production programs is attempting to gather more information on varietal reactions to spring seeding.

Our oat selection program continues to emphasize straw strength, BYDV tolerance, protein production, hardiness and yield (not necessarily in that order). The most common parent in all of our material is Carolee and the most visibly distinguishing characteristic is probably a tendency toward large numbers of seeds/panicle and relatively small seeds. Crown rust is not a major problem in North Carolina and, while this situation is an apparent blessing, it may result in us being too lax in our attention to this disease and producing varieties with somewhat limited adaptability.

CFM:bb

North Dakota

M. S. McMullen and V. Jons

Production. Approximately 64.8 million bushels of oats with an average yield of 37 bu./A were harvested from 1.75 million acres in 1977 which is an increase from 1.18 million acres in 1976. The growing season was warmer and drier than normal from seeding until early in July. During the remainder of the growing season more precipitation and lower than normal temperatures occurred.

Oat Crown Rust. Only trace amounts of crown rust were observed in commercial fields throughout the growing season.

Oat Stem Rust. In early July, trace amounts of oat stem rust were present in commercial oat fields in southeastern North Dakota. By July 20, rust severities of 20-30% were common in southeastern sections of the state and trace amounts were present in Northwestern North Dakota. With favorable temperature, moisture and susceptible varieties, stem rust severities of 30-40% were recorded in the northeastern part of the state by the end of July. Production losses due to oat stem rust were significant in late planted areas in the eastern one-third of the state. Yield and test weight reductions approaching 50% were reported for individual fields. The only oat stem rust race from more than 350 isolates collected in North Dakota and identified by the Cereal Rust Laboratory was race 31.

OHIO

Dale A. Ray

Production. The 420,000 acres of oats harvested by Ohio farmers in 1977 produced 24,780,000 bushels of grain. This acreage was a decline of approximately 80,000 acres compared with the 1976 crop. Cool temperatures and excessive soil moisture prior to seeding probably discouraged or delayed establishment of the oat crop. Although excellent growing conditions prevailed in midseason, declining moisture supply accompanied by high temperatures after the oats had headed caused a shortened period of grain development and early ripening. The state yield average of 59.0 bushels per acre was an increase of 2 bushels over the 1976 yield but was considerably below the yield potential expressed by the midseason vigor of the crop. Barley yellow dwarf was the only oat disease observed in any incidence of concern but did not appear to produce a major effect on the statewide yield.

Oat Varieties. Noble and Otee continued as the principal varieties grown in Ohio. The recommended list of oat varieties for Ohio production currently consists of Clintford, Dal, Noble, Otee, and Stout. Noble, Otter, and Lang were the leading varieties for grain yield at one or more locations in the statewide performance trial.

Oat Breeding. Bulked advanced-generation selections from Clintland 60 x Rodney 2x Putnam 61 and an *Avena sterilis* selection crossed with Garland and Florida 500 were compared with nine standard check varieties in a replicated test at two locations. Although these lines exhibited considerable plant-type variation, the entries were evaluated in potential for further selection. Extensive plantings of individual panicle selections were observed for plant type uniformity, adapted maturity, and field tolerance to BYDV. Selected materials will be multiplied for bulking as new lines and for protein analysis.

OKLAHOMA

H. Pass, L. H. Edwards and E. L. Smith

Production. The Oklahoma state average oat yields and acreage fluctuate from year to year. We have had two consecutive years of record oat yeilds. Average yield in 1976 was 45.0 bushels per acre. The 1977 average yield was up to 46.0 bushels. This increase in average yield plus harvesting 25,000 more acres raised the 1977 oat production to 5,980,000 bushels, up 27 percent over 1976. It is estimated that over half of the fall seeded oats are used as pasture and hay.

Oat Varieties. Most of the winter oat acreage is seeded to Cimarron, Chilocco and Nora varieties. Nora acreage has been increasing each year by the grain farmers, but is susceptible to winterkilling in some years and Barley Yellow Dwarf Virus. this virus has been on the increase in the state since 1975.

A selection, (OK7222336, C.I.9258) from a cross of Chilocco and Ora, has been approved for release by the Agriculture Experiment Station, naming and release committee. The Foundation Seeds Stock, Inc. has approximately 25 acres seeded for 1978 harvest. In four-year state average yield, this selection has outyielded Chilocco by 15.8 bushels per acre and Nora by 21.1 bushels.

South Dakota

D. L. Reeves and L. Hall

Production: The 1977 oat acreage of 2,920,000 acres was the largest since 1959. Moisture supplies varied from somewhat limiting to more than ample. The average yield was 54 bu./A with a total production of 132.3 million bushels. This was the largest crop since 1945 and only the fourth time production has exceeded 120 million bushels. Development during the growing season was 10-12 days earlier than average due to above average temperature in May. In regions of limited moisture this resulted in lower yields.

Diseases: Leaf rust was again present only in trace amounts. Stem rust became very common in the eastern part of the state. Fortunately most of the stem rust developed late enough so it did not seriously affect yields, except on some late planted fields. Many farmers reported extensive rust at harvest resulting in a 'red dust' covering machinery. Smut was less prevalent than the previous 2-3 years.

Varieties: A major increase of SD 9095, a selection from Spear is planned for 1978. It has better grain quality and stem rust resistance than Spear.

Equipment: Planting head rows via plastic trays was used for the second time. Two people planted 10,000 rows in nine hours this year. Some occasional seed mixing can occur if trays bind or jam. This year we had problems with only 8 of 156 trays.

TEXAS

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

Production: The seeded acreage of oats in Texas in 1977 increased to 1,450,000 acres. The acreage increased approximately 10% over the low ebb for the 1975 and 1976 seasons; however, it is still 23% below the average of 1,883,000 acres seeded in Texas for the 10-year period 1968-1977. The 600,000 acres harvested in 1977 represents a relatively high proportion (41.4%) of the oats seeded. The proportion harvested in Texas for the last 10 crop seasons has averaged 27.7%. The mean yield of the harvested oats was 40.0 bu/a in 1977, which is considerably higher than the 34.7 bu/a average for the past 10 years.

The low average grain yields in Texas are caused by several factors. Most of the harvested acreage is grazed and frequently the decision to graze-out or harvest for grain is based on the amount of spring rainfall. "Take-off" time is far too late on much of the harvested acreage, causing drastic reduction in grain yield. Much of the oat crop, particularly that grazed, is not fertilized adequately for good grain production. Nitrogen removal is high when oat forage is grazed because the forage has a very high protein level. Good grain yields will not be obtained unless N is replaced by timely topdressing. In addition, the state has its full share of drought, winter injury, hail, and disease and insect problems. However, it is possible to produce good oat yields in Texas. The following data are from 1977 replicated grain yield trials at several Texas locations:

Location	Yield, best entry (bu/a)	Yield, best Cultivar	Best Cultivar	Average Yields, all entries
Bushland 1/ 2/	127.0	100.3	TAM 0-312	94.1
Chillicothe	113.3	93.0	Nora	90.7
Merkle	150.2	141.5	TAM 0-312	125.5
Dallas 3/	163.1	157.5	Coker 227	116.7
Overton	210.0	177.0	Appler	178.0
McGregor	102.2	95.9	TAM 0-312	88.3
Temple 3/	84.0	76.6	Cortez	74.2
Uvalde 1/	130.1	115.9	TAM 0-312	94.2

1/ Irrigated tests at Bushland and Uvalde. Other locations dry-land.
2/ Considerable hail damage to all entries
3/ Several entries had severe stand losses due to winter injury.

The major oat production areas in Texas lie in the Blacklands (represented by Dallas, Temple, and McGregor), the Rolling Plains (represented by Chillicothe and Merkle), and the Uvalde area. Since we obtain good grain yields in experimental nurseries in each of these areas, it is obvious that commercial oat grain yields could be increased appreciably if the crop were managed properly.

Research: Excellent levels of combined seedling and adult-plant stem rust resistance have been recovered at a relatively low frequency among F_2 segregates from crosses and backcrosses of Texas oats to C.I. 9221 and C.I. 9222. Repeated crosses to adapted winter-type oats will be necessary to recover adequate winterhardiness, straw strength, and seed size in this material. TAM O-312 and Texas experimental oat 72C3034 appear to have outstanding BYDV resistance; comparative symptoms at several Texas locations and Manitoba, Canada, were consistently lower for these lines than for other oat genotypes. 72C3034 is being increased for possible release. It is similar to TAM O-312, but has better winterhardiness. Good seedling resistance to biotype C of the greenbug was found in F_2 populations from crosses and backcrosses of Texas lines with P.I. 186270; resistance appears to be recessive. Iron chlorosis studies were expanded; Alamo-X appears to have excellent resistance to Fe stress, while Coker 75-12 is Fe sensitive. Cooperative Iowa State University-Texas Agricultural Experiment Station crown rust investigations in South Texas were continued in 1977. Mass spore collections from multiline and recurrent parent populations presently are being compared for virulence levels.

Rusts: No major shifts in oat rust races occurred during the past season. Stem rust continued to increase in severity; serious losses occurred in commercial fields of oats in a number of locations in the southern part of the state in 1977. No locally adapted cultivar has adequate resistance to the virulent stem rust races prevalent in Texas. The crown rust resistant Coker varieties and TAM O-312 are particularly susceptible to the current races of oat stem rust.

Personnel: Dr. Dennis Johnson joined the staff of the Texas A&M University Agricultural Research and Extension Center at Chillicothe-Vernon February 1, 1978. Dr. Johnson assumes duties as Pathologist for the statewide small grain breeding and research progrems. Dr. Johnson received his Ph.D. from the University of Minnesota in 1977. He has conducted research with bacterial blight, powdery mildew, and the slow-rusting (leaf rust) trait in barley. Dr. E. C. Gilmore, Texas Agricultural Experiment Station Wheat Breeder, was promoted to the rank of Professor September 1, 1977. Dr. Gilmore transferred from College Station to Chillicothe-Vernon in July, 1977. His research will concentrate on hard red winter wheat variety development for the extensive wheat production area in the Rolling Plains of Texas. Mr. Charles Erickson was promoted to Research Associate and transferred to the Uvalde Research Center in September. He will develop a wheat breeding program for South Texas and also will conduct other small grain forage and grain yield research in this area of the state. Mr. M. J. Norris, Associate Professor at the Blackland Research Center at Temple, Texas, retired in August, 1977. Mr. Norris conducted small grain research throughout his career in the Texas Agricultural Experiment Station system. Most of Mr. Norris' long span of service was at the McGregor Research Center. His initial appointment was at the Denton Station.

UTAH

R. S. Albrechtsen

The extremely dry winter of 1976-77 resulted in reduced plantings and increased abandonment of oat acreage in Utah. The 1977 harvested acreage and total production were both the lowest values on record, dating back to 1882. Timely spring and early summer rains and marginal supplies of irrigation water partially overcame the moisture deficit in most areas and resulted in a fair-to-good crop. Losses from disease were generally minimal.

Cayuse is the top-yielding named cultivar on a long-term basis and is the most widely grown cultivar in the state. We are not carrying on an active oat breeding program because of the small acreage in the state. Promising new cultivars and breeding lines are identified from the Northwestern States Oat Nursery.

WASHINGTON

C. F. Konzak

As with other crops, oat production in Washington was reduced by the widespread deficit in precipitation. On fallowed land, oat yields were only slightly below normal. New cultivars Corbit (Id) released in 1977, and Appaloosa (WA), to be released in 1978, did not outperform Cayuse in some tests, but did so significantly in others. The hulless Canadian cultivar, Terra, was tested more widely in 1977, and on the average performed nearly as well as Cayuse if a yield adjustment is made for its absence of hulls. New entries WA 6392 and WA 6394, both from the CI2874/Cayuse cross, showed promise of better yields than Cayuse, Corbit and Appaloosa at equal to better test weights. These selections are shorter in height than Cayuse and carry higher tolerance to BYDV as determined via tests kindly conducted by Dr. C. O. Qualset at Davis, California.

WISCONSIN

R. A. Forsberg, M. A. Brinkman, Z. M. Arawinko, R. D. Duerst, E. S. Oplinger, H. L. Shands, V. L. Youngs, and D. M. Peterson (Agronomy), and D. C. Arny and C. R. Grau (Plant Pathology).

The yield of oats in Wisconsin averaged a record high 65 bushels per acre in 1977. This was two bushels more than the previous high in 1970, and it was 22 bushels more than the 1976 average. Most phases of the 1977 oat growing season--including planting, heading, and harvesting--occurred 2 weeks earlier than normal, and the early-season higher temperatures favored oat-plant growth and development especially in central and northern areas of Wisconsin. Oats in many areas of the state had to withstand high temperatures and moisture stress during May, but cool temperatures in June and adequate rainfall in June, July, and August contributed to the high grain yields.

Production of oats in Wisconsin totaled 76 million bushels compared to 55 million in 1976, an increase of 38%. Approximately 1.3 million acres of oats were planted in 1977, a decline of 10% from 1976 due in part to the fear of atrazine carryover because of the 1976 drought. A January 1978 prospective planting survey by the Wisconsin Agricultural Reporting Service indicated that Wisconsin farmers plan to seed 1,450,000 acres of oats in 1978, an increase back to 1975 and 1976 acreage levels. Oat smut continued to command attention, and several fields with high infection were observed. Nearly all Wisconsin foundation seed was treated prior to 1977 sales, and susceptible varieties will be seed treated in 1978. A rigorous inspection program has been imposed on "certified" seed production fields, and the Wisconsin Crop Improvement Association now requires seed treatment if the infection level in a certified seed production field exceeds 1%.

Losses due to crown rust were negligible, and red leaf was much less prevalent than in 1976. Although stem rust infection was sparse in 1977, it was widely dispersed throughout the state, and all collections were identified as race 31. This is cause for concern because resistance to race 31 is noticeably absent among cultivated varieties. Sources of resistance to race 31 have been identified and kindly made available to oat workers by Dr. Paul G. Rothman, Cereal Rust Laboratory, University of Minnesota. These lines are very late maturing and have very thin kernels so that backcrossing to the adapted recipient is a necessity.

A major increase of X2456-2 oats will be made during the summer of 1978, and the final decision regarding release and distribution of foundation seed will be made in December, 1978. X2456-2 was derived from a cross between Holden and a sister line of Dal. The pedigree is Holden/3/Trispernia/Belar/2/Beedee. In 32 Wisconsin tests during 1973-1977, X2456-2 has averaged 5.4 B/A more than Dal, 77.3 vs. 71.9. The differential between these two entries in 72 Uniform Midseason Oat Performance Nursery tests was 7.6 B/A in favor of X2456-2 (83.1 vs. 75.5). X2456-2 ranked first in protein pounds per acre among entries in 1973-76 Wisconsin tests.

In view of the seriousness of the oat smut problem, it was decided not to release selection X1839-1. This selection is a Lodi type whose pedigree is La Prevision/C.I. 1098 /2/ 3* Lodi. Unfortunately, X1839-1 is susceptible to the newer and serious "Lodi" smut race(s), a disadvantage which at this time was thought to outweigh the contribution of improved resistance to crown rust from La Prevision.

Dr. H. L. Shands has continued his project concerned with the development and utilization of oat germ plasm in developing countries with support from the Quaker Oats Company. This project served as the basis of a Title XII preproposal document involving 13 developing countries, nine U.S. Land Grant institutions, the U.S.D.A., and Quaker Oats. The Joint Research Committee of the Board for International Food and Agricultural Development will be evaluating this and other proposals in the months ahead.

Thesis Research Projects. Several graduate students recently have completed requirements for MS degrees. Wesley R. Root studied the inheritance of and interrelationships among factors influencing groat conformation and quality including groat length, width, volume, density, protein content, and protein percentage, and groat percentage. Mr. Root is continuing this research in his Ph.D. program. Mr. Arlei S. Terres investigated the influence of different forms of nitrogen fertilizer applied at different stages of growth on oat groat and straw yields, harvest index, groat percentage, groat protein concentration, and groat protein yield. He returned to Brazil in January, 1978. Mr. Olatunji A. Adenola studied the intercropping and double cropping of soybeans, buckwheat, and proso millet with Lang oats, Beacon barley, and two soft red winter wheats. Mr. Adenola will return to Nigeria in June, 1978. Mr. James A. Radtke studied the genetic and cytogenetic nature of translocations in three hexaploid "transfer" lines which are homogeneous for crown rust resistance from tetraploid C.I. 7232 or from 6x amphiploids. The resistance traces back to diploid *Avena strigosa*. Mr. Radtke will initiate a Ph.D. program with Dr. D. D. Stuthman at Minnesota in September, 1978. Mr. David K. Langer investigated the response of 20 oat varieties and selections to different levels of atrazine residue.

Mr. Kenneth R. McNamara is studying the nature of crown rust resistance in tetraploid *A. barbata* var. excoimbra (M.S.-R. A. Forsberg), and Mr. Yeong D. Rho, newly arrived from Korea, will continue multiple cropping investigations (Ph.D.-M. A. Brinkman). In the U.S.D.A. Oat Quality Laboratory, Madeline F. Chinnici is continuing her study of blast in oats under the direction of D. M. Peterson and Mr. Gordon A. Miller has initiated a study of phytic acid in oat groats under the supervision of V. L. Youngs.

VI. NEW CULTIVARS AND RELATED MATERIAL

NEW CULTIVARS

PANEMA

R. Cook, D. A. Lewis, J. Valentine and J. D. Hayes

Panema, a winter oat variety bred at the Welsh Plant Breeding Station, has been granted Plant Breeders Rights and added to the National Institute of Agricultural Botany's Recommended List of Cereals for 1978.

Panema was produced by the partial backcross method and has the pedigree (03981 Cn x 9065 Cn^2 x $Peniarth^2$. It incorporates resistance to the cereal cyst nematode (*Heterodera avenae*) from the Avena sterilis line I.376. The effect of this resistance is to drastically reduce the nematode population with benefit to the succeeding crops.

In the absence of nematode infestation, the yield of Panema is not significantly different from that of the well-established variety Peniarth. Panema has a high level of winter-hardiness similar to that of Peniarth, but is generally less stiff, and slightly taller and later. Panema has very good resistance to mildew (*Erysiphe graminis*) and is also resistant to stem eelworm (*Ditylenchus dipsaci*).

Panema has intermediate-sized grains which are slightly smaller and with a slightly lower kernel content than those of Peniarth.

TRAFALGAR

D. J. Thompson

The spring oat variety Trafalgar was bred by Weibull, Sweden and introduced into the U. K. by Rothwell Plant Breeders, Lincoln. It is selected from the cross Nelson x Selma.

Included on the Recommended List and National List of the National Institute of Agricultural Botany for 1978, it is the highest yielding variety on the list with a yield at 112% of the control varieties (Leanda and Maris Tabard). It has moderate adult plant resistance to Erysiphe graminis and is the only variety on the N.I.A.B. Recommended List for 1978 with resistance to Cereal Cyst Eelworm.

Length of straw is similar to Maris Tabard; ripening is average for the U.K. and similar to Leanda, and kernel content is high.

BOB

F. C. Collins and J. P. Jones

'Bob' oats (Avena sativa L.), C. I. 9261, Ark. 99-190, is a winter oat cultivar released by the Arkansas Agr. Exp. Stn. in 1977. It was derived from a cross of 'Nora' X 'Florida 501' made in 1970. Bob traces to an F_3 plant that exhibited crown rust resistance (Puccinia coronata Cda. F. sp. avenae Eriks & E. Henn.) at Stuttgart, Arkansas in 1972. It has been tested in Arkansas for five years and in the Uniform Central Winter Oat Nursery from 1975 to 1977. Prior to release, 13 sister lines of the F_6 generation with similar appearance were composited to form the breeder seed.

Bob should be well adapted to the oat growing areas of Arkansas and adjacent states with similar environments. Bob is particularly well adapted to the Grand Prairie area of Arkansas where most of the seed oats is grown. The five-year yield averages for Bob, Nora, and Florida 501 at the Rice Branch Station near Stuttgart, Arkansas were 3838, 3415, and 3171 kg/ha, respectively. Bob also has had heavier test weight (48.3 kg/hl), better crown rust resistance, and higher protein level than Nora or Florida 501, and it is intermediate to Nora and Florida 501 for winter hardiness and maturity.

Bob has erect juvenile growth habit, and its adult plant height averages 5 and 7 cm shorter than Florida 501 and Nora, respectively. Culms are midsized and lightly pubsecent above the nodes. Leaves are green and glabrous. Panicles are equilateral and spreading with a twisted rachis. Spikelet separation is by semiabscission and floret separation by heterofracture. Lemmas are yellow, short, and glabrous. Awns are rare but subgeniculate when present. Kernels are plump.

Breeder seed will be maintained by the Arkansas Agr. Exp. Stn., Fayetteville, AR 72701. Variety protection will not be sought.

BATES

Dale Sechler

'Bates,' C19211, is a spring oat variety selected in Missouri and released jointly by the Missouri and Nebraska Agricultural Experiment Stations. It originated from a single F_3 plant selection made in a space planted population of the cross 'Pettis' x 'Florida 500.' Bates was grown in the Uniform Early Oat Nursery from 1973 through 1975 as the Mo.06072 selection.

The performance of Bates has been good in Missouri; compared to Pettis it has averaged 2 days later in maturity, 10 cm shorter, 7% less in lodging, 1 kg/hl heavier in test weight, and 445 kg/ha higher in grain yield. Bates is more resistant than Pettis to BYDV, crown rust, and smut.

The Bates variety tillers well and has medium green, relatively drooping leaves. The panicle is medium sized, equilateral in shape, and light green at heading. When ripe both the panicle and straw turn a deep yellow. The kernels are slightly dark in color, moderately plump, and heavy.

USDA Oat Collection

J. C. Craddock

During 1977 Cereal Identification (C.I.) numbers were assigned to 24 oat accessions. I am concerned with such a low figure and fear that much potentially good germplasm is not being added to the Collection. Your breeding materials, not necessarily outstanding to your present research program, could prove very useful in other projects. Please consider contributing this potentially valuable germplasm to the USDA Oat Collection. All that is required is the submission of the sample (any amount up to one pound) and a statement that the material is open stock. Any pertinent information that you care to offer is always very helpful in documenting the accession.

During 1977 there were 5,008 (five gram samples) distributed. 3,762 of these samples were sent to research workers within the United States; the other 1,246 samples went to foreign researchers.

When considering naming a new cultivar, please submit to me the proposed name for clearance through the Trademark and Patent Office. This procedure minimizes the duplication of name and possible infringement on existing trademarks. Please indicate your station number, and C.I. number if one has been assigned.

Please REMEMBER THE GENE BANK before discarding your excess seeds from F_1 and F_2 plants.

A listing of the new accessions to the Collection follows.

OAT CI NUMBERS ASSIGNED IN 1977

CI No.	Name/Designation	Parentage	Source
9293	TERRA	Vicar/2* Random	Canada
9294	ARK 99-23	Bob sib.	Arkansas
9295	ARK 99-35	Bob sib.	Arkansas
9296	ARK 99-98	Bob sib.	Arkansas
9297	APPALOSSA	CI 2874/Cayuse, K7100299	Washington
9298	ARK 99-3	Bob sib.	Arkansas
9299	ARK 99-68	Bob sib.	Arkansas
9300	ARK 99-84	Bob sib.	Arkansas
9301	ARK 99-226	Bob sib.	Arkansas
9302	AR 093-1	Nora/Bruce	Arkansas
9303	IL 65Y-2015-3	Albion/CI 8074	Illinois
9304	IL 65Y-2023-3	Albion/CI 6975	Illinois
9305	IL 65Y-2098-4	Albion/CI 5068	Illinois
9306	IL 65Y-2126-2	CI 5068/CI 6975	Illinois
9307	IL 70-1125	Albion/CI 5068//Albion/CI 8074	Illinois
9308	IL 70-1245	Albion/CI 8074//Albion/CI 6975	Illinois
9309	IL 70-1299	Albion/CI 8074//CI 5068/CI 6975	Illinois
9310	IL 70-1354	Albion/CI 6975//Albion/CI 1915	Illinois
9311	IL 70-1396	Albion/CI 6975//CI 5068/CI 6975	Illinois
9312	IL 70-1468	Albion/CI 1915//CI 8078/CI 6975	Illinois
9313	IL 70-1493	CI 5068/CI 8074//CI 5068/CI 6975	Illinois
9314	IL 70-1548	CI 5068/CI 6975//CI 8074/CI 6975	Illinois
9315	IL 70-1556	CI 5068/CI 6975//CI 8074/CI 1915	Illinois
9316	OXFORD	Involving: GA 85, Clintland 60, OA 48-54 and Stormont	Canada

PLANT VARIETY PROTECTION PROGRESS REPORT

Larry W. Dosier, Examiner

As of February 1, 1978, the Plant Variety Protection Office has received 12 applications for protection of oat varieties. Eight certificates of protection have been issued, one was withdrawn, and one denied. Only the two applications received within the last six months remain pending.

With the exception of 'Coker 234,' all certificates specify that the variety may be sold by variety name only as a class of certified seed. The certificates were issued on the following dates:

'Dal'	- 10/27/76	'Noble'	- 3/18/77
'Goodland'	- 10/27/76	'Allen'	- 3/18/77
'Wright'	- 10/27/76	'Coker 227'	- 10/20/77
'Stout'	- 2/15/77	'Coker 234'	- 10/26/77

The suggestions made in last year's Oat Newsletter should still be followed by those considering application to our office.

Our new application form (GR-470; Jan. 1978) takes account of the change in regulations (effective March 17, 1977) that requires that the seed sample (2,500) and the search and examination fees (total = $500) accompany the application. This should be noted by anyone approaching the application deadline of one year following sale or publication of a variety (section 42(a) (1) (B) of the Plant Variety Protection Act).

Bernard Leese has been named Acting Commissioner following Stan Rollin's retirement on December 30, 1977. Mr. Rollin was the first and only Commissioner since the Plant Variety Office was established.

We have moved within the National Agricultural Library Building. Our new address is:

Plant Variety Protection Office
Livestock, Poultry, Grain and Seed Division
Agricultural Marketing Service, USDA
National Agricultural Library Bldg., Rm 205
Beltsville, Maryland 20705

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