p 31 Buchtrich
44 - Leggett
50 Oh et al
72 dehuller
74 bags/oz wild oats

1980

OAT NEWSLETTER

Vol. 31

May 1981

Sponsored by the National Oat Conference

1980

OAT NEWSLETTER

Volume 31

Edited in the Department of Plant Pathology, Iowa State University, Ames, Iowa 50011. Costs of preparation financed by the Quaker Oats Company, Chicago, Illinois 61654.

May 1981

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Marr D. Simons, Editor

CONTENTS

III. CONTRIBUTIONS FROM OTHER COUNTRIES

PAGE

PAGE

I. NOTES

NEWSLETTER ANNOUNCEMENTS AND INSTRUCTIONS

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

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

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

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

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

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

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

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

Please Do Not Cite The Oat Newsletter in Published Bibliographies

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

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

AMERICAN OAT WORKERS' CONFERENCE COMMITTEE, 1978-81

Executive Committee

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

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C. M. Brown, Representative at large
M. E. McDaniel, Representative at large

Announcement
of
Joint meeting of American Oat Workers' Conference
and First International Oat Research Workshop

This is to announce a joint meeting of the American Oat Workers' Conference and the First International Oat Research Workshop to be held June 21-23, 1982 at The Pennsylvania State University, State College, Penna., USA. The American Oat Workers' Conference has met once every 4 years, but this will be the first international meeting of oat workers. The future need for such international meetings will undoubtedly be judged by the success of the 1982 meeting in the USA. This announcement is made now so as to allow ample time for non-USA oat workers to seek funding and foreign travel authorization.

You should have received an announcement of this meeting in the mail and a first call for volunteer paper presentations. The language of the Workship will be English and presentation time will be limited to 20 minutes. Present plans are to publish abstracts of papers in the Oat Newsletter (of the American Oat Workers' Conference), but a committee is considering the feasibility of publishing a proceedings. A second announcement and final call for papers will be made in January, 1982. The deadline for receipt of paper titles will be April 1, 1982. In addition to volunteer papers, you are encouraged to provide suggestions for panel discussions.

If you tentatively plan to attend the First International Oat Research Conference and did not receive the mail announcement, you will need to contact me in order to receive future mailings of information regarding that meeting.

Harold G. Marshall, Secretary
American Oat Workers' Conference

1980 NORTH CENTRAL (NCR-15) OAT WORKERS FIELD DAY

The 1980 North Central Oat Workers Field Day was held June 29-31 at the University of Minnesota, St. Paul. An informal evening meeting was enjoyed by the group Sunday, June 29.

The oat workers were welcomed to the campus the following morning by Dr. Deon Stuthman, leader of the oat project and Dr. Richard Sauer, Director of the Agriculture Experiment Station.

Dr. Bob Wych and Dr. Steve Simmons discussed their studies of oat physiology. Dr. Wych discussed experiments examining nitrogen uptake, translocation and mobilization and indicated results suggest nitrogen harvest index is positively correlated with harvest index and negatively correlated with total nitrogen accumulation across genotypes. Studies of the physiology of a dwarf oat were explained by Dr. Simmons. The dwarf produces more tillers than conventional height varieties. Dr. Simmons also described studies of nitrogen remobilization and effects of source and sink manipulation on rate of kernel development.

Four graduate students explained their thesis research. The effect of recurrent selection for grain yield on various plant characters was discussed by Jim Radtke. Mark Van Horn explained research comparing the efficiency of selecting for increased grain yield before crown rust resistance with selection in the reverse order. Jim Luby discussed a study testing the relationships of tetrad micronuclei frequency of Avena fatua/A. sativa F_1 hybrids with genetic recombination. Multivariate analysis is being used to examine relationships of parents to progeny. Bob Nielson explained a study of "alleleopathic" relationships of 5 oat varieties with 6 alfalfa varieties.

Dr. Howard Rines reviewed his work with tissue and anther culture and mutagenesis using sodium azide, ethidium bromide and EMS. Space planted screening nurseries of mutagen treated populations were observed. Dr. Rines also explained a study of the components of straw strength.

Dr. Deon Stuthman guided the group through the breeding nurseries and explained some of his philosophies regarding selection and testing. Breeding nurseries toured included a space-planted F_2 nursery, a 5000 entry 10' single row F_3 nursery, a 4-row protein selection nursery, 2000 entry F_4 hill plot nursery, preliminary and advanced yield trials.

The group enjoyed a lunch sponsored by the Milling Oats Improvement Association and continued the field tour in the afternoon in the buckthorn crown rust nursery. Dr. Paul Rothman explained that this nursery provides an environment in which the rust fungus can hybridize readily allowing evaluation of resistance of breeding lines against more of the potential virulence of the disease.

The tour proceeded to the Rosemount Station and observed the Uniform Midseason Oat Performance Nursery and Oat Variety Trials which included advanced experimental lines. A nursery used for screening lines for smut resistance was toured. Dr. Roy Wilcoxson indicated that seed of entries for this nursery is vacuum inoculated with smut before planting. After flowering the entries are evaluated for smut reaction using percent smutted heads.

Dr. Stuthman discussed experimental weed control plots using DPX 4189 at .03 lb/A for control of grasses and broadleaf weeds in oats.

The tour was adjourned. Thanks to the staff and students at the University of Minnesota for enjoyable and informative field days.

Respectfully submitted,

M. S. McMullen

Michael S. McMullen
Secretary NCR-15

OAT WORKERS IN ATTENDANCE, NORTH CENTRAL FIELD DAY

Markus Andres
Lee Briggle
Marshall Brinkman
Doug Brown
Ed Deckard
Deon Duebbe
Ron Duerst
Karen Ela
Hal Fisher
Bob Forsberg
Ben Hable
Lon Hall
Richard Halstead
Jonathan Hanft
Larry Haugen
Mark Hughes
Randy Jeppson
Herb Johnson
Russ Karrow
Bill Laskar
Ken Lebsock
Eunice Link
Jim Luby
George Luk
R.I.H. McKenzie
Mike McMullen
J. W. Martens
Matt Moore
Frank Moser
Bob Nielsen
Dave Petersen
Jim Radtke
Jonathan Reich
Howard Rines
Bruce Roskens
Paul Rothman
Richard Sauer
Don Schrickel
H. L. Shands
Greg Shaner
Steve Simmons
Marr Simons
Jim Stage
Deon Stuthman
Mark Van Horn
Sam Weaver
Roy Wilcoxson
Bob Wych

MEETING OF THE NATIONAL OATS IMPROVEMENT COUNCIL

March 24, 1981 - Chicago, Illinois

In attendance from the NOIC:

K. J. Frey - Iowa State University
R. A. Forsberg - University of Wisconsin
P. J. Langston - USDA Oat Quality Lab., Madison, Wisconsin
H. G. Marshall - USDA, Penn. State University
M. E. McDaniel - Texas A&M University
C. F. Murphy - USDA, Beltsville, Maryland
H. W. Ohm - Purdue University
D. M. Peterson - USDA Oat Quality Lab., Madison, Wisconsin
G. E. Shaner - Purdue University
D. D. Stuthman - University of Minnnesota

In attendance from Quaker Oats:

Felix Germino	Ed Oliszewski	Bill Whiteford
Oscar Gilbert	Nancy Pitz	Fran Webster
Dave Hurt	Dave Albert	Lee Young
Ted Moeller	Bruce Sampsell	Mao Yueh
Dave Nogle	Sam Weaver	

This meeting of the NOIC was called specifically to discuss priority research and production support needed to keep oats an economically and nutritionally valuable food and feed grain. Decreases in oat acreage, decreases in financial support, and the low priority ranking assigned to oat programs in comparison with such major market and export crop-programs as corn, soybeans, and wheat emphasize the need for aggressive, meaningful plans to increase the productiveness and utility of oats.

The Committee assembled for lunch kindly hosted by Quaker Oats and during which brief comments were delivered by D. J. Schrickel and by the state and federal oat workers on behalf of their station programs. After lunch the group adjourned to the Quaker audio-visual conference room.

Dr. Fran Webster, biochemist in the Quaker Oats Research Laboratory at Barrington, initiated the program with a discussion of the structure, function, and chemical composition of oat groats including description of some newer laboratory evaluation techniques. Dr. Dave Peterson then described the current budget and present and future support needs of the U.S.D.A. Oat Quality Laboratory.

The remainder of the meeting was devoted to a discussion of "Oat Research Priorities" lead by Dr. Deon Stuthman, University of Minnesota. Options discussed, should increased funding from public or private sources become available, included:

(1) Maintaining or increasing the current levels of support for public oat programs and for existing Federal oat research and support facilities and programs.

(2) The expansion of specific areas of oat research at certain institutions.

(3) The advantages and disadvantages, relative to immediate and long range needs, of emphasis on basic and applied research.

(4) Funding for capital purchases.

The underlying philosophy of the above approaches centered on the need to build on existing strengths.

The most vigorous recommendations were presented after the above points were discussed and these conclusions centered on the need for immediate action and immediate and visible gains:

(a) There is a clear-cut need for immediate progress if the status of oats as a viable crop is to be maintained. Improved "management" could show immediate gains in TDN per acre.

(b) Item (a) translates into the immediate, critical need to increase oat grain yields per acre. This is necessary if oats are to compete with corn, soybeans, and wheat in the U. S. agricultural economy.

Consideration of detailed and specific program recommendations becomes the next step in meaningful deliberations. Comments and suggestions from oat workers are welcome. It is likely that a further discussion will be held during the 1981 NCR-15 Oat Workers Field Day.

Respectfully submitted,

Robert A. Forsberg
Chairman, American Oat Workers Conference

REPORT OF THE LEGISLATIVE SUBCOMMITTEE OF THE AMERICAN OAT WORKERS CONFERENCE

Committee Members: L. W. Briggle, R. A. Forsberg, K. J. Frey, H. G. Marshall, C. F. Murphy, D. J. Schrickel, D. D. Stuthman

Committee members assembled in Washington, D.C. the evening of March 24, 1981, for a strategy-planning session. All members except Dr. Briggle had attended a planning session of the National Oat Improvement Council (NOIC) in Chicago earlier that day and the advice and counsel of NOIC members provided strength and guidance for visitation deliberations. We were joined by P. C. Racey, Government Relations Counsel for Quaker Oats, who helped us establish our visitation contacts and provided valuable leadership and insight.

The Committee visited the following offices and persons, noting that Dr. Briggle and Dr. Marshall did not participate in the legislative visits:

March 25, 1981.

(1) Mr. Robert Foster, Staff Assistant to Congressman Jamie Whitten, House Appropriations Sub-Committee on Agriculture and Related Agencies.

(2) Mr. Stephen Kohashi, Majority Staff Counsel for Senator Thad Cochran, Senate Appropriations Sub-Committee on Agriculture and Related Agencies.

(3) Ms. Mollie Frantz, Office of Management and Budget (OMB; Executive Branch).

Dr. Denis Prager, Assistant Director, Office of Science Technology Policy (Executive Branch).

(4) Dr. Anson Bertrand, Director, Science and Education Administration, U.S.D.A.

Dr. Gerald S. Still, Senior Scientist-SEA Staff for Plant and Entomological Sciences.

March 26, 1981.

(5) Mr. Jack Brock, General Accounting Office (GAO).

Summary: With Foster and Kohaski we emphasized

(a) the need for continued support for existing federal oat research facilities and programs, and

(b) the need for support for crop germplasm evaluation, especially the oat collection.

With Ms. Frantz and Dr. Prager we discussed the need for continued support for long term, unglamorous, but productive crop breeding and research programs and of the need for apparently similar programs in different geographical areas of adaptation.

Dr. Bertrand advised us to proceed independently with our oat germplasm evaluation program and not to wait for a joint small grain or agronomic-crop program.

Mr. Jack Brock is preparing a report on germplasm management and utility within the U.S.D.A. We were able to offer pertinent suggestions for program improvements.

(6) Research Staff, Beltsville Agricultural Research Center.

Following lunch with Dr. Marshall Levin, the Committee had a 1-hour round table discussion with

Dr. P. S. Baenziger - Wheat and Barley Breeder located at Beltsville in the Field Crops Laboratory. Steve is Uniform Nursery Coordinator for several Eastern and Southern Nurseries.

Dr. J. G. Moseman - Research Plant Pathologist, now coordinator for the International Oat Rust Nursery.

Dr. W. M. Porter - Agronomist and Computer Program Specialist for the Small Grains World Collection Program. He is in the Germplasm Resources Laboratory.

Dr. D. H. Smith, Jr. - Curator of the Small Grains World Collection. He is in the Germplasm Resources Laboratory.

Dr. A. K. Stoner - new Chairman of the Plant Genetics and Germplasm Institute, Beltsville.

The Legislative Sub-Committee has established excellent rapport with persons in certain key Legislative and Executive Offices and with U.S.D.A. administrators. Our requests have been meaningful and our credibility gives us a strong base from which to address the needs of oat workers. We intend to maintain this activity on at least an annual basis, and we are indebted to the Milling Oats Improvement Association for financially supporting this visitation activity.

Respectfully submitted,

Donald J. Schrickel.

HOW TO PROMOTE OATS VARIETIES AND HAVE A GOOD TIME DOING IT

Samuel H. Weaver

The Quaker Oats Company has been funding oats variety development at a number of midwestern universities for over 40 years. During this period, many oats varieties exhibiting improved insect and disease resistance, high yield potential, relatively high protein content, and better milling quality have been released. Generally, the state foundation seed organization or crop improvement association is charged with the increase and distribution of new oats varieties. The state experiment station publishes a release notification and the aforementioned organizations distribute seed availability notifications. Additionally, the state extension services publish agronomic descriptions and performance data annually. Once the seed reaches the local seed outlet; which may be a feed and/or fertilizer company, grain elevator, or seed company; there is little or no active promotion of the qualities, neither agronomic nor economic, of the new varieties.

In order to promote new varieties, as well as the production of oats, Quaker has tried a number of methods. One of the most obvious methods is to contract oats production which requires the use of new varieties, as well as older, accepted varieties, along with a management plan. Promotion through contracting was fairly successful, but very expensive. The most exciting promotional endeavor has been the Oats Improvement Program. The basic concept of this program is the growing of well-adapted oats varieties along with the best possible management practices. Cash prizes serve as the major incentives. In order to fully understand the program, one first must know a little background.

In 1963, Dallas E. Western of The Quaker Oats Company and six vocational agriculture instructors in eastern Iowa met with the purpose of promoting oats production. They formulated a program that emphasized the use of adapted oats varieties, proper tillage methods, timely planting and harvesting, and adequate fertilizer applications. The newly born Oats Improvement Program was to be administered by Quaker, regulated by the vocational agriculture instructors, and performed by the students of vocational agriculture that participated in the program. The participants who demonstrated proficiency in their performance were to be rewarded in a modest way. The actual premium was one dollar for each bushel of oats in excess of 75 bushels per acre for one measured acre. The first year the program was offered was highly successful. There were participants representing about twenty schools. An awards banquet was held at the end of the season to honor the winners as well as the participants who were not fortunate enough to qualify for a cash award.

Subsequent to this first year, the Oats Improvement Program underwent several changes. In the late 1960's, the cash awards were based on the pounds of groat-protein production per acre. This change was in response to Quaker's emphasis on the level of protein in the cereal based products. Due to a change in the labeling standards directed by the Food and Drug Administration, the marketing advantage to Quaker, relative to protein levels in unfortified products, became nonexistent. Consequently, in 1976 the premium scale was changed to reflect the always present, but renewed interest, in yield per acre with a reduced emphasis on protein. In 1977, the premium scale was increased to $2 per bushel for each bushel in excess of 80 bushels per acre. In addition, a $500 scholarship was awarded to one qualifying student in each of the three states in which the program is offered, Iowa, Minnesota, and South Dakota. In 1978, the scholarship was increased to $1,000.

Over the years, the Oats Improvement Program has expanded substantially. In 1980, over 700 students from 100 schools participated. Approximately $33,000 in cash premiums and scholarships were awarded. Due to extremely favorable acceptance of the program by instructors, students, parents of participants, and Quaker management, I think I am safe to say that the program will continue and will be expanded.

With this brief history in mind, one might question the value of the Oats Improvement Program to all concerned. The program has served as a valuable teaching aid for the vocational agriculture instructors, a terrific learning experience for the participants and their parents and an important promotional tool for Quaker. Many proficiency opportunities are available to students and instructors in the area of livestock production, but few are available to these people for crop production. This has been the primary factor influencing the acceptance and progress of the program. Admittedly, the cash incentives have aided the success as well. The program offers opportunities for teaching and learning management practices and proper record keeping. Unquestionably, the participants and their parents have gained valuable insights into the profitability of oats, if yield potentials are maximized.

The direct benefits to Quaker are difficult to measure in monetary terms. However, distinct values can be recognized. For example, the program serves as a method of demonstrating the advantages of newer, higher yielding oats varieties developed at public institutions receiving financial support from Quaker. Additionally, there is a small percentage of the farmers who have children enrolled in the program who would not be growing oats were it not for the Oats Improvement Program. This is very important to Quaker as a major commercial user of oats, especially in view of the fact that oats production has declined sharply over the past two decades.

I think that if the value of good will could be measured with a meter stick, Quaker would have accumulated several hundred kilometers as a result of this program. Some of the participants are not scholastic, athletic, or social stars; however, they are very capable in the area of oats production. These people are honored at the banquets, thus receiving some degree of positive reinforcement and giving a feeling of pride to their parents and instructors. Obviously, those participants who are exceptional scholars and Future Farmers of America achievers are also recognized with the same positive reinforcement. This reinforcement has had and will continue to have an impact on all concerned with the program relative to oats production and to good will.

It is apparent that other promotion methods are available, but the Oats Improvement Program initiated eighteen years ago by Quaker, has been very successful. Certainly, adaptations can be made from this program for any geographic location. If there is interest in promoting oats varieties and production in a similar manner, one might organize a program through the local County Extension Service. The 4-H leaders might serve as regulators and local businesses might be willing to serve as sponsors. Use your own imagination, promote oats, and have some fun.

NEW PURCHASING METHODS FOR OATS

A. Bruce Roskens

For many years the Quaker Oats Company has been a leader in the area of working with the farmer and elevator towards the goal of profitable oats production. We have offered a variety of purchasing and premium agreements over the past several years, beginning with acreage contract programs back in 1962 in eastern Iowa, and eventually spreading out to include most of Iowa, Minnesota, and eastern North and South Dakota. These programs were accepted well by nearly everyone involved in oats production and marketing. As marketing, farming, milling, and production needs and trends have changed, we have altered our programs and purchasing agreements to try to make oats profitable to all concerned. We changed premiums, emphases, and locations to reflect changes in acreages and needs for higher protein and better milling quality oats. In keeping with the belief that oats can and must be a profitable crop to all parties involved, we would like to announce a change in our purchasing policy for oats. The Premium Oats Program, a production and purchase contract offered by Quaker for the past several years, is not being offered in 1981.

Instead, we would like to offer a new premium scale program available to all oats producers and elevators which we feel is far more equitable and profitable to all parties concerned--farmer, elevator, commission company and Quaker Oats. This premium is based on Quaker's bid for No. 2 Heavy White Oats, 38 pounds, 96 sound oats basis. The premium scale will reward the farmer and/or elevator for producing and marketing higher quality milling oats. The premium scale we are offering is as follows:

TEST WT. PREMIUMS FOR OATS WITH MINIMUM 98% SOUND CULTIVATED OATS		SCO PREMIUMS (BEGINNING W/34# OATS)	
Lbs. per bu.	Prem. per bu.	% SCO	Prem. per bu.
38.5	1¢	98	2¢
39	2¢	98.5	3¢
39.5	3¢	99	4¢
40	4¢	99.5	5¢
40.5	5¢		
41	6¢		
41.5	7¢		
42	8¢		

As you can easily see, this scale will reward the seller a premium for higher than average quality oats. This should help encourage the use of best quality seed, fertilizer, and cultural practices, and encourage keeping the oats clean or cleaning them before selling. In this manner, all parties should benefit. The producer will obtain premiums directly correlated to his production methods, the

elevator can gain by cleaning the oats or at least maintaining clean oats, and the grain miller should obtain better mill yields, reducing their costs.

Sound cultivated oats (SCO) is an official USDA grading factor. Quaker Oats will begin grading truckloads of oats at our plants for SCO, as well as our other grading factors, as we do currently on rail cars of oats. The official USDA definition of Sound Oats is as follows:

> SOUND OATS ARE KERNELS AND PIECES OF KERNELS OF OATS (EXCEPT WILD OATS) WHICH ARE NOT BADLY GROUND DAMAGED, BADLY WEATHER DAMAGED, DISEASED, FROST DAMAGED, HEAT DAMAGED, INSECT BORED, MOLD DAMAGED, OR OTHERWISE MATERIALLY DAMAGED.

We hope that this premium scale helps meet the needs of many oats producers who are looking for a market for high quality milling oats.

This premium scale will be in effect until further notice.

Virulence in Ustilago avenae in Wisconsin

D. C. Arny, D. T. Caine, F. B. Diez
University of Wisconsin

Tests on a number of oat smut collectors were continued in 1980, on the standard differentials and a number of cultivars. Inoculations were made by the partial vacuum method and plantings made in the field. Counts were made on the panicle basis. In most cases each of the collections came from a single cv. in 1979, and several had been maintained on the same cv. for several years.

A summary of cv. reactions to 19 collections is given in Table 1. On the basis of average infections, there appeared to be four classes: Anthony was highly susceptible, several (e.g. Ajax and Beedee) moderately susceptible, Jaycee and the three Wis. selections highly resistant, and others such as Lyon, Marathon and Moore, moderately resistant.

The range of smut infection indicates the variation in reaction of the cvs. to the collections. The 0's in the ranges is due to the fact that several collections were from "older" sources and do not have virulence on newer cvs. The high figures in the ranges perhaps forecast what could happen to Lyon, Marathon and Moore in the future. Jaycee and the three selections would appear to be more "durable" in their resistance. X2459-8 has Jaycee in its parentage and X3420-1 has Garland, which may account for their resistance. The source of resistance in X3521-1 is not evident.

Smut from relatively high infections (35-45%) on Lyon, Marathon and Moore in 1979 was put back on those cvs. in 1980. Infections in 1980 were less than 10% - thus no build-up of virulence was indicated.

Some indication of the distribution of reactions is given by the number of collections which gave infections of 10% or less, taking this as an arbitrary separation between resistance and susceptibility. Anthony, as a check from the differentials, was susceptible to all collections, Jaycee and the Wis. selections resistant to all, and a rather complete range in between. It is of interest to note that Lyon was resistant to the same 16 collections as its parent Portage, i.e. both had the same virulence pattern. Beedee and Lodi were resistant to the same six collections, although the reason for this is not so obvious. The virulence patterns for the other cvs. were all different.

The same 19 collections, plus two others, were tested on the 13 smut differentials. The virulence patterns are summarized in Table 2. All collections gave relatively high infections on Anthony, Black Diamond, Black Mesdag, and Victory, while no collection gave more than two percent infection on Camas or Markton (Camas = Markton x Victory). On the basis of the seven remaining differentials, there were 15 different virulence patterns.

The wide range of virulence patterns indicates the presence of considerable variability in U. avenae, which is not surprising. I do not believe that attempting to assign race designations to these collections would serve any useful purpose. However, in comparing these patterns with those for described races, it is clear that the present collections are quite different than the older races. Collection 11 and 13 fit the old race 4 of U. avenae (Holton & Murphy, ARS 34-83, 1966), since it was virulent on Anthony, Black Diamond, Black Mesdag and Victory, as well as on Monarch. No other described race was simultaneously virulent on the first four.

We must admit that there are some unexplained variations among our various tests. A similar test on the differentials made in 1979, gave a number of different virulence patterns even though many of the collections were essentially the same as in 1980, except for being one generation earlier. For example, Camas and Fulghum had several infections somewhat above 10% in 1979, but none in 1980, and, Navarro had none above 10% in 1979, but several in 1980. Markton had no infections greater than 5% in either year in our tests. However, Illinois reported relatively high infections in Camas and Markton in 1979 (Coop Uniform Midseason Oat Performance Nursery for 1979). Using a sample of their collection (from Jedlinski), we found no infection in either Camas or Markton.

In conclusion, oat smut still is a disease which needs continued watching. Sources of good resistance are available for breeding purposes. A seed certification program which takes smut into account should be able to produce smut free seed even of susceptible cultivars.

Table 1. Reactions of oat cultivars to 19 collections of oat smut, Ustilago avenae, Madison, Wisconsin, 1980.

Cultivar	Percent smut[a]		No. collections	
	Ave	Range	≤10%	>10%
Ajax	20	6-42	3	16
Anthony	58	16-90	0	19
Beedee	22	0-54	6	13
Clintland 64	8	0-19	12	7
Dal	6	0-19	15	4
Froker	32	0-68	4	15
Garland	6	0-16	16	3
Garry	14	0-33	7	12
Goodland	2	0-13	18	1
Holden	12	2-22	8	11
Jaycee	1	0-3	19	0
Lodi	27	0-60	6	13
Lyon	4	0-24	16	3
Marathon	6	0-19	15	4
Moore	8	0-31	13	6
Portage	3	0-20	16	3
Richland	24	10-39	1	18
Rodney	26	2-38	7	12
Vicland	23	8-45	1	18
Wright	22	0-53	7	12
X2459-8	Tr	0-2	19	0
X3420-1	0	0	19	0
X3521-1	Tr	0-2	19	0

[a] Smut percentage based on panicle counts, 50 panicles in two replications for each cv. X collection.

Table 2. Virulence patterns of 21 collections of U. avenae on the standard differential cultivars. Madison, Wisconsin. 1980.

Collection no.	Virulent on differential no.:[a/]
6	5,6,7,10,11,12
9	5,7,10,11,12
21	5,6,7,9,12
5	5,6,10,11
17	5,7,10,12
8 & 18	7,10,12
3	5,7,12
4 & 10	7,11,12
7	5,11
14	7,9
15	5,6
16	6
19, 20	7
11 & 13	9
1, 2, & 12	None

Key to differentials

5 - Clintland 64
6 - Fulghum
7 - Gothland
9 - Monarch
10 - Navarro
11 - Nicol
12 - Victoria

[a/] Infection greater than 10%.
All collections were virulent on Anthony, Black Diamond, Black Mesdag, and Victory.
No collection was virulent on Camas or Markton.

Greenbug Resistance in Oats

Norris E. Daniels and Louis D. Chedester

Greenbugs collected by Daniels and Chedester from a field near Bushland in November and December 1979, destroyed the formerly resistant wheat Amigo in a laboratory test. They were designated biotype E. Specimens collected from the same field and other locations in the Texas Panhandle during the following spring and summer also proved to be biotype E.

In 1980, 551 oat selections from the USDA World Collection were tested in the greenhouse for biotype E greenbug resistance. Of these, 7 had ratings of 3.0 to 3.3, table 1. Thirty to 40 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.

Table 1. Greenbug resistant oat selections, Bushland, 1980.

P. I. Number	Designation	Source	Rating
296149	Hasan	U.S.S.R.	3.0
296153	Sovetskij	U.S.S.R.	3.3
296162		U.S.S.R.	3.3
296168		U.S.S.R.	3.1
296177		U.S.S.R.	3.2
296178		U.S.S.R.	3.2
306384	Unnamed		3.3

Rusts of Oats in 1980

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

Oat stem rust was first observed during 1980 in a Beeville, Texas forage nursery on March 31. This was one month later than 1979 and two weeks later than the 40-year mean. Stem rust severities were high late in the season in some Texas nurseries but minimal in commercial fields and stem rust resulted in only trace losses. By mid-June traces of oat stem rust were reported as far north as southeastern South Dakota. In early-July, traces of rust were scattered throughout the northern oat growing area and even though the initial rust was present earlier than normal, losses were minimal. This was due to the earlier than normal crop maturity, low rainfall, and the low amount of initial inoculum arriving from the south.

In 1980, oat stem rust race NA-27 was the most prevalent race identified from 1150 isolates obtained from 433 collections made in the U.S.A. NA-27 comprised 78% of all isolates (Table 1) and was the most commonly identified race. In 1979, NA-27 comprised 94% of the isolates. The frequency of NA-16 was greater than 1979 because a higher percentage of the isolates from wild oats were identified as NA-16. Isolates of race NA-5 were identified from collections made throughout the USA with the greatest number made in Texas nurseries.

Oat crown rust development throughout the southern USA was light in commercial fields even though it was severe on susceptible cultivars in some nurseries. Generally, light severities of crown rust were observed in the northern USA commercial oat fields due to a low amount of exogenous inoculum and generally unfavorable environmental conditions. However, losses did occur in some late maturing fields and fields near buckthorn in Minnesota and Wisconsin.

Table 1. Physiological races of stem rust identified from 1980 collections made from oats.

State	Source	Number of Collec.	Number of Isol.	Percent of isolates of each race[a/] NA-5	NA-12	NA-16	NA-23	NA-27	NA-25	NA-26
CA	Wild oats	1	3	67		33				
GA	Nursery	1	3					100		
IL	Field	8	9					100		
	Nursery	8	20			10		90		
IN	Nursery	1	3					100		
IA	Field	4	12					100		
	Nursery	18	44	7		9		84		
KS	Nursery	1	3					100		
LA	Nursery	2	6			50		50		
MI	Field	5	15	7				93		
	Nursery	2	6					100		
MN	Field	77	207			4	1	95		
	Nursery	34	88	8		16		76		
	Wild oats	18	45			53		47		
ND	Field	5	15					100		
	Nursery	10	22			27		73		
	Wild oats	19	44			39		61		
OK	Nursery	1	3					100		
SD	Field	21	58			3		97		
	Nursery	15	40			7		93		
	Wild oats	11	25			40		60		
TX	Field	1	3	100						
	Nursery	161	451	19		8	3	70		
WA	Wild oats	1	3	100						
WI	Field	5	14					100		
	Nursery	3	8			12		88		
USA	Field	126	333	1		3	1	95		
	Nursery	257	697	14		10	2	74		
	Wild oats	50	120	4		43		53		
	Total	433	1150	9		11	1	78		
Mexico[b/]	Nursery	19	36	3		11		86		
	Wild oats	12	36	5		42		53		
Canada[c/]	Nursery	15	22		27		4	14	41	14

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

[b/] Collections were from eastern Mexico.

[c/] Collections were from Ontario, Canada from areas near barberry bushes.

III. CONTRIBUTIONS FROM OTHER COUNTRIES

NEW SOUTH WALES OAT CROP 1980-81

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The area sown to oats is estimated at 580,000 hectares of which 320,000 hectares were sown for grain production. However because of prolonged drought conditions 25,000 hectares failed leaving 295,000 hectares to be harvested. Grain production was 330,000 tons and yield 1.03 tons/hectare based on area intended for grain production.

The season was extremely dry overall in all sections of the State except for the South West Slopes which received reasonably good rainfall during the late autumn - early winter. However as the early autumn was dry everywhere there was practically no oats sown early with the intention of obtaining prolonged winter grazing and a subsequent recovery for grain. Most crops were sown in May when many areas received their best rainfall during the season. The late winter - early spring were very dry everywhere resulting in loss of potential grain yield and heavier graizing than usual.

Stem and leaf rust were only rarely found but loose and covered smuts were fairly widespread.

The variety picture is changing very slowly. Cooba is in first place (42.2%) a position it has held since 1965. Collabah has 22.7%. Blackbutt, a comparatively new variety is in third place with 9.4% of total sowings. Less important varieties are Cassia, Algerian, Avon, Belar, Saia and Swan.

DWARF OATS FOR SOUTH AUSTRALIA

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Crosses made to the Canadian dwarf mutant OT207 ("Dwarf OT184") were first made in 1977. Lines derived from these crosses have now been yield tested at a number of sites over two seasons. Reselected F6 lines were tested in 1980 at two sites. These lines are now quite uniform and will enter widespread testing and parallel seed multiplication in 1981.

Most of the lines under test are crosses to West. These lines have excellent lodging and shattering resistance, useful BYDV tolerance and are one-half to two-thirds the height of 'normal' varieties. They are segregating for pg 9 - Sydney University will screen selections for this gene. The major problems encountered in this dwarf programme have been

1. Detecting good grain quality
2. Detecting early maturing segregants from crosses with varieties such as Swan and Moore.

The former problem appears to be overcome but the latter is still presenting difficulties. In contrast lines developed from West crosses provide a wide range of maturity with some as early as the adapted variety.

Results from two trials are presented below from vastly different growing conditions.

Table 1: Performance of selected lines at Birdwood, South Australia in 1980

	Yield (kg/ha)	Mature Height (cm)	Lodging 8 5 2	100 grain weight (g)
West	3881	125	7	3.4
Swan	4794	160	5	4.2
Avon	4490	155	3	4.5
West x OT 207/3/1	6768	90	8	3.5
West x OT 207/54/2	6751	95	8	4.0

Table 2: Performance of selected lines at Pinery, South Australia in 1980

	Yield (kg/ha)	Mature Height (cm)	Shattering (spikelets/m.row)
West	873	45	18
Swan	764	60	39
Avon	714	50	19
West x OT 207/2/13	1071	30	0
West x OT 207/3/13	1210	40	0

DWARF OATS

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Crosses made in 1975 to the Canadian dwarf mutant O.T. 207 (Dwarf O.T. 184) have now been yield tested over three seasons at four sites in Western Australia. The results are extremely promising.

Over the period of testing no lodging has been observed in the material even when current commercial varieties have been completely lodged. Shedding resistance has also been extremely easy to obtain at levels superior to current commercial varieties, which have been regarded as having good shedding resistance.

There was considerable variability in the degree of emergence of the head, but lines showing complete head emergence were readily selected. This is in contrast with problems reported by other oat breeders where they have found complete head emergence difficult to achieve.

Yields of the material have been quite outstanding. So far yield trials have only been conducted with F2-derived bulks but we have lines which have consistently outyielded West (our current best commercial variety) by 20-40% in the areas where we expect to grow the dwarfs commercially.

Grain plumpness and hectolitre weight have been the most difficult characters in which to achieve satisfactory quality, and a large percentage of material is discarded on these characters. However, promising lines have been obtained which are acceptable on all counts.

Lodging resistance and short straw are such major needs in oat varieties in our high rainfall areas that we are working towards the release initially of F2-derived lines once they have been adequately tested.

VIRULENCE SURVEY OF OAT CROWN RUST IN AUSTRALIA, 1978-80

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Concurrent with the annual race survey of oat crown rust, the following nine oat lines have been tested for potential value in breeding for crown rust resistance in Australia:

A	Ascencao	F	Pc-50
B	Pc-38	G	Pc-55
C	Pc-39		Pc-56
D	Pc-45		TAM 0-312
E	Pc-48		

Letters A-G refer to Table 1.

Samples of crown rust were collected from roadsides and farmers fields, each site being represented by one sample. Seedling tests were conducted with a spore-suspension prepared directly from the rust samples received. The samples were not only examined for virulence to the nine oat lines, they were also classified into race groups, using the International Differential Set. Where mixtures of strains occurred and identification was difficult, isolates were taken. Over a period of two years (1978/79 and 1979/80) a total of 641 isolates were identified from all mainland states, which were divided into zones (1 = Queensland, 2 = Northern New South Wales, 3 = Southern New South Wales, 4 = Victoria, 5 = South Australia, 6 = Western Australia).

Some isolates were not fully virulent, but reacted with a high infection type. They are indicated by the use of parentheses (Tables 1 and 2). No virulence has been detected for either Pc-56 or TAM 0-312. Whereas virulence for Pc-38 was widespread throughout Australia, virulence for the combination (Pc-39)Pc-45(Pc-48) occurred relatively frequently only among samples from zones 1, 2 and 3.

The distribution of cultivars carrying resistance genes, derived from the International Differential Set, may account for the geographical differences in race pattern. The variation in virulence to the resistant oat lines would be more difficult to explain as they have not been used in the development of commercial cultivars in Australia.

Table 1. Numbers and percentages of isolates, identified with virulence to individual resistant oat lines over a period of two years (1978/79 and 1979/80) for all zones.

Survey Year	Total Number of Isolates	Virulent on Oat Lines						
		(A)*	B	C(C)	D	(E)	F	(G)
1978/79	376	1	150	25	26	22	1	5
1979/80	265	0	75	33	30	27	0	5
2 Years (1978/80)	641	1	225	58	56	49	1	10
Perc. of 2 year total	100	0.2	35.1	9.1	8.7	7.6	0.2	1.6

*Parentheses indicate isolates not fully virulent.

Letters A-G refer to lines mentioned in text.

Table 2. Numbers and percentages of isolates, identified over a two year period (1978/79 and 1979/80), grouped according to zone, and to virulence for single resistant oat lines or their combinations.

Virulence on Oat Lines	Zones						All Zones	Percentage of Total Number of Isolates
	1	2	3	4	5	6		
Avirulent	47	126	41	39	46	50	349	54.5
(Ascencao)*		1					1	0.2
Pc-38	76	97	10	16	10	15	224	35.0
Pc-45	2	3					5	0.8
Pc-50				1			1	0.2
Pc-39, Pc-45		1					1	0.2
(Pc-39)Pc-45		1					1	0.2
Pc-39, Pc-55	1		1	7			9	1.4
Pc-39(Pc-55)				1			1	0.2
Pc-45(Pc-48)		2	1				3	0.5
Pc-39, Pc-45(Pc-48)		1					1	0.2
(Pc-39)Pc-45(Pc-48)	10	26	7		1		44	6.9
Pc-38(Pc-39)Pc-45 (Pc-48)		1					1	0.2
Total Number of Isolates	136	259	60	64	57	65	641	

*Parentheses indicate isolates not fully virulent.

SINGLE SEED DESCENT - TWO DECADES

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While the single seed descent technique, as we now call it, was applied to oat breeding at Lacombe, Alberta, 20 years ago, the credit for its original proposal as a tool in genetic studies more than 40 years ago, must go to Dr. Cyril Goulden, then a plant breeder at Winnipeg. It appeared to be a good method for oat breeding at Lacombe because there are no serious oat diseases in Alberta and there are no stringent quality requirements. We had not been successful in selecting for yield in segregating populations although our objective had been to increase productivity. The method involves taking a single seed from each F2 plant to develop the F3 and so on until virtual homozygosity is reached, when lines are first yield tested and crosses are evaluated.

The first crosses were made in 1960 and from one of these 'Random' was developed, licensed and distributed in 1971. Less time is now required to advance generations because growth cabinet facilities now in use were not available in the early stages of this program. Cavell, Athabasca and Cascade, the latter a derivative of Random, have recently been licensed. In less than 20 years two cycles have been completed.

A system has been developed to evaluate crosses in conjunction with the seed increase of lines in the F7 generation. Fifty lines from each of 5-8 crosses are seeded in blocks of 5 m rows 45 cm apart with one line from each cross in a block along with one or two controls. The average yield, maturity, lodging and growth rate are obtained for each cross and control and the CV calculated. From this information the crosses that we wish to work with are chosen. It is felt that by evaluating and selecting crosses the probability of obtaining superior lines is increased. If only small differences are found between crosses and they compare favourably with the controls they are tested further in replicated trials. If a particular cross shows a high potential for the criteria being sought all of the available lines are yield tested, which may require more than one season depending upon the physical capabilities. Promising lines are initially compared in yield trials of two replications at two or three locations and superior lines are then advanced for more extensive and intensive testing.

A relatively small number of crosses have been used in the program, averaging five per year, with parents chosen on the basis of their performance record in the area. The genetic base is maintained by introducing unrelated material from other sources.

One of the advantages of the single seed descent method is that the same lines used for plant breeding purposes can be used for genetic or correlation studies because they are random lines. Regardless of the plant breeding method used for self pollinated crops the single seed descent technique could be used to generate lines to determine the potential of a cross.

Postharvest Oat Storage Study

R.N. Sinha, H.A.H. Wallace, J.T. Mills, N.D.G. White and R.I.H. McKenzie
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The various factors affecting physical properties and quality criteria of naked and common oats in storage are being studied. In the laboratory, the effects of seed moisture content in naked (cv. Terra) and common oats (cv. Random) on susceptibility to mite infestation and on mycofloral growth and germination loss were observed (Sinha et al. 1979a). Moisture content-relative humidity equilibrium curves were developed for both adsorption and desorption by Terra oats at 22°C and 35-100% R.H. Terra, which had higher levels of Penicillium infection than Random at 90-100% R.H., lost viability most rapidly. Fat acidity values for Terra oats at 90-100% rose from 35 to 87-118 mg KOH/100 g of seed after 4 weeks. Terra oats was a better substrate than Random for the multiplication of the mites Tyrophagus putrescentiae, Acarus farris, and Lepidoglyphus destructor. Safe storage criteria were similar for both hulled and hulless oats with the exception of greater potential for mite infestation on the latter.

In a 24-month field trial of two 11.5-tonne lots of Terra oats stored in wooden granaries in Manitoba, the storability of dry oats was observed (Sinha et al. 1979b). Three insect species were introduced into one bin. Cryptolestes ferrugineus and Tribolium castaneum did not thrive and failed to survive the second year while Oryzaephilus surinamensis multiplied in small numbers for 22 months. A negligible quality loss occurred in the first 20 months. Then the moisture content of the bottom layers of grain in both bins rose from 10 to 13-16% leading to heavy infestations by the fungi Penicillium and Aspergillus versicolor and the mites Caloglyphus berlesei and Tarsonemus granarius. Fat acidity values in these bottom layers rose from 30 to 50-78 mg KOH/100 g seed. Low temperature was an important factor affecting insect and mite numbers.

A long-term study on the comparative storability of hulled and hulless oats is currently in progress. Two wooden granaries each containing about 8 tonnes of either naked (cv. Terra) or common oats (cv. Random) harvested in September 1978 are being sampled monthly to monitor interrelations among temperature, moisture, grain viability, mites, insects and fungi.

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Oats in Western Canada 1980

R.I.H. McKenzie, J.W. Martens, C.C. Gill, P.D. Brown and D.E. Harder
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1980 was another atypical year in western Canada. April, May and June were the driest and warmest on record at many locations in Manitoba and Saskatchewan. Emergence of all crops was erratic due to the drought. The sparse stands caused many farmers, following late June rains, to reseed to oats as an emergency source of forage for their livestock.

Statistics Canada estimates that 1,497,000 hectares of oats were sown and 1,072,000 harvested in the prairie provinces. Rains at harvest time across the whole area reduced yield and quality. Average yields in Manitoba, Saskatchewan and Alberta were 1.53, 1.70 and 2.40 tonnes per hectare, respectively. Harmon sown on 38% of the oat hectarage continues to be the most popular cultivar in western Canada. Grizzly, Random and Hudson were also widely grown.

In 1980 Fidler, a cultivar with highly effective multigenic resistance to stem rust, crown rust and smut, and with good yield and straw strength was released (see variety description).

Barley Yellow Dwarf

Barley yellow dwarf was severe on cereal crops in parts of southern Saskatchewan and Alberta. Because of dry conditions across the prairies many crops were seeded late and late crops in Saskatchewan and Alberta became heavily infested with aphids. Barley yellow dwarf virus was isolated from samples of stunted, diseased cereals received from Lacombe in Alberta and Swift Current in Saskatchewan. Migrant aphid populations, mainly Rhopalosiphum padi, were, however, much lower in southern Manitoba. Therefore, damage in this region was minimal.

Barley yellow dwarf was also very severe in experimental plots of winter cereals (excluding oats) at Lacombe. These cereals were naturally infested with high populations of aphids in the fall of 1979.

Oat Stem Rust

Oat stem rust was first observed in southern Manitoba on July 25. The rust was common throughout Manitoba and eastern Saskatchewan by the third week in August, but infections were light causing no damage except in isolated fields where infections of up to 50% were noted in late August. Due to the severe drought in Manitoba in the spring and early summer, some oat fields were planted very late in the season in an attempt to produce fodder. Some of these fields (cv. Harmon) developed infections of up to 60% but the cultivar Hudson was much less severely infected. Cool temperatures in September slowed rust development and enhanced the resistance of Hudson which carries the temperature sensitive gene Pg-9.

Thirteen avirulence/virulence combinations were identified from field collections in 1980. Race Na 27, the dominant race for many years,

comprised 69% of all field isolates identified. Races Na 5, 9, 12, 16, 20, 25 and 29 all occurred five or more times. Two new avirulence/virulence combinations, NA 31 = 1,3,8,16,a/2,4,9,13,15 and NA 32 = 1,8,16,a/2,3,4,9, 13,15 were isolated from collections in the barberry area of eastern Canada. The cultivar Hudson, which comprised about 40% of the oat hectarage in Manitoba in 1980, is the only available commercial cultivar that is moderately resistant to all of the races of stem rust prevalent where it is grown. None of the races identified from field collections threaten the new resistant cultivar Fidler.

Oat Crown Rust

Oat crown rust was first observed on July 25 but it developed very slowly. The rust became common throughout most of Manitoba and eastern Saskatchewan by late August but few fields that had been planted at the normal time developed infections of more than 5%. Even the very late fields planted for fodder did not develop infections of more than 40%. No potentially dangerous new races have been detected in the annual race survey.

The Influence of Herbicide on Septoria Development on Oats in the Growth Room

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In 1979 we reported on the possibility that field application to oats of the herbicide bromoxynil (Brominal 1.3 L/ha) to control weeds increased septoria disease development. Since then 2 experiments have been run in the growth room with comparable results in which 3 cultivars were treated at the 4-5 leaf stage with the recommended rate and 10 times the recommended rate of bromoxynil and 7 days later inoculated with septoria. Ten days after inoculation septoria development on the foliage was assessed and with 2 of the cultivars there was a highly significant increase in septoria on plants to which the recommended rates of herbicide was applied. Plants receiving the ten times rate were no different to the inoculated control plants except that some spray damage was evident on the former. These results confirm the field observations and suggest that perhaps this herbicide should not be used on oats in areas where the septoria disease is normally prevalent and severe. The variable reaction of cultivars needs to be investigated further.

Usefulness of Lemma Awns in Hull-less Oat Cultivars

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A hull-less oat (OA571) possessing long lemma awns was isolated and evaluated for agronomic performance at Ottawa. It was found to be true breeding for the awned character and its yield and other agronomic qualities were found to be good in most respects. The selection was derived from a hybrid with the following parentage: CAV2700/Gemini/2/Rodney/3/581lal-8B/4/ Gemini/3932-16/2/OA123-3-134/3932-16. This is a complex hybrid involving parents of diverse origins such as CAV2700 (A. byzantina) from Turkey, 581lal-8B which is a winter oat from Cornell (N. Jensen), 3932-16 a strong strawed hull-less oat from Ottawa, Gemini and OA123-3-134 are interspecific oats involving A. sativa/A. strigosa[2] from Ottawa, and the good commercial cultivar Rodney from Winnipeg. The awned hull-less plant was selected and the seed increased partly because the combination of hull-lessness and lemma awns was considered rare and partly because it was thought that the awned condition might help reduce the amount of damage caused by birds in the field. We have repeatedly observed, at Ottawa, that sparrows do not attack awned cultivars of wheat as they do awnless cultivars. Unfortunately, we have not yet determined whether the presence of awns will help protect the crop from birds but we have observed that the awns have helped solve another problem associated with breeding and processing of hull-less oats namely the difficulty in removing oat kernels possessing hulls from naked groats.

Seed samples from hull-less cultivars commonly contain a varying percentage (0.3 - 7.0 percent) of kernels possessing tightly adhering hulls. The number of such kernels depends upon the cultivar and upon the environmental conditions experienced by the cultivar during the growing season. These hulled kernels cannot be removed easily, or at all, from the groats by mechanical means. The presence of the long lemma awn on seeds of OA571 makes separation possible and samples with 100 percent groats have been achieved easily. Our ability to obtain completely naked seeded samples of oat groats in hull-less oat cultivars should be of interest to food processors.

Its interesting to note that heavy lemma awns have long been considered undesirable in hulled cultivars because they prevent the proper packing of seeds to give high bushel weights but heavy awns may prove to be very desirable in hull-less cultivars to permit proper cleaning of oat groats.

Oat Disease Tolerance Test and Kernel Weight of Oats

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A test similar to that described in the 1979 newsletter was run again in 1980. However only 45 cultivars were employed and three treatments replicated 4 times as follows: 1. Regular maneb spray application to control diseases; 2. Inoculation with septoria following heading and supplemental irrigation to promote disease development; 3. Unsprayed and uninoculated check. Crown rust was prevalent and severe in eastern Ontario this year and consequently the septoria inoculated and the check treatments were equally infected by crown rust with little additional septoria development because of inoculation. However there was good control of the diseases on the maneb treated plants and substantial increases in yield and kernel weight (Table 1).

Table 1. The mean yield (g/plot) and 1000 KW (g) of maneb sprayed oat plants compared with plants inoculated with septoria and plants receiving no treatment

	Treatment		
Variable	Maneb sprayed	Septoria inoculated	Untreated Check
Yield	274.7	165.6	168.0
1000 KW	32.0	28.1	25.4

The mean yield loss due primarily to crown rust was 38.8% while that for the plants inoculated with septoria was 39.7%. In the case of kernel weight the loss from crown rust amounted to 20.6% and it was only 12.0% for the septoria inoculated plants. The latter figure was less due to the increase in the kernel weight of a number of cultivars from the irrigation provided this treatment to stimulate disease. Even in a year when diseases were severe the beneficial effects of supplemental irrigation on kernel weight were evident.

Oats & Oat Breeding in Saskatchewan 1980

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

Acreage

Saskatchewan's oat acreage was up by 8.0% from 1979 to 1.3 million acres in 1980, reversing the trend of the past several years which has shown a constant decline from more than 2.0 million acres as recently as 1975. The main reason for the increase was the drought of 1980 which led to many acres of late seeded oats for forage and greenfeed for livestock as a replacement for failed forage crops. Virtually all the oats produced in 1980 are being used as livestock feed and milling quality oats are at a very low level or simply not being marketed as such due to feed shortages.

Varieties

Harmon continues to be the most popular variety, occupying 50% of the provincial acreage. Other important varieties include Kelsey (14%), Random (8%) and Garry (8%). A promising new variety, which is still in the seed multiplication stages, for the area is Cascade. It has shown a very high yield potential in our regional trials, consistently out-yielding all other varieties by 5 to 10%. Another new cultivar, Fidler, may also find some acreage in the south-eastern portion of Saskatchewan for late seeding since rust can be a problem in that area.

Breeding

Thanks to the support of the Quaker Oats Company of Canada Ltd. we are able to continue our modest oat breeding effort here at Saskatoon. Our major emphasis continues to be the development of high yielding, large seeded, high test weight oats which are well adapted to the oat growing areas of Saskatchewan. We seem to be having some success in our efforts and are hopeful that the performance of our lines OT307 and OT308 in the 1980 Western Canadian Oat Co-op Test will continue to be as good as this year. A brief summary of these results follows:

1980 Western Oat Co-op - 14 station years

	Yield kg/ha	T. wt. kg/hl	k. wt. g/1000	% Hull	Days to Mature
OT307	4340	50.1	35.8	22.1	105
OT308	4430	50.1	36.6	21.6	106
Random	3790	46.4	36.0	24.0	101
Cascade	4250	47.0	35.6	25.1	103
Harmon	3850	47.1	32.0	24.1	103

OAT BREEDING AT HISSAR, INDIA

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Oat breeding at Hissar was intensified during the year 1971. Since then we have collected many varieties from all over the world. In the initial stage certain promising selections were made from the germplasm. This resulted in the selection of variety HFO 114 (Haryana Javi). This variety combined higher green fodder, higher dry matter and higher seed yield. Variety HFO-114 performed well at many locations throughout India. Due to the overall performance, it was recommended for release by the All India Forage Workers Workshop held at Jhansi during January, 1973, as a dual purpose variety for cultivation throughout India. Subsequently, this variety was released for cultivation in Haryana State in 1974.

We also made many crosses and made promising selections in segregating generations. These selections from promising crosses were bulked in F_5 generations and put in different trials. A few genotypes were also included in coordinated trials. Among these, the selection OS 6 performed consistently well and gave higher yield of both green and dry matter production at fourteen locations out of sixteen locations where these varieties were tested. It gave the highest dry fodder yield (about 95 q/ha) and green fodder yield (about 420 q/ha) during 1977-78 and 1978-79. This variety has been identified at a promising entry and is being considered for recommendation for release. Another selection, OS 7, did well during the last five years in Haryana State. Based on its consistent superior performance, OS 7 was also identified by the University Variety Evaluation Committee in its meeting held during June, 1979. These two varieties have many common characteristics including higher yield, but they differ in seed colour, leaf and stem colour and adaptability. The OS 6 is adapted to all the oat growing regions of India, whereas OS 7 is adapted to Haryana State only.

Oat acreage is gradually increasing in India for green forages and it is far behind in grain production and its utilization. Our approach presently, is to breed varieties for both forage and grain. We are now putting more emphasis on the production of multiple crosses to incorporate the genes for both high forage and high grain yield. Also we are utilizing biparental, NC I, NC II and triple test cross designs for the production of better recombinants by using desirable F_2's as foundation material. With this approach we have been able to recover certain promising material. The new lines, in addition to other desirable characters, have greater leaf area and a higher number of leaves per tiller.

PERFORMANCE OF SOME OATS VARIETIES UNDER LATE SOWN CONDITIONS

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In India only spring oats are cultivated. They are grown during the winter season and planting is generally completed by the end of November to insure optimum yield. During this period farmers also sow other crops, like wheat, which are preferred for many reasons. The area under oats is therefore, far from satisfactory on the farmers fields. One way to overcome this problem may be to identify genotypes which can be sown as late as January and still give relatively high yields during April. It is during this month when farmers generally face a lean period for fodder supply in this country.

Keeping this in view, eight varieties, which were otherwise high yielding when sown in November, were grown in a randomized block design with three replications at the farm of Haryana Agricultural University during rabi, 1979-80. The varieties tested were OS 6, OS 7, OS 8, OS 46, HFO 114, Kent, Weston-11 and FOS 1/29. Each variety was sown in a 12 square meter area. At the 50 percent panicle stage plots were harvested and weighed to determine green fodder yield. An estimate of dry fodder yield was obtained by drying a 1.0 kg sample in an oven for 48 hours. The trials were sown on 17 January 1980 and were harvested on 16 April, 1980. Recommended amounts of nitrogen and phosphorus were applied. Five irrigations were given.

The data obtained on green and dry fodder yield are presented in Table 1. Genotypes OS 46, OS 7 and Kent produced over 350 q/ha of green fodder. These three genotypes also produced over 70 q/ha of dry fodder. The highest green fodder yield (372 q/ha) and dry fodder yield (89 q/ha) was recorded for the entry, OS 46. The range for green fodder yield was 140 q/ha to 372 q/ha and for dry fodder yield 50.40 q/ha to 89.28 q/ha. It was interesting to observe that although the green fodder yield was one third less than that of the November sown crop, the dry fodder yield of the best lines was at par with the November sowing. This experiment is encouraging and larger scale experiments are being undertaken.

Table 1. Performance of promising oat varieties under later sown conditions.

Varieties	Yield (q/ha)	
	Green fodder	Dry fodder
1. OS 6	292.0	61.32
2. OS 7	368.0	88.32
3. OS 8	296.0	59.20
4. OS 46	372.0	89.28
5. HFO 114	236.0	56.64
6. Kent	352.0	70.40
7. Weston-II	248.0	54.56
8. FOS 1/29	240.0	50.40
C.D. as 5%	60.27	13.47

DRY MATTER DIGESTIBILITY AND CHEMICAL COMPOSITION OF OAT FORAGE

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Ruminants are able to digest a great part of the forage carbohydrates and use them as their main source of energy; hence forage carbohydrate composition has long been of interest as a factor in determining forage quality. Many attempts have been made to devise simple methods for forage carbohydrate determination which have a good correlation with animal digestion. Van Soest's detergent fiber methods are often used these days.

The earlier studies with legume forages conducted in this laboratory have revealed that the accuracy with which dry matter digestibility could be predicted, increased by using pretreatment with neutral detergent before the acid detergent fiber is estimated. In view of this it was thought worthwhile to study the effect of neutral detergent pre-treatment with a cereal fodder such as oats.

Twelve genotypes were analyzed for different quality traits. The range and the average values by using direct samples as well as by using pre-treatment, i.e., sequential analysis are given in Table 1. The correlation coefficients between *in vitro* dry matter digestibility and chemical parameters with and without pre-treatment are shown in Table 2. For Table 2 it is clear that sequential analysis has not improved the preidction of *in vitro* dry matter digestibility from any of the chemical parameters. The non-significant correlations obtained by using the direct analysis perhaps indicate that the genotypes examined were very similar in composition.

It is concluded that pre-treatment with neutral detergent is not required for the analysis of oat forage.

Table 1. Range and average values of different components of forage in 12 oat genotypes.

		NDF %	ADF %	Cellulose %	Lignin %	Silica %	H. cellulose %	IVDMD %	C.P. %
Range		49.90-57.55	29.70-35.75	25.60-30.75	2.45-3.60	0.90-1.90	17.35-30.86	65.40-74.90	4.37-8.75
Average	Direct	54.51	33.53	29.16	2.96	1.41	20.90		
	Sequential	--	31.02	28.61	1.99	0.42	23.49		

Table 2. Correlation coefficients between dry matter digestibility and chemical parameters using direct and sequential analysis.

	IVDMD	
	Direct	Sequential
NDF	-0.37	--
ADF	-0.42	-0.20
Cellulose	-0.37	-0.19
Lignin	-0.08	-0.06
Silica	-0.48	-0.03
Hemicellulose	+0.34	-0.41

AN APPEARANCE OF ALTERNARIA SPP ON OATS IN HARYANA

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Scientists working on forage crops, in general, have concluded that leafiness contributed more towards higher dry matter production that the stem. Also leafiness improves the quality in terms of intake, digestibility and utilization, provided the leaves are free from toxic substances and infestation from major leaf diseases. Although many different diseases attack the oat crop worldwide, in Haryana State this crop is relatively free from the attack of diseases, and therefore, preferred by the farmer as a forage crop among rabi cereals. Recently we saw symptoms of a disease appearing at Haryana Agricultural University Research Farm. During 1978-79 we also recorded observations and collected leaves from the infested plants for the identification of the disease. The symptoms of disease appeared in only two varieties, i.e., FOS 1/29 and Flammings gold. The symptoms appeared as follows:

This disease is mainly confined to leaves. On leaves there is formation of light brown to dark brown spots. In later stages these spots coalesce with each other and the leaves die. The fungus was isolated on Potato Dextrose Agar (PDA) medium, and identified as Alternaria spp. The culture has been sent to the Common Wealth Mycological Institute, England, for specific identification.

OATS IN NEW ZEALAND

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In 1900, about 180,000 hectares of oats were grown in New Zealand, and the average yield was 1.9 tons per hectare. The acreage then steadily declined until the 1950's, and has since remained relatively stable at about 20,000 hectares. In the last year for which data are available (1976-79), 17,000 hectares were harvested with an average yield of 3.46 tons per hectare. The high yielding variety Mapua (or Makuru), released in the early 1970's, makes up about two-thirds of the current acreage.

BREEDING OATS FOR THE NORTH ISLAND OF NEW ZEALAND

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Oat breeding has been carried on in the South Island of New Zealand for approximately 45 years. This program has led to the development of some barley yellow dwarf virus (BYDV) tolerant cultivars that are short strawed, shatter resistant and have plump grain. Some of these cultivars are well suited agronomically to the North Island, but the level of crown rust resistance they possess is insufficient for this Island.

With increasing fuel costs, the cost of transporting oats from the South to the North Island has been increasing and as there is a high demand for oats as horse feed in the North Island, it has been decided to initiate a program for the selection of an oat cultivar for this area.

What is required is a short strawed, shatter resistance oat cultivar with large plump grain, associated with high levels of tolerance to BYDV and crown rust as both diseases are epidemic in the North Island. Tolerance to stem rust would be advantageous because this is a periodic disease, the importance of which may increase in time.

Currently the evaluation of oat lines and cultivars from Illinois and North Dakota is being carried on. However, the main thrust of the program is in selecting material from a co-operative program Crop Research Division has with Agriculture Canada. This program has been running for 4 years and involves the screening of early generation material from three CDA oat improvement projects for BYDV resistance in the North Island of New Zealand.

The Canadian breeders come to New Zealand to select their material in their out of season nurseries. The largest input is from the Winnipeg station, but material from Quebec and Ottawa is also screened. Some of these lines have New Zealand parentage and so are agronomically suited to this area.

To date some promising lines and selections have been extracted and tested under local conditions and the likelihood of producing an oat selection suitable for the North Island is high.

OATS IN TURKEY

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In 1979, the total oat-planted area in Turkey was 220,000 hectares and the total production was 370,000 metric tons, with an average yield of 168.2 kg/ha.

As compared with wheat and barley, the oat-planted area is very small. For example, according to the same statistics, areas of wheat and barley are 9,400,000 and 2,800,000 hectares and the total production of these crops is 17,550,000 and 5,240,000 metric tons, respectively. Also, a reduction has been observed in oat acreage in recent years, and the reason for this reduction is the fact that growers can gain more money from wheat and barley than from oats.

The primary use of oats is as animal feed in Turkey; but especially in recent years, some use in industry has also been started. Therefore, the oat acreage is expected to increase both in Eskisehir and in some other regions of Turkey in the near future.

In our region, oats are sown generally in the spring. The low and irregular spring rains have a serious adverse effect on yield and spring-oat yields are generally low. In this region, which is partly a plateau, winter oats give better results, and this requires developing winter tolerant varieties with high yielding capacity by means of breeding programs. In the early years of our Institute efforts were made to develop high-yielding and winter-tolerant varieties by breeding, and cultural practices for producing winter oats have been studied. Through previous work, the Apak variety was developed and released. It is an Avena sativa type which has good resistance to cold and drought. It has a good yield potential and is a fall-sown alternative variety. We have been trying to develop new varieties superior to Apak both in yield and in winter resistance. In our present program, around 3000 varieties, some domestic and some introduced from other countries, are under observation. The material at different levels is being observed and selections are being made from among them and the selections are being carried on to a next level.

The material at different levels of the breeding program in the growh year of 1979/80 are given below.

Winter yield trial	25 varieties
Spring yield trial	25 varieties
Preliminary yield trial (winter)	40 varieties
Preliminary yield trial (spring)	80 varieties
Winter observation nursery	800 varieties
Spring observation nursery	543 varieties

Segregating Material

F_5 generation (winter)	205 lines
F_4 generation (spring)	32[illegible] lines
F_2 generation (spring)	224 lines
F_1 generation (winter)	16 lines

The selected winter material has been sown, and we are planning to sow the spring material in March.

The hard winter of last year, with temperatures of as low as -20°C, did little harm because of snow cover, but the very dry spring resulted in very low yields from the spring oats. Also during the last year, neither rusts nor other diseases made epidemics as big as to affect yield.

There has not been found yet, any new variety superior to Apak in either winter hardiness nor other characteristics. Presently, we have some lines in yield trials which seem to be promising as compared with Apak. These are CI 8451 T.5199, Fowys, Full Brence, Aric PI 2375-76, Grey Winter Lateria, Mysell, Sporen, Novasadsky, and Century. We hope to obtain a winter-tolerant variety from among them.

In addition to introductions, crossing is also being done. Especially, the varieties which seem to be promising for yield and winter resistance are crossed with Apak.

We would be greatly pleased if you could send us varieties or lines that you think would adapt well to our conditions explained above.

NEW INTERSPECIFIC HYBRIDS IN THE AVENAE

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The interspecific hybridization of Avena species provides us with valuable information with regard to speciation within the Avenae, and can also provide new germplasm for incorporation into the cultivated hexaploid oat.

The triploid hybrid resulting from a cross between the tetraploid A. maroccana and the diploid A. canariensis has been successfully doubled using the capping method of colchicine treatment. The gross morphology of the resulting 6x amphiploid is similar to that of the triploid hybrid and the A. maroccana parent. The spikelet of the 6x amphiploid is longer than either the triploid hybrid or the tetraploid parent. However, there is a difference in the size of the abscission scar, that of A. maroccana being longer than the triploid or the 6x amphiploid. The scar of the latter is however longer than the abscission scar of the triploid.

Preliminary examination of the 6x amphiploid indicates that the overall fertility is of the order of 80% with each of the three florets per spikelet being capable of setting seed. Seeds were also obtained when the 6x amphiploid was crossed with A. sativa (cv Sun II) or A. maroccana. These hybrids have not yet been examined.

Avena hybrida is a hexaploid wild oat which is similar to A. fatua and A. occidentalis. Its geographic distribution is apparently quite diverse. The seed used in this work originated from the Wakhan region of Afghanistan and was collected at an altitude of 3,300 meters. This species is of interest in that it may possess winter hardiness that would be useful to incorporate into the cultivated oat A. sativa. It may also provide further information as to species relationships within the Avenae. To date it has been successfully crossed with A. sativa (cv Sun II) and the tetraploid A. maroccana.

Cytological evidence indicates a number of translocations between the chromosome of A. hybrida and A. sativa and some chromosomes remain unpaired, but nevertheless seed set was in the order of 70%. It is thus possible that some of the progeny of this cross will yield monosomic plants which may enable the monosomic series to be completed. The hybrids between A. hybrida and A. maroccana have not as yet produced any seed on selfing. Analysis of seeds of A. hybrida for protein content have proved disappointing giving a crude protein content of only 18% considerably lower than that found in some A. sterilis genotypes.

CHARACTERISTICS OF SOME EUROPEAN SPRING OAT VARIETIES

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The yields of 10 spring oat varieties that came to us from Holland were tested at our Institute for three years (1976-78). The material was planted in randomized blocks with five replications in plots of 5 m^2. Sowing was at rate of 500 seeds per square meter. Analysis and discussion of the results follow.

Table 1. Plant height of 10 oat varieties for three years

Variety	Plant height in cm			
	1976	1977	1978	Average
Astor	127.0	85.0	105.0	105.7
Condor	127.0	95.0	100.0	107.3
Flamingstreue	135.0	105.0	110.0	116.7
MG 8023	112.0	100.0	107.0	106.3
Bento	124.0	95.0	98.0	105.7
Gambo	120.0	90.0	105.0	105.0
Karin	130.0	100.0	100.0	110.0
Marino	125.0	100.0	105.0	110.0
Mustang	133.0	96.0	110.0	113.0
Tarpan	124.0	100.0	102.0	108.7
Average	125.7	96.6	104.2	108.8

Mean plant height averaged 125.7 cm in 1976, 104.2 cm in 1978, and 96.6 cm in 1977. In 1976 the highest varieties were Flamingstreue (135cm) and Mustand (133cm), and shortest, Gambo (120cm) and MG 8023 (112cm). Over the three years the tallest variety was Flamingstreue (116.7cm) and shortest were Gambo (105cm), Bento (105.7cm) and Astor (105.7cm). New semi-dwarf varieties have great promise for growth on rick soils, and with high application of mineral fertilizers.

Heading date is presented in Table 2. The earliest in heading in 1976 were Karin (12.VI) and MG 8023 (13.VI); the latest, Bento (17 VI). In 1977 the heading date varied from 1.VI for Tarpan to 9.VI for Bento.

Table 2. Mean date of heading of 10 oat varieties in three years

Variety	Heading date in		
	1976	1977	1978
Astor	14 VI	6 VI	13 VI
Condor	14 VI	6 VI	10 VI
Flamingstreue	13 VI	5 VI	13 VI
MG 8023	13 VI	5 VI	10 VI
Bento	17 VI	9 VI	14 VI
Gambo	15 VI	7 VI	14 VI
Karin	12 VI	3 VI	15 VI
Marino	15 VI	8 VI	15 VI
Mustang	15 VI	8 VI	15 VI
Tarpan	10 VI	1 VI	15 VI

Mean yields were 69.25 q/ha in 1976, 50.65 q/ha in 1977, and 50.17 q/ha in 1978.

Table 3. Mean yields of 10 oat varieties from Holland

Variety	Yield of grain/ha in				
	1976	1977	1978	Average	
Astor	69.54	53.28	53.76	58.86	
Condor	67.94	51.56	49.56	56.35	
Flamingstreue	58.80	48.72	39.40	48.97	
MG 8023	74.50	48.84	50.92	58.09	
Bento	75.30	50.96	53.84	60.03	++
Gambo	77.64	51.92	50.04	59.87	+
Karin	69.80	49.20	49.32	56.11	
Marino	67.14	53.36	55.20	58.57	
Mustang	63.00	48.88	49.00	53.63	
Tarpan	68.80	49.80	50.64	56.41	
Average	69.25	50.65	50.17	56.69	

In 1976, the highest yielding varieties were Gambo (77.64), Bento (75.30), and MG 8023 (74.50 q/ha). For three three years, the highest yielding varieties were Bento (60.0), Gambo (59.87) and Astor (58.86 q/ha). Under optimal conditions and on rich soils the yield potential of these new Dutch varieties is very high. The semi-dwarf varieties Bento and Gambo showed consistently high yields.

Weight of 1000 kernels (Table 4) varieted from 27.2 grams in Flamingstreue to 38.10 grams in Marino in 1976. Averaged over the three years the weight of 1000 kernels varied from 28.20 gr in Flamingstreue to 33.67 gr in Bento. Other varieties high in 1000 k. weight were Mustang (31.27), Marino (32.30), Astor (30.30) and Gambo (30.27 gr).

Table 4. Mean weight of 1000 kernels of 10 oat varieties

Variety	1000 kernel weight in			
	1976	1977	1978	Average
Astor	31.30	29.80	29.80	30.30
Condor	28.40	31.40	28.70	29.50
Flamingstreue	27.20	28.40	29.00	28.20
MG 8023	29.00	31.00	29.80	29.93
Bento	38.10	31.00	31.90	33.67 +
Gambo	30.50	30.40	29.90	30.27
Karin	30.90	30.00	29.80	30.23
Marino	38.90	28.00	30.00	32.30
Mustang	31.50	30.40	31.90	31.27
Tarpan	32.30	30.20	32.30	31.60
Average	31.81	30.06	30.31	30.73

Hectoliter weight varied from 39.55 kg in Condor in 1976 to 50.80 kg in MG 8023 in 1977 (Table 5).

Table 5. Hectoliter weight of 10 oat varieties

Variety	Hectoliter weight in			
	1976	1977	1978	Average
Astor	40.60	44.35	42.65	42.53
Condor	39.55	45.40	44.15	43.03
Flamingstreue	47.70	49.15	44.75	47.20
MG 8023	45.80	50.80	45.20	47.27
Bento	39.95	43.70	44.95	42.87
Gambo	46.85	47.90	43.90	46.22
Karin	47.90	46.45	45.40	46.58
Marino	49.55	46.45	47.25	47.75 +
Mustang	45.40	45.40	46.45	45.75
Tarpan	44.35	49.15	47.05	46.85
Average	44.76	46.87	45.17	45.60

Averaged over the three years, Astor (42.53 kg) had the lowest hectoliter weight and Marino (47.75), MG 8023 and Flamingstreue (47.20 kg), the highest. Also showing high hectoliter weights were Gambo (46.22) and Karin (46.58).

Protein content varied from 12.1% in Flamingstreue to 13.3% in Condor.

IV. CONTRIBUTIONS FROM THE UNITED STATES

ARKANSAS

F.C. Collins, J.P. Jones, Mike Fouts,
D.E. Longer, and D.S. Howle

Production: Oat acreage in Arkansas has dipped to its lowest level in over 50 years; farmers planted 56,000 acres and harvested 32,000 which was moved primarily into the seed trade. The acreage used for seed production is confined to the Grand Prairie area of the state where farmers use oats in a three year rotation of rice - soybeans - winter oats - soybeans. Many farmers have switched from oats to wheat in recent years.

Diseases: Barley yellow dwarf (red leaf) was the only disease observed with any frequency this past season and was of minor economic importance. Results from our seed treatment tests again indicated excellent control of covered smut with several commercial and experimental seed dressings. The fungicides Baytan (Mobay), BAS-42100 (BASF-Wyandotte), CGA-64251 (Ciba-Geigy), DPX-115B and DPX-770-2 (Du Pont), Vigil (ICI America), SN-80141, SN-80716, SN-63589 and SN-80824 (Nor-Am), Orthocide-Vitavax (Ortho), Sisthane-Vitavax (Rohm and Haas), Trivax and Trivax-UBI-P368 (Uniroyal) controlled smut at rates ranging from one half to four ounces active ingredient per hundred weight of seed. Oat lines with improved tolerance to cold, BYDV and crown rust are being developed in a cooperative program with Dr. M.E. McDaniel of Texas A & M University. Selections are made from reciprocal nurseries grown at Fayetteville (cold and BYDV) and Beeville Texas (crown rust). Results have been encouraging to date.

Personnel Changes: Dr. Dave Longer has taken over the responsibilities for variety testing of oats as well as wheat, soybeans, and cotton. D.S. Howle has joined the program as research assistant to Dr. Longer.

GEORGIA

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

The Georgia Crop Reporting Service reports that Georgia growers planted 150,000 acres of oats in 1979-80, harvested 65,000 acres at 53 bushels per acre for a total production of 3,445,000 bushels. Coker 79-21 and Coker 79-23 oats were the highest yielding experimental varieties at Tifton and Plains, Georgia in 1980; followed closely by Coker 227 which is now the leading oat variety grown in the state. In the Piedmont, Elan, Appler and Salem were the highest yielding varieties at Experiment for the last two years. Appler was very susceptible to lodging.

Coker 227 also has shown the highest percentage of protein in the groats over an 8-year period at Tifton and Plains as shown in table 1. Over a three-year testing period only Salem oats from North Carolina has a higher protein content than Coker 227 (table 2).

Table 1. Protein Percentages in the Groats of Oat Varieties Grown in South Georgia - 1972-1977.

	Tifton 1972	Tifton 1973	Tifton 1975	Plains 1975	Tifton 1976	Tifton 1977	6-Yr. Avg.
Coker 227	20.2	18.2	20.6	18.4	22.3	19.0	19.8
Appler	18.0	15.7	23.3	18.9	20.3	19.9	19.3
Ga. 7199	20.9	17.2	17.8	18.0	21.6	17.6	18.8
Fla. 501	18.8	17.9	17.0	17.8	21.5	18.5	18.6
Coker 234	17.3	17.5	18.7	17.1	22.2	18.5	18.5
Elan	17.1	16.7	18.8	18.4	20.0	17.9	18.1
Nora	16.2	15.0	17.9	17.2	21.0	16.9	17.4

Table 2. Protein Percentages in the Groats of Oat Varieties Grown in South Georgia - 1977-1980.

	Tifton 1977	Tifton 1978	Tifton 1980	Plains 1980	3-Yr. Avg.	4-Yr. Avg.
Salem	18.3	----	19.1	18.5	18.6	----
Coker 227	19.0	19.7	17.9	16.5	17.8	18.3
Fla. 501	18.5	16.7	16.9	15.5	17.0	16.9
Elan	17.9	17.6	15.4	15.8	16.4	16.7

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 in Indiana in 1980 totalled 5.85 million bushels, 9 percent less than in 1979. Yield was 65 bu/A. For the third straight year, outset of spring oats seeding was delayed by excessive soil moisture but oats seeding was completed in early May, ahead of the average date. Although moisture was generally adequate during the growing season, moisture stress was apparent due to above normal temperatures during June and July. Oats developed below normal growth. Lodging was of little consequence early. There was considerable straw breakage and lodging at harvest. Disease was generally absent or of little consequence. Barley yellow dwarf was scattered and generally resulted in little loss of yield.

Research. In controlled chamber tests and in controlled plots in the field, barley yellow dwarf (BYD) symptoms were more pronounced in infected oats under moisture and fertility stress, but larger differences between infected and control plants were measured under ample fertility and low moisture stress conditions. We are continuing the screening of breeding lines for BYD resistance in the greenhouse and field. We hope to expand testing of lines which are infested as small seedlings in the greenhouse (uniform infestation, small population of aphids required) and then transplanted to the field in paired (control, infested) and replicated hill plots.

KANSAS

E. G. Heyne

Total grain production in Kansas in 1980 was 4,560,000. Considerable acreage was used for pasture. There was a total of 175,000 acres seeded and 120,000 acres harvested for grain. Although the total grain production in 1980 was 41 percent over 1979, the yield per acre was less; 38 bushels per acre in 1980 compared to 44 bushels in 1979. Moisture was below average and hot, dry conditions prevailed during filling time. A brief, but heavy, infestation of greenbugs occurred when the oats was about 10-12 inches tall and considerable yellowing occurred. The oats appeared to grow out of the effects as later leaves were normal color but oats did not tiller well. The rating note on apparent infection of greenbugs and BYDV correlated well with yield performance and previous response to BYDV although no typical symptoms of "red leaf" were present during grain filling. Andrew, Neal, and Clintford had high ratings and low yields while Larry, Lang, Ogle and several others had low incidence and were among the high yielders. No other diseases were observed that appeared to damage the oats.

Kansas participated in the release of Larry oats, CI 9400, IL 73-2186. We produced only 150 bushels of seed in 1980. It appears superior to Lang and Bates in our trials.

The winter oat nurseries seeded in southern Kansas (Hutchinson) were nearly 100% winter killed and no winter survival data were obtained. Late seeding followed by a heavy, packing rain and poor emergence did not give the oats a chance to get established in the fall of 1979.

Certified seed of Bates, Lang, Pettis, and Trio were produced in Kansas in 1980.

Maryland

D.J. Sammons

Maryland farmers harvested a total of 19,000 acres of oats in 1980, about equal to acreage in the recent past. Statewide, oat yields averaged 59 bu/A, for a total state harvest of about 1.1 million bushels or a 7% increase over 1979. In 1980 an annual Spring Oat Variety Trial for Maryland was initiated, and a similar program has been instituted for winter oats in 1981. The purposes of these trials are to provide data to support our oat variety recommendations, and to determine to what extent oat production might be improved and expanded in Maryland. I would be pleased to receive seed from oat breeders who might wish to test their breeding lines in our environment, and will gladly accomodate new entries as space permits. To provide readers with an indication of spring oat performance in Maryland in 1980, a summary of data is included with this report. Also listed are the current entries in the 1981 Winter Oats Variety trial for Maryland. They are as follows:

AR 125-5	Coker 227	Coker 70-16
Coker 76-20	Coker 79-21	Coker 79-23
Compact	KEN 64-10653	Norline
PA 7408-174	PA 7409-8	Pennwin
Southern States 76-30	Windsor	

Performance of spring oats for several characteristics, Clarksville, Maryland, 1980.

Entry	Yield bu/A	Test Wt. lbs/bu	Percent Lodging	Height Inches	Date Headed	Percent Survival
Astro	66.2	29	10	37	June 3	92
Clintford	51.4	34	9	34	May 31	90
Clintland 60	58.6	31	20	40	June 2	95
Clintland 64	43.7	31	50	42	June 3	98
Dal	47.6	33	25	36	June 4	95
Garry	51.0	28	20	46	June 3	85
Jaycee	62.2	31	98	33	May 30	95
Lang	90.5	33	15	37	May 30	95
Mariner	61.0	34	68	40	June 3	95
Noble	66.2	31	70	40	June 1	95
Otee	72.4	33	88	35	May 31	95
*Ill 73-2184	94.7	32	20	33	May 30	98
*Ill 73-2664	100.4	30	15	38	June 1	95
*PA 7527-1079	75.4	30	8	36	June 2	95
*PA 7628-457	78.8	35	62	35	May 29	100
*PA 7733-648	73.2	34	8	34	May 30	98
*PA 7733-1269	64.2	34	38	36	May 30	95

*Advanced breeding line.

Minnesota

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

Production

Oat production in Minnesota totaled nearly 85 million bushels from almost 1.5 million acres harvested for grain in 1980. The estimated average yield was 57 bushels per acre, the same as in 1979. The growing season was somewhat unfavorable in that much of the State experienced several one month or longer periods of drought. The first occurred right after planting and the result was many fields with poor stands. The second began at heading and was accompanied by excessively warm temperatures. Thus, grain filling in late maturing genotypes was terminated abruptly. Even so, fields with good stands were highly productive. We received numerous reports of over 100 bushels per acre yields from certified seed growers.

Varieties

According to AOSCA reports, Lyon, Moore, and Benson occupied 12 percent of the certified spring oat acreage in the U.S. and Canada in 1980. Lyon occupied the third highest acreage in the 1980 South Dakota acreage survey. We estimate that Lyon, Moore, and Benson collectively are now planted on at least half of the Minnesota acreage.

Breeding

Recent crossing blocks for our breeding program have emphasized shortening plant height. We will, however, maintain a balance with somewhat taller types because of continued demand for straw. Presently OT 207 (formerly OT 184d) is our principle source of "dwarfness." We have identified high yielding, short, lodging resistant derivatives with and without disease resistance. Excessively late maturity and failure of the panicle to emerge completely from the boot are continuing problems. We are hopeful that the "long peduncle" stock recently obtained from V.D. Burrows will help correct these deficiencies.

Personnel

Mark Van Horn will soon complete his M.S. degree. In his thesis research he compared pedigree selection for rust reaction to single seed descent with yield selection from hill plot data. The populations studied were progenies of combinations of high yield and rust resistant parents. Mark will continue graduate work in the IPM program at the University of California-Davis. Jim Radtke will complete requirements for a Ph.D. by summer 1981. His thesis research centers on the second cycle of our recurrent selection program. He will evaluate progress from selection and analyze correlated responses of several traits, e.g., height and maturity.

MISSOURI

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

Production: Only 46,000 acres of oats were harvested in Missouri in 1980. While it was one of the driest years on record (12-13 inches below normal in most areas), rainfall was frequent and surface moisture excessive during the oat seeding period which possibly contributed to the low acreage. Excessively high temperatures during June and early July reduced yield and test weight of the grain. An average yield for the state of 43 bu/acre was reported by the Crop Reporting Service.

Diseases: Winter as well as spring seeded oats were relatively free of disease throughout the state. Barley yellow dwarf virus disease was the most prevalent problem although damage was much less severe than normal.

Varieties: Although there has been reduced interest in oats in recent years, a small acreage continues to be certified of the varieties Bates, Lang and Otee. Bates, Lang and Noble have been the highest yielding varieties in performance trials.

There has been little interest in winter oats in Missouri in recent years. In 1980, however, a few acres of Walken were certified and in the fall of 1980, following the drought when pasture and summer crops were severely damaged, inquiries regarding winter oat production and seed availability were noticably greater.

Breeding: The breeding effort on winter oats is being discontinued. Limited testing of a few more promising selections has been continued into the 1981-82 season. All breeding material will be offered to other breeders after the 1982 harvest.

Efforts to incorporate resistance to BYDV, crown rust, and smut into short, stiff strawed, early maturing, high yielding oat lines continue. Straw strength has been one of the most elusive traits in this effort. Physical and chemical quality of the grain are also important breeding considerations especially protein content.

Research: Experiments are underway to see if the BYDV tolerance in Bates is conditioned by different genes than that in Mo 06234. Mo 06234 is of different parentage and is superior in BYDV resistance to Bates and the possibility exists of building a still higher level of resistance.

In the monitoring of aphids in small grain at Columbia over the past two years Schizaphis graminum, Rhopalosiphum padi, and Rhopalosiphum maidis were observed although not all at the same time. In the fall of 1980 only R. maidès was observed. Almost all collections have been found to be viruliferous. The species present and its feeding preference is reflected in relative BYDV damage.

Screening for BYDV resistance in hills rather than rows appears to offer some advantage. Space planted rows are preferable to solid seeded.

Personnel Changes: Dr. J. M. Poehlman retired in September, 1980, after 45 years of association with the small grains project in Missouri.

NEBRASKA

John W. Schmidt and Stephen Dofing

Oat seedings in Nebraska continue at the one-half million acre level but harvested acreage has dropped to or below 400,000 the past two seasons. Average yield at 41 bu/a was the lowest since 1968. Total production was 15,170,000 bushels. Production is concentrated in northeastern Nebraska.

The new Illinois cultivars Ogle and Larry performed well in 1980, but so did Kelsey. Both Ogle and Larry appear to be superior to Lang currently the most popular cultivar. The Nebraska Station joined the Illinois Station along with Ohio, Pennsylvania, New York and the USDA in the release of Ogle. Both Benson and Lancer were in certified production in 1980.

In 1980, as well as in 1979, stem rust came into Nebraska late but with high severities. Had it arrived a week earlier losses would have been extensive.

OHIO

Dale A. Ray

Production. Cold, wet conditions in March and early April caused delay in oat seeding and contributed to reduced acreage. The crop was slow in establishment due to the absence of measurable rainfall for about one month after oats was seeded. Midseason conditions were excellent for vegetative growth and the oat crop matured only about ten days behind normal schedule. Approximately 300,000 acres of oats were harvested in 1980 with a statewide average yield of 67 bushels per acre, a decline in yield of 3 bushels per acre and a corresponding reduction in production by one million bushels when compared with the 1979 crop. Barley yellow dwarf virus infection was not evident until midseason but increased in damage to oat vegetation as the season progressed. Crown rust did not appear to be widespread in farmers' fields, however the breeding nurseries had the most rust infection observed in the recent 15-year period.

Oat Varieties. Noble and Otee are the dominant varieties grown by the seed industry and by the farmers of the state. Lang was the top-yielding variety in the 6-location 1980 yield trial. IL 73-2664, recently named Ogle, ranked high in both the yield trial and uniform nurseries and was multiplied for co-release in 1981 with Illinois. Clintford, Dal, Noble, and Otee varieties are currently recommended. Ogle will be added to the recommended list for 1982.

Oat Breeding. About 75 new spring oat lines that had been purified by panicle-row plantings were entered in advanced and preliminary yield tests at two locations. The highest yielding selections at both test sites were from crosses of Garland x an Avena sterilis line. Data on yield, straw strength, adapted maturity, and tolerance to barley yellow dwarf virus and crown rust were used in determining the selections to be continued in the testing program.

OKLAHOMA

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

Production: The Oklahoma state average oat yields and acreage fluctuate from year to year. The 1980 oat crop harvested for grain amounted to 3.9 million bushels and was harvested from 100,000 acres with a yield of 39.0 bushels per acre. Harvested acreage was up 5,000 acres over the past two years. Normally about one-half of the seeded oat acreage is used for pasture and hay crop and the other one-half harvested for grain.

Oat Varieties: Most of the oat acreage is seeded to winter oats. However, there seems to be an increase of spring oat seeding in the state at this time. Popular varieties are Cimarron, Chilocco, Okay and Nora. Relatively little disease or insects were observed with Barley Yellow Dwarf being the most prevalent disease. Nora is the most susceptible to this disease of any of the popular varieties but it was not severely affected in 1980.

Research: Work is continuing on the development of greenbug resistant oat variety for Oklahoma. Unlike the situation in wheat, the source of greenbug resistance in oats is maintaining its resistance to the bio-type "E" greenbug under greenhouse infestations. Expectations are to have some of this material in yield tests in 1981.

NEW YORK

Mark E. Sorrells

Ogle spring oats has performed exceptionally well in New York State for the past two years. In test locations in the central and western regions of the state, Ogle has had excellent grain yield, average test weight, good lodging resistance, and excellent resistance to the Yellow Dwarf Virus disease. The New York Agricultural Experiment station will be participating in the joint release. One of the parents in the pedigree of Ogle is Egdolon 23. Neal Jensen selected this line out of a cross between Astro and PI193027 (a stiff-strawed accession).

This past summer about 200 A. abyssinica (tetraploid) accessions were grown out for evaluation of agronomic traits. We intend to use several of the better lines as parents in crosses with cultivated hexaploids.

We recently purchased an Apple II Plus computer and a printer. After studying computer programs used by other breeders, it was apparent that most are specifically designed for a particular breeding program or method. Also, programs used on large computers frequently must be scaled down and translated for microcomputers. Finally, using organizational concepts common to computer programs used else-where, I began writing programs in small modules. We now have the capability of generating field books, entry information files, plot tags, and some data summaries for replicated trials. These programs are written in BASIC and occupy relatively little working memory space.

Roland Massaquoi finished his MS degree and returned to Liberia. His thesis involved studies on Helminthosporium sativum root rot in winter wheat. Two new students, both from Penn. State, have joined the small grains project. Sue Fritz will be doing a cytogenetics project in oats, and Dave Cooper will be conducting research on barley yellow dwarf virus in wheat and oats.

North Dakota
Michael S. McMullen

Production

According to the North Dakota Crop and Livestock Reporting Service, 1,050,000 acres of oats were planted in 1980 while only 450,000 acres were harvested for grain with an average yield of 30 bu. per harvested acre resulting in total production of 13,500,000 bu. The planted acreage was nearly equal to that of 1979 while the harvested acreage was substantially reduced. Severe drought over much of the state resulted in harvest of much of the oat crop for hay to supplement short forage supplies rather than harvest for grain. The severe growing conditions resulted in the lowest total oat production in North Dakota since 1936.

Diseases

Crown rust infection was observed in only a few localized areas in the northeastern part of the state. Stem rust infection did become severe in some late fields in the northeast.

Personnel

Frank Moser completed his M.S. studies dealing with comparisons of replicated and unreplicated designs with varying plot size and their effect upon various agronomic characters in oats. Bill Laskar joined the oat project and will be working toward his Ph.D.

South Dakota

L.A. Hall, D.L. Reeves, and D.K. Cernick

Production: Oat acreage in South Dakota dropped 21% from 1979 to 1980. Oat production also dropped showing a decline of 30% from 1979 to 1980. Drought stress was the probable cause for the average yield falling from 50 to 44 Bu/A.

Diseases: Both stem and crown rust came late in the season and probably had little affect on the plants. Smut was present, but heavy infestations were rare in our plots.

Varieties: Burnett continues to be the number one variety planted with 50.8% of the total acres. Three year averages in the Standard Variety Oat Trials indicate the top yielding varieties are Moore, Marathon, Lancer, and Benson, ranked in that order.

Increases: Five selections from the Dal/Nodaway 70 line, SD743358, will be increased and entered in the 1981 Standard Variety Oat Tests.

Personnel: Dr. Reeves will have completed a two year stay in Botswana and will be back in May, 1981. Diane Cernick joined the project to work toward a M.S. degree.

U T A H

R. S. Albrechtsen

Production. Utah harvests a small but consistent acreage of oats annually. Per-acre yields have shown a rather steady improvement. However, oats are generally not competitive with barley or wheat in our agricultural system. Diseases are generally minimal although an occasional field is badly injured by smut.

Oat Program. Our small acreage does not justify an oat breeding program. Adapted improved cultivars coming from other breeding programs are identified from the Uniform Northwestern States Oat Nursery. Cayuse, Corbit, Otana and Park are the higher yielding named cultivars. Some of the hull-less entries tested show considerable promise.

WISCONSIN

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

Oat grain yields in Wisconsin in 1980 averaged 61 bushels per acre, an increase of 4 and 5 bushels over 1979 and 1978 averages, respectively. An even higher yield average was nearly in hand but excessive rain in August and September caused severe lodging, severely hampered harvesting, and caused reduced grain yields and some field abandonment.

Nearly all oat seeding was accomplished between mid April and mid May. Oats got off to a good start with the exception of above-normal atrazine damage enhanced by low rainfall in April and May. Ample rainfall in late May, in June, and in July contributed to good plant growth and to good kernel fill and also helped to counteract any detrimental effects associated with very high temperatures during July. Oat diseases were very low in prevalence statewide.

The average grain yields and groat protein percentages in the seven primary statewide oat performance tests in 1978, 1979, and 1980 are listed below, with the stations listed in a south to north order:

Station	No. of entries	Grain yield (station average) Bushels per acre			Groat protein percentage (Station average)		
		1978	1979	1980	1978	1979	1980
Lancaster	31-32	71.3	106.5	112.9	19.1	19.6	17.3
Madison Nursery	100	74.3	93.1	91.1	16.3	17.2	13.7
Arlington Drill Plots	20-21	81.0	122.3	126.6	19.7	15.7	18.2
Hancock (sand)	30-31	40.9	39.8	57.4	18.7	21.4	18.9
Marshfield	32-33	72.0	40.2	81.2	19.5	17.9	17.6
Spooner (sand)	30-31	45.8	55.0	--	18.5	15.3	--
Ashland	30-32	72.6	53.2	77.6	18.4	16.0	17.7

As in 1979, grain yields were highest in 1980 in the Lancaster, Madison, and Arlington tests. In the 1980 Arlington drill plots, Ogle ranked first with a four-replicate mean of 163.6 b/a followed by Stout with 156.0 b/a. Entries ranking third, fourth, and fifth were three midseason (towards early) Wisconsin test selections with mean yields of 153.6 (X4041-1), 138.9 (X4024-7), and 138.6 (X4047-2) b/a, respectively. As in 1979, the 1980 growing season favored the earlier-maturing genotypes.

The 13.7% groat protein percentage average for the 100 entries in the 1980 Madison Nursery was completely unexpected. Soil fertility was adequate with grain yields ranging from 77.6 to 109.5 with a mean of 91.1 b/a, and Kjeldahl assay confirmed the accuracy of the Neotec readings. Test weights and seed sizes were "normal" so high carbohydrate content would not seem to be

the cause of the low protein percentage. The physiological cause of the low protein at Madison remains unknown at present.

The west harvest conditions resulted in genetic differentiation for oat-groat discoloration at six of our seven statewide testing sites, with groats only from the Hancock test being uniformly bright and clean. Among named cultivars, Stout, Ogle, and Froker--all with large groats--often had discolored groats.

U.S.D.A. Oat Quality Laboratory

Dr. Pat J. Langston joined the Oat Quality Laboratory in January, 1981, as Research Chemist. Dr. Langston received her Ph.D. in Biochemistry at Texas A&M University and was a post-doctoral Research Fellow in Biochemistry at the University of Minnesota. Dr. Langston's initial research will deal with carbohydrates in oats, the enzymes involved in their synthesis and degradation, and their nutritional significance. Tom Frantz has completed his M.S. thesis on the effects of tabtoxin from Pseudomonas syringae (halo blight pathogen) on N metabolism in oat leaves. Erik Donhowe has also completed his research for the Masters degree. He purified protein bodies from the aleurone and starchy endosperm of oats, and characterized them with regard to specific proteins and other constitutents. Chris Brinegar is continuing his Ph.D. research on protein synthesis in developing oats.

Thesis Research Projects

Fatty Acid Inheritance. Mr. Russell S. Karow completed his M.S. program in December (1980) and is continuing on for the Ph.D. degree. The main thrust of his M.S. research was to determine the feasibility of maintaining or raising the groat-oil content of oats while decreasing the linoleic acid content. The double bonds present in this C18:2 carboxylic acid can lead to rancidity in stored oat grain and in stored food products made from oats because these bonds are readily oxidized. While it appears that the desired changes in oat oil composition are under complex genetic control, the apparent importance of additive gene action in oat fatty acid inheritance and work in other crops suggest that genetic manipulation of fatty acids in oats is possible.

Avena Translocation Lines. Mr. Bernard J. Hable began his M.S. program in June (1980). His thesis research is concerned with the genetic, cytogenetic, and agronomic evaluation of several different Wisconsin hexaploid translocation lines which contain genes for crown rust resistance from diploid Avena strigosa. In 1980, inheritance patterns for reaction to crown rust were determined in the following 38 F_2 populations:

(a) Translocation line x translocation line crosses: 17 populations representing 4 crosses.

(b) Translocation line x Avena sativa crosses: 8 populations representing 3 crosses.

(c) Translocation line x Translocation line x A. sativa crosses: 13 populations representing 10 crosses.

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

Interspecific Transfer of Genes For Stem Rust Resistance. Mr. P. Douglas Brown, having completed his formal course work, is conducting remaining phases of his Ph.D. research at Winnipeg, Manitoba where he is employed by the Canadian Department of Agriculture. Mr. Brown is using two different gene-transfer methods in attempts to transfer a gene for stem rust resistance from tetraploid Avena barbata to hexaploid A. sativa.

Potential For Oat Improvement Using Avena fatua. Mr. Jonathan M. Reich is evaluating progenies from Avena fatua x A. sativa crosses for agronomic and grain-quality traits. He expects to complete his M.S. program in May, 1981.

Effect of Nitrogen on Grain Yield and Growth Characteristics of Oats. Mr. Yeong-Deok Rho expects to complete his Ph.D. program and return to Korea near mid 1981.

V. NEW CULTIVARS AND RELATED MATERIAL

ATHABASCA

H.T. Allen and M.L. Kaufmann

The spring oat cultivar Athabasca (Avena sativa L.) was developed by the single-seed descent method at the Agriculture Canada, Research Station, Lacombe, Alberta. It was tested in the Alberta Regional Oat Test 1974-1977 under the designation 351-15 and was entered in the Western Cooperative Oat Test 1975-1977 as OT 725. It was licensed (No. 1834) in April 1978 and has been assigned the Plant Gene Resources of Canada No. CN001792.

Athabasca was derived from the cross OA123-3 X Pendek made at Lacombe in 1966. OA123-3 is a large seeded selection made by V.D. Burrows (Ottawa Research Station) from a bulk population (F_8 to F_{10}) of two intraspecific crosses involving Avena strigosa (2n = 28) and Avena sativa (2n = 42). The two crosses made by Dr. F. Zillinsky were CD 3820^2 X Abegweit. Athabasca was selected in 1972 from 175 F_7 lines.

Athabasca is an early maturing cultivar with high kernel weight, good yielding ability and good lodging resistance. It is particularily adapted to the grey and black soils of Alberta where it is primarily intended for production. In recent tests (1975-1980) in central Alberta it has averaged 6 days earlier maturing than Random with about equal yield while in the northern areas it is 3 days earlier but 10% lower yielding than Random.

The panicle of Athabasca is equilateral with short semierect side branches. Leaves are glabrous, medium green and about 10 cm shorter than Random. The kernel is medium wide and medium long, shorter than Cavell and less plump than Rodney. The lemma has a medium pointed tip, few medium strong awns, glabrous at base. The rachilla is glabrous, medium width, long rachilla on second floret. Athabasca has high kernel weight, slightly less than Grizzly, superior to other commonly grown cultivars. Hull percentage is similar to Random, percent oil slightly less than Random and protein 1% higher. Athabasca is susceptible to crown and stem rust and smut and is moderately susceptible to barley yellow dwarf virus. These diseases are not a problem in the western Canadian prairies.

CASCADE

H.T. Allen and M.L. Kaufmann

The spring oat cultivar Cascade (Avena sativa L.) was developed at the Agriculture Canada, Research Station, Lacombe, Alberta. It was tested in the Alberta Regional Oat Test 1974-1978 under the selection number 364-12 and was entered in the Western Cooperative Oat Test 1975-1978 as OT 726. It was licensed (No. 1920) in April 1979 and has been assigned the Plant Gene Resources of Canada number CN001793.

Cascade originated from the cross Random X Forward made at Lacombe in 1970. Subsequent generations were advanced to F_6 by the single-seed descent procedure. Cascade was selected in 1972 from 219 F_7 lines. Cascade is a high yielding cultivar of medium-late maturity and good lodging resistance that is especially adapted to the grey and black soil areas of central and northern Alberta. Prior to the introduction of Cascade, Grizzly was the highest yielding cultivar in central and northern Alberta. In recent tests (1975-1980) Cascade has outyielded Grizzly by 6.3% in central and by 9.7% in northern Alberta and is three days earlier maturing in both regions.

Cascade has a large equilateral panicle with medium long branches, drooping spikelets containing 2-3 florets. Awns are few and weak. Leaves are medium green with many hairs on lower leaf margins. Lower leaf sheaths are glabrous to slightly hairy. Kernels are medium long and medium width. Lemmas are long with pointed tips, prominent barbs on tips and few basal hairs. The rachilla is medium long glabrous to few hairs. Kernel weight is similar to Grizzly and Random and hull percentage similar to Grizzly, 2% higher than Random. Percent oil and protein is less than Random. Cascade is susceptible to crown and stem rust and is moderately resistant to smut.

Fidler

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

Fidler, a spring oat (Avena sativa L.), was developed by the Oat Rust Area Project Group co-ordinated from the Agriculture Canada Research Station, Winnipeg, Manitoba from the cross Random x RL 3013 made in 1972. RL 3013 has an extremely complex pedigree including in its parentage Pendek, Rodney, Kelsey, Exeter, Landhafer, Mindo, Hajira, Joanette, Andrew, Roxton, Victoria, Banner, Beacon, Rosens mutant, CI 3034, CI 6792 and four Avena sterilis accessions D137, CAV 2647, CAV 2648 and CAV 5165.

Fidler has better rust and smut resistance than any existing variety. Pc-39 confers a high level of resistance to all but two isolates (to which it has moderate resistance) of oat crown rust (Puccinia coronata Cda. f. sp. avenae Eriks.) found in the annual Canadian crown rust surveys of 1978 and 1979. It also has good resistance conferred by Pg-1 and Pg-13 and possibly Pg-2, Pg-3 and Pg-9 to all but one race of stem rust (Puccinia graminis Pers. f. sp. avenae Eriks. and E. Henn.). It is susceptible to the rarely occurring race NA 26. It is resistant to all races and collections of loose smut (Ustilago avenae (Pers.) Rostr.) and covered smut (Ustilago kolleri Wille) to which it has been tested.

Tested under the experimental numbers W 76121 and OT 210, Fidler has been equal in yield to Hudson in Manitoba, but in Saskatchewan and Alberta has been lower yielding than both Cascade and Hudson. Fidler has short and fairly stiff straw. Kernels are creamy white in color and medium to small in size and the test weight is moderately low.

Fidler appears particularly well adapted to Manitoba because of its good yield, straw strength and superior crown and stem rust resistance. Approximately 35,000 kg of seed was sown in 1980. Breeder seed will be maintained by the Seed Section, Agriculture Canada, Research Station, Regina, Saskatchewan. Fidler is named after Peter Fidler, a surveyor and fur trader with the Hudson's Bay Company from 1788 to 1821.

ORLANDO

J. E. Jones and D. A. Lawes

The spring oat Orlando, bred at the Welsh Plant Breeding Station, was granted Plant Breeders Rights and added to the U.K. National List of varieties in 1979. It was included on the National Institute of Agricultural Botany's Recommended List of Cereals for 1981.

Orlando was derived from the cross:

(7717 Cn 3/3 x Condor) x Condor

and has yielded well under a wide range of conditions. It has good resistance to mildew; having effective resistance to race 2, slight seedling resistance to race 4 and a moderate level of adult plant resistance to other races of Erysiphe graminis.

OS 7, A PROMISING NEW VARIETY

R. S. Paroda, K. R. Solanki and C. Kishor
Department of Plant Breeding
Haryana Agricultural University
Hissar, India

In India, oats are the only rabi cereal fodder sown near towns and in intensive livestock development areas, and on military and other dairy farms. For this purpose the variety 'Kent', an introduction from Australia, is grown largely. This variety has been in cultivation for many years without any replacement. The research work on oats, which has been intensified at Haryana Agricultural University, Hissar, has given encouraging results and it has been possible to identify high yielding genotypes. One of these, genotype OS 7, which is a result of single plant selection from the cross HFO 10 x [illegible]0 55, has shown superiority over Kent over many years of testing.

OS 7 was tested in progeny row trials during winters of 1975-76 and 1976-77 and in final evaluation trials during the last four years. It showed its superiority for both green as well as dry matter yield as compared to the released varieties, Kent and HFO 114. OS 7 on an average gave 18% and 19% higher green fodder yield and 23% and 26% higher dry matter yield over HFO 114 and Kent, respectively. The average green and dry matter yield over the last four years was 535 q/ha and 110 q/ha against 447 q/ha and 87 q/ha, respectively of the variety HFO 114. It has also given higher yield at 20 demonstrations conducted throughout Haryana. Based on its consistent performance OS 7 was identified as a promising variety by the University Variety Evaluation Committee in its meeting in June, 1979.

Distinguishing traits of OS 7 as against HFO 114 and Kent

Traits	OS 7	HFO 114	Kent
Early vigour	V. good	Good	Good
Days to 50% flowering	109.0	110.0	109.0
Plant height (cm)	111.0	93.0	94.0
No. of tillers/plant	10.9	9.4	9.6
Leaf length (cm)	47.0	50.1	49.8
Leaf breadth (cm)	2.98	2.5	2.5
Protein %	7.4	6.4	7.0
IVDMD %	57.3	58.0	59.0
Green fodder yield/plant	286.3	260.0	150.9
Dry fodder yield/plant	50.8	44.8	46.8

Other morphological characters: OS 7 grows erect, has early vigour and appealing plant type. Leaves are relatively broad and light green in colour as compared to check varieties. Flag leaf remains erect at the time of emergence of panicle. The panicle is open. OS 7 grows tall but is tolerant to lodging, and is resistant to all major pests and diseases prevailing in Haryana. Seed is medium large and straw-colored.

Table 1. Performance of OS 7 against check varieties during the last four years.

Genotype		1976-77	R	1977-78	R	1978-79	R	1979-80	R	Mean	R	Percentage increase over HFO 114	Percentage increase over Kent
OS 7	GFY	486.6	2	513.5	2	530.4	2	613.8	1	535.8	1	18.68	19.86
	DMY	98.9	4	116.4	1	98.7	6	128.3	1	110.6	1	23.69	26.87
Check													
HFO 114	GYF	426.2	12	466.0	9	495.9	7	418.0	19	451.3	13		
	DMY	97.7	8	84.4	18	88.5	19	90.0	18	89.4	18		
Kent	GFY	365.0	19	443.5	18	483.2	11	495.5	11	447.0	14		
	DMY	78.1	20	94.1	9	95.3	12	81.1	20	87.2	20		
C.D. at 5%		86.7		42.5		16.3		114.6					
		18.4		14.8		19.3		21.5					
CV %		12.3		10.2		6.3		13.7					
		12.1		10.2		14.9		13.6					

GFY: Green fodder yield
DMY: Dry matter yield
R : Ranking is based on performance of varieties (24) in these trials.

USDA OAT COLLECTION

D. H. Smith, Jr.
Small Grain Collection

From January 1, 1979 to December 31, 1980 there were 249 new entries accessioned. The 203 foreign entries were assigned Plant Introduction (PI) numbers.

In CY 1980, 99,029 samples of small grain germplasm were distributed as follows: foreign - 33,370; domestic - 65,659. A total of 24,496 samples of oats were shipped.

The contract for the renovation of the cold storage room has been let for approximately $79,000 which includes a new air conditioning unit, bricking in existing windows, insulating the ceiling and walls, and new insulated doors. In addition, $100,000 in planning money has been allocated to develop plans for a new building to house the Collection.

The new CI numbered accessions for 1979 and 1980 are listed, and have been entered in the computer file.

OAT CI NUMBERS ASSIGNED IN 1979

CI No.	Name/Designation	Pedigree	Class	Source
9361	OA 366	CAV2700/Gemini/2/Rodney/3/CAV2700/ Gemini	S	Canada
9362	OA 424-1	A. fatua/Clintland 60/2/Gemini/3/ CAV2700/Gemini/2/5872-1	S	Canada
9363	OA 405-5	Dorval/3/CAV2700/Gemini/2/Rodney	S	Canada
9364	Amagalon	Avena magna (CI 8330)/Avena longiglumis (CW57)		Minnesota
9365	AR 125-5	Nora/Cortez	W	Pennsylvania
9366	AR 148-15	AR 99-311/Coker 227	W	Pennsylvania
9367	MN 79886-92	Avena fatua/Avena sterilis		Minnesota
9368	MN 791702	Astro/3/Stormont/CI 834//Lodi/ Egdolon #26		Minnesota
9369	MN 791706	Froker/Dal		Minnesota
9370	MN 791708	Dal/CI 9221		Minnesota
9371	MN 791710	Dal//Portage/Clintland 60		Minnesota
9372	MN 791725	Moore/3/Otter//Stormont/CI 8335		Minnesota
9373	MN 791728	Lodi/MN65B252-6//Wright		Minnesota
9374	MN 791735	Jaycee//Garland/PI 267989/3/Egdolon #26/Lodi		Minnesota

CI No.	Name/Designation	Pedigree	Class	Source
9375	MN 791751	Lodi/MN65B252-6//Unknown		Minnesota
9376	MN 791756	MN65B663/MN65B1362		Minnesota
9377	MN 791763	MN65B663/MN65B252-6		Minnesota
9378	MN 791766	MN65B1313/MN65B663		Minnesota
9379	MN 791722	Tippecanoe/MN65B1362/3/Stormont/CI 8340// Lodi/Egdolon #26		Minnesota
9380	MN 791776	Tippecanoe/MN65B663//Tippecanoe/ MN65B252-6		Minnesota
9381	MN 791778	Tippecanoe/MN65B252-6//Unknown		Minnesota
9382	MN 791781	Tippecanoe/MN65B252-6//MN67B1157		Minnesota
9383	MN 791785	Lodi/MN65B252-6//Lodi/MN65B663		Minnesota
9384	MN 791790	Tippecanoe/MN65B1286//Unknown		Minnesota
9385	MN 791795	Lodi/MN65B1313//Tippecanoe/MN65B1286		Minnesota
9386	MN 791802	Lodi/MN65B662//Lodi/MN65B252-6		Minnesota
9387	MN 791804	Lodi/MN65B1362//Unknown		Minnesota
9388	MN 791816	Tippecanoe/MN65B2417		Minnesota
9389	MN 799883-85	CI 9221/CI 9139//Johnson Selection		Minnesota
9390	W 78370	Terra^2 (Rodney O^2 X CI 9139)		Manitoba
9391	Fidler	Random x RL 3013		Manitoba
9392	W 78367	Terra^2 (Rodney O^2 X CI 9139)		Manitoba

OAT CI NUMBERS ASSIGNED IN 1980

CI No.	Name/Designation	Pedigree	Class	Source
9393	Lochow 7770			Germany
9394	Lochow 7765			Germany
9395	Fl Aura			Germany
9396	Fl Trumpf			Germany
9397	Fl Krone			Germany
9398	Fl Stern			Germany
9399	Fl Nova			Germany
9400	Larry	Tyler x Egdolon 2 x Orbit	S	Illinois
9401	IL 73-2664			
9402	FL 7118A13-7-2-6	Coker 70-20/FL 67AB113		
9403	NC 77-3	Firecracker/Walken		
9404	NC 77-32	Delair/Carolee//Coker 69-20		
9405	I-1169-1M-3R-0C	(ArkansasxNo.58-AB-177/Curtx Nodaway^{3}) (Indio-Nodaway)		Maryland
9406	Variety 018	3034-Tippecanoe/CurtxOpalo-Curt/ Cuauhtemoc		Maryland

VI. EQUIPMENT, METHODS, AND TECHNIQUES

Safe Removal of Hulls and Dust from Experimental Oat Dehuller

Vernon D. Burrows and C.F. Nicholls
Research Branch, Agriculture Canada

The experimental oat dehuller designed, built and supplied by the Quaker Oats Company to several oat breeding institutions, over 20 years ago has been a great help in the evaluation of breeding material for milling quality. One of the problems with the machine has been the inadvertant liberation of dust and hairs (trichomes) into the air space around the machine during the dehulling operation and this has acted as a skin irritant and posed a respiratory health hazard to operators. Finding a suitable method to contain and remove this dust has been a problem because there is a positive air pressure on the exit vent of the machine due to the centrifugal motion of the revolving dehulling plate which acts as a fan blade pushing air down through the machine. Another problem with the design of the dehuller is the requirement that the dehulled groats have to be separated from the chaff and dust in a separate operation.

Several design changes were attempted to contain the chaff and dust at the base of the machine but all efforts failed. Finally both the dust removal and groat-chaff separation problems were solved by adding a rather large air suction attachment appendage to the dehuller (Fig. 1). This attachment is fastened by flexible tubing to conventional cyclone collector located outside the room. The attachment allows the expelled grain and chaff to fall into a metal tube (A, 15 cm diameter), the upper end of which is connected to the suction line. Because air is drawn through the path of falling grain, roughly at right angles, dust and chaff are drawn freely into the suction line leading to the cyclone collector, whereas, the heavier grain spills out the end of the tube at B that is the primary air intake. The volume of air flowing through the tube can be adjusted with the use of a shutter (C), sliding over a secondary air intake to allow only enough suction through the tube at B to remove chaff without lifting seeds. The angle of the tube can be adjusted if required, for seeds of different weights, to provide a continuous flow of clean grain.

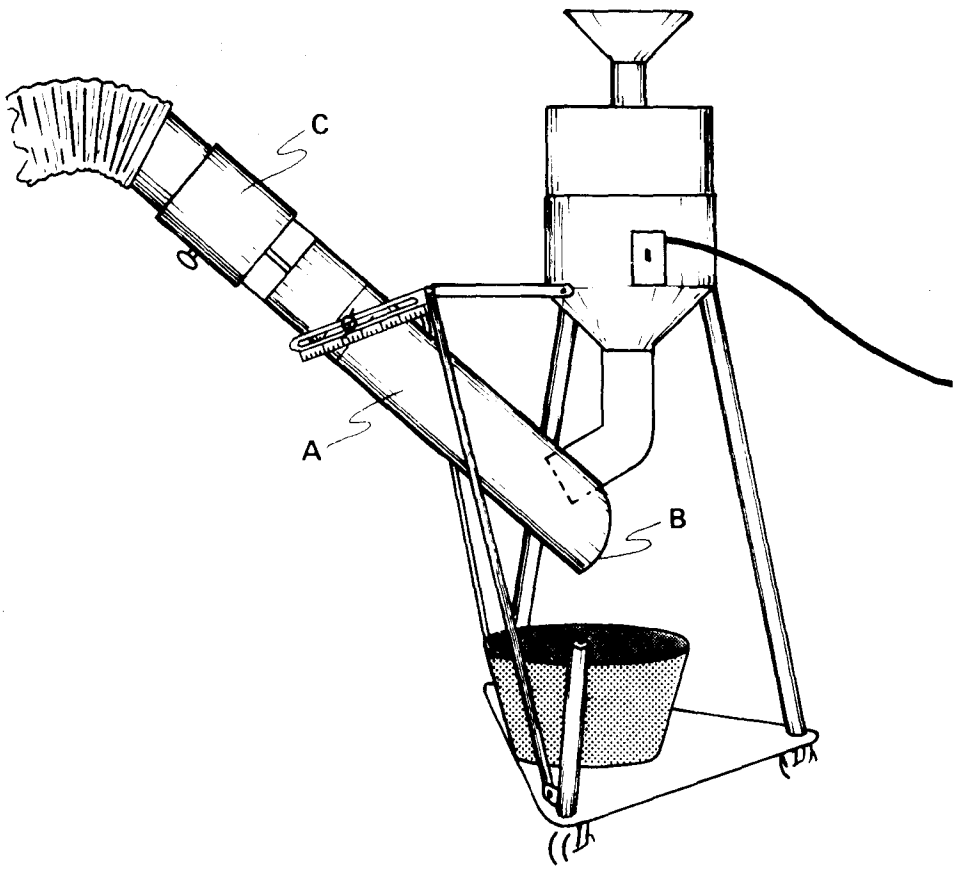

Figure 1. Experimental oat dehuller equipped with new exhaust system to remove hulls and grain dust.

Panicle Bags for Collecting Shattering Seeds

H.W. Rines and D.D. Stuthman
SEA-AR, USDA and University of Minnesota

A new type of plastic bag has proven useful in collecting shattering seed from wild oat species grown in our germplasm development nurseries. The bags are made of a plastic netted material which allows ready air movement through the bags. Thus, seeds develop normally inside the bag, and there is no problem of water retention to cause molding of ripe, shattered seeds. A procedure we have adopted is to place a bag over the panicles of a plant when the tip spikelet starts to mature and secure the bag around the stem(s) with a piece of wire attached to a label tag. After the plant matures, the bag containing the panicles and shattered seed is collected by cutting the stems below the bag. The seed is threshed by feeding bag and all into a head thresher where the bag is shredded.

Bags 20 inches long and 4 to 6 inches wide are useful for bagging single plants, while bags 10 to 12 inches wide are better for hills. These plastic net bags also have been used with shattering species of other grains and for seed increases of weed species.

The plastic net bags we used are of Delnet* pattern PQ 218 and were obtained from Hercules, Inc., 910 Market Street, Wilmington, Delaware, 19899, USA. Inquiries on sizes and current prices should be directed to Ms. Vija Jones at Hercules.

*Mention of a trademark or proprietary product does not constitute a guarantee or warranty of the product and does not imply its approval to the exclusion of other products that may be suitable.

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