1982

OAT NEWSLETTER

Vol. 33

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1982

OAT NEWSLETTER

Volume 33

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Marr D. Simons, Editor

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I. NOTES

NEWSLETTER ANNOUNCEMENTS AND INSTRUCTIONS

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

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

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

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

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

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

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

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

<u>Please Do Not Cite The Oat Newsletter in Published Bibliographies</u>

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. <u>One suggestion that may help</u>: If there is material in the Newsletter that is needed for an article, contact the author. If he is willing, cite him rather than the Newsletter. This can be handled by the phrase "personal communication."

AMERICAN OAT WORKERS' CONFERENCE COMMITTEE, 1982-85

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MILLING OATS IMPROVEMENT ASSOCIATION OPENS MEMBERSHIP TO INDIVIDUAL OAT RESEARCHERS AND PRODUCERS

by
A. Bruce Roskens
Quaker Oats Co.

The Milling Oats Improvement Association was formed in 1975 by members of several oats milling companies in the Midwest. The purpose of the organization is to advance research and to promote milling quality oats to all elements of the industry. This includes the presentation of research needs to the U.S. House of Representatives and Senate in Washington, D.C. The organization has been successful, even though membership has been small.

In 1980, the membership agreed to an expansion to include oats growers, handlers, seed producers, processors, and marketing companies. It was felt that all these elements were equally important if high quality milling oats was to be promoted. The Association by-laws were revised and the purpose was listed as follows: "The purpose of this Association shall be every lawful manner to promote research of improved oats varieties for milling on a state and national basis. Particular emphasis will be placed on variety development in the north central states, which furnish most of the oats to the milling oats market. In addition, the Association will promote the production and proper handling of oats intended for the milling oats market. "

In 1982, Mr. Keith Carlson was hired as Secretary - Manager for the Association. Along with his responsibilities of soliciting membership and arranging of meetings, he will be publishing a newsletter three to four times per year, updating members as to the status of the organization and new research and developments in the oats industry. Membership fees for the Association are as follows:

Oats Researcher or Producer	$10.00
Grain Handler or Shipper	$25.00
Seed or Grain Marketing Firm	$50.00
Milling Firms	$100.00

We are encouraging all persons interested in the betterment and promotion of milling quality oats to join this organization. You may join by sending your check for the appropriate amount payable to The Milling Oats Improvement Association:

The Milling Oats Improvement Association
815 Shakespeare
P.O. Box 66
Stratford, Iowa 50249

U.S. AND WORLD OATS SITUATION

Phillip F. Sisson
The Quaker Oats Company

World oats production during the decade of the 70's generally trended downward from a peak of 56 million metric tonnes (MT) in 1971 to a low of 44 million in 1980. Production during the past two years has recovered to some degree but still totals something less than 50 million MT.

The Soviet Union is by far the world's largest oats producer with 36 percent of total production in 1980. The Soviet Union is the only major producing country in which production has been on the up trend. Most of the world's production of oats is centered in latitudes between 40 degrees-50 degrees (map of world oats production).

The United States and Canada are the 2nd and 3rd largest world producers respectively. Western Germany, Poland, France, the PRC, and Sweden follow in order.

Foreign trade in oats is relatively insignificant. This is likely attributable to the bulkiness of the grain which increases overall transportation costs compared to other grains.

Oats probably rank second to wheat in the volume utilized for food production. On a world basis, we estimate about 13 percent of total production of oats is consumed as food. The major use of oats, as is true with all the feed grains, is for animal feeding.

In the United States, most of the oats never leave the farm where they were produced. In fact, about 65 percent of all oats produced are either fed or used for seed on the producing farm. Of those oats actually sold from farms, roughly one-third are utilized by the food industry, while the remainder are utilized by the feed industry.

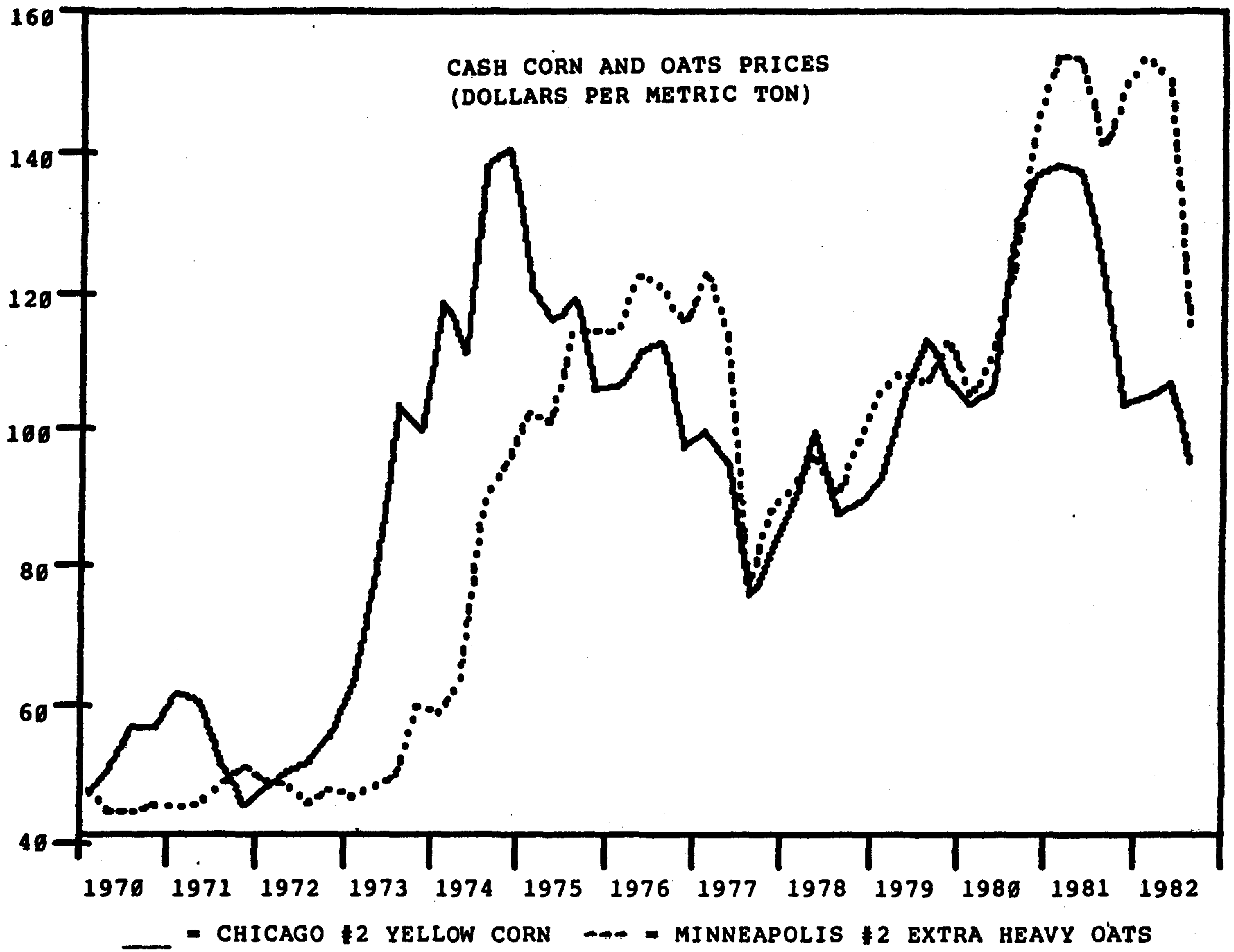
The longer term decline in oats production in the United States that occurred during the 70's reflected low economic returns to producers for oats compared to other grains and oil seeds. During this period, acreage devoted to oats dropped about 45 percent while oats planted were generally relegated to the less productive sections of the farm. Thus, average oats yields during this same period did not keep pace with the strides being made in corn and other competitive crops. In many instances, oat acreage would probably have dropped even more if economic return for grain was the sole reason for planting oats. Oats are an excellent nurse crop for newly seeded legumes and other hay crops. Additionally, the value of oats straw for bedding is superior to that produced from other small grains. A fairly high percentage of oat acreage is not harvested for grain, but is either used for silage or as forage for livestock.

Prices for milling grade oats at Minneapolis during the early 70's fell significantly below the price for corn at Chicago on an equivalent weight basis (chart 1). However, by the late 70's, prices moved more in line with corn values as production was reduced. In the early 80's, oats prices moved above corn and still holds a significant premium. Additionally, the value of oats straw increased to the point where in some areas the value per acre was equivalent or higher than the value of the grain. The improvements in economic returns resulted in an expansion in acreage devoted to oats of 11 percent in 1982. Recent values for oats relative to corn on an equivalent weight basis were at a 28-30 percent premium. Some of the gains in acreage that were made in 1982 are likely to be lost in 1983 as a result of USDA's Feed Grain Program. Oats do have the advantage of the lowest cost of production of any of the grains and certainly significantly below costs for corn and soybeans. Thus producers strapped for money may well consider oats as an alternative crop in 1983.

Record high participation by corn producers in the 1983 Feed Grain Program is anticipated. This factor alone may not influence overall acres planted to oats, but it may affect the amount of oats acreage harvested for grain, since oats are a prime candidate to be planted on diverted and setaside acres as a conservation crop.

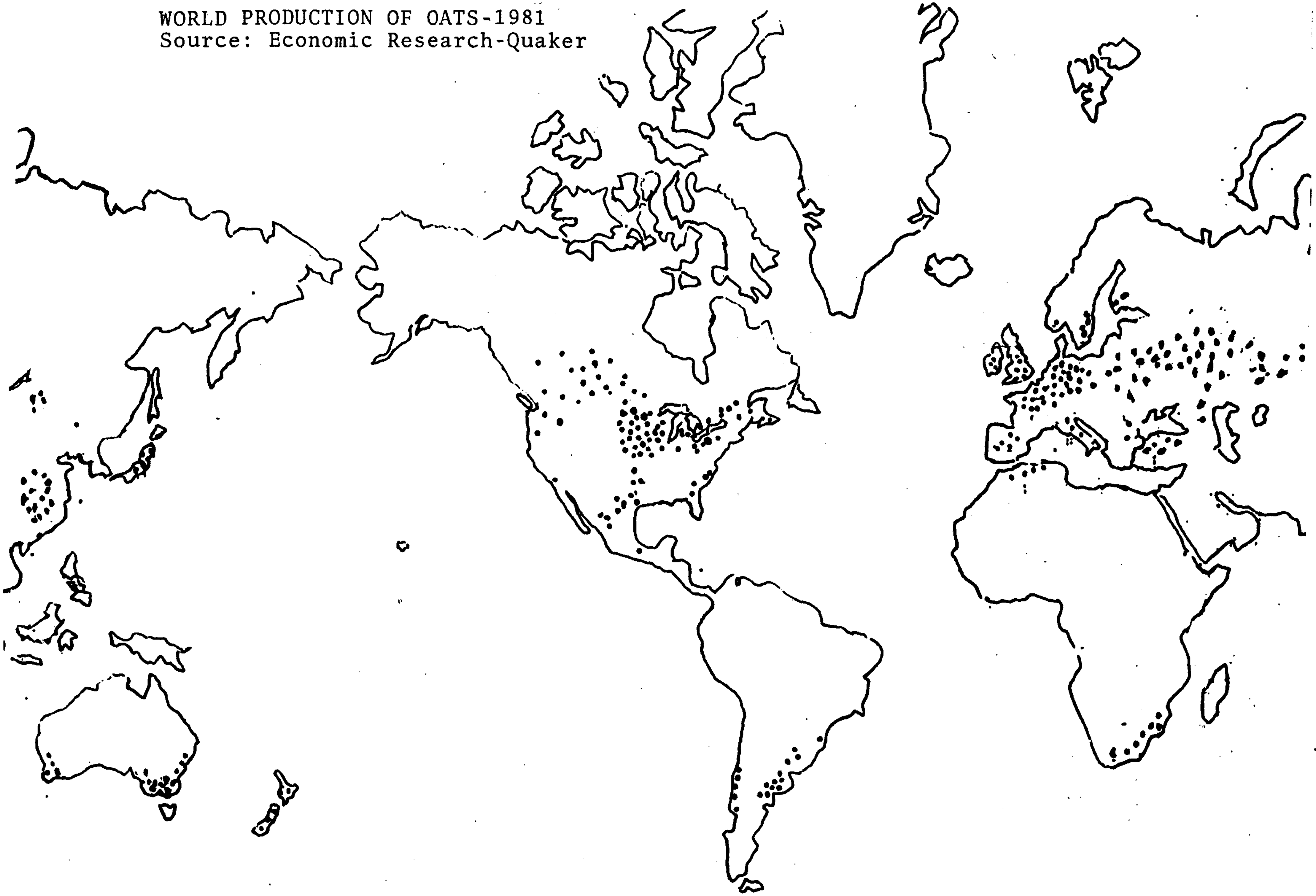
Major additions are also anticipated in oats carryover on June 1, 1983 as feed demand is expected to remain on the defensive relative to a year early. Additionally, exports will be insignificant, however, we do anticipate some additional oats will be used for food purposes.

Overall value for oats will follow the basis trend of corn, however, we anticipate premiums for oats relative to corn on an equivalent weight basis will continue throughout the 80's.



CASH CORN AND OATS PRICES
(DOLLARS PER METRIC TON)
160
140
120
100
80
60
40
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
= CHICAGO #2 YELLOW CORN
= MINNEAPOLIS #2 EXTRA HEAVY OATS

WORLD PRODUCTION OF OATS-1981
Source: Economic Research-Quaker



1982 Oat Stem and Crown Rust

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

In 1982, oat stem rust was first observed in a Beeville, Texas nursery on March 30. This is two weeks later than the 40-year mean (1941-1980). Throughout Texas oat stem rust was light and primarily in the southern and eastern areas. This area provided inoculum for the northern oat growing area where rust was found in most fields, but generally only in light amounts. The first infections were found in the northern oat-growing area in late May in eastern Minnesota. This early infection normally would result in a severe buildup; however, cool temperatures and infrequent dews in June and early July retarded disease development. The second effective exogenous input of inoculum occurred at the end of June and covered the western part of Minnesota and the eastern Dakotas. This resulted in a heavier infection level but was too late to damage the crop which was maturing rapidly even though favorable environmental conditions occurred in most of this area. Oat stem rust losses occurred only in few late maturing fields in northern Minnesota, North Dakota, and Wisconsin.

The most prevalent race in 1982 (1000 isolates from 364 collections), was NA-27 making up 89% of all isolates (Table 1). Race NA-5 was the only race identified from the Pacific Northwest. It also occurred in Texas and Louisiana, comprising 4% of the total, nationally. As in recent years NA-16 was found in low levels in the upper plains and the south, comprising 6% of the total. Data included in Table 1 are from uninoculated nurseries only.

Oat crown rust was severe throughout Texas in 1982, causing losses in the most severely infected cultivars. Severe crown rust developed and statewide losses occurred in Iowa and New York. Elsewhere losses were light. Aecial development was heavy on buckthorns in the upper midwest and provided heavy local inoculum sources to adjoining fields resulting in some local losses.

Table 1. Physiological races of stem rust identified from 1982 collections made from oats and wild oats.

State	Source	Number of		Percent of isolates of each race[a]						
		Collec.	Isol.	NA-5	NA-16	NA-23	NA-24	NA-25	NA-26	NA-27
Alabama	Nursery	1	3		100					
Arkansas	Nursery	1	3							100
Idaho	Nursery	6	18	100						
Illinois	Nursery	6	16			44				56
Iowa	Nursery	8	22		14					86
Kansas	Field	1	3							100
Louisiana	Field	1	3							100
	Nursery	1	3	100						
Michigan	Field	1	1							100
Minnesota	Field	13	36		3					97
	Nursery	29	79		2					98
	Wild oats	7	16							100
N. Dakota	Field	6	18		17					83
	Nursery	17	49							100
	Wild oats	11	26		4					96
S. Carolina	Nursery	1	3							100
S. Dakota	Field	4	7							100
	Nursery	8	22							100
	Wild oats	2	6		67					33
Texas	Field	10	28		11	7				82
	Nursery	224	623	3	6	*				91
	Wild oats	4	11							100
W. Virginia	Field	2	4							100
1982 USA	Field	38	100		7	2				91
	Nursery	302	841	5	5	1				89
	Wild oats	24	59		8					92
	Total	364	1000	4	6	1				89
1981 Total		555	1530	1	3			*		95
Canada[b]	Nursery	6	18				33	17	44	6
Mexico	Field	2	6							100
	Nursery	10	26							100
	Wild oats	12	36		3					97

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

b Collections were made in Ontario in an area where barberry occur.

* = Trace

Entries in International Oat Rust Nursery Furnished by Cooperators

by J. G. Moseman
USDA, ARS, NER, BARC, Beltsville, Maryland 20705

The primary objectives of the International Oat Rust Nursery Program are to permit cooperators to have their advanced selections and parental material tested in the field at many locations to different and potentially new important pathogenic strains of rust pathogens, and to enable cooperators to observe and select new sources of resistance to those pathogens to use in their oat cultivar improvement programs. Ten cooperators furnished 115 new entries for the 1983 International Oat Rust Nursery. The seed of that nursery has been assembled and distributed to the cooperators. We hope that all cooperators will benefit from the new entries in the 1983 nursery.

The first 48 entries in the 1983 nursery were selected by M. D. Simons, and P. G. Rothman. Those entries are being used to monitor the virulences of the rust pathogens in North America. Many of those entries have specific genes for resistance to the rust pathogens.

We hope that individuals will continue to submit entries for the International Oat Rust Nursery. The more new entries submitted, the more the nursery will contribute to the world wide improvement of oat production. Individuals wishing to submit entries for the nursery should contact me. Only 15-20 grams of seed of each entry is required. The seed should be sent to Beltsville by February 1.

OAT PRODUCTION AND BREEDING IN SOUTH BRAZIL

Elmar Luiz Floss, Augusto Carlos Baier, Lizete Eichler,
Claud Ivan Goellner and Renato Serena Fontanelli; Agronomy Faculty,
University of Passo Fundo

PRODUCTION

During the last five years, the acreage and the production of oats have increased in Rio Grande do Sul. In 1981, 57,187 ha of grain oats were cultivated, 149% more than in 1976. The production of grain was 58,838 metric tons, 165% higher than 1976. An estimated area of 120,000 ha of pasture oats, mostly Avena strigosa, was also grown.

In 1982 the grain oats were estimated at 60,798 ha and that for pasture at 150,000 ha. In acreage of small grains, oats was second only to wheat. For 1982 the production was estimated at 39,184 metric tons, with an average yield of 644 Kg/ha.

The increased acreage of oats is attributed to the frequent failures of wheat, better prices for oats, import barriers and the expansion of dairy production.

In 1981 the crop was excellent, mainly due to the good weather conditions. The low yields of 1982 are explained by the high crown rust incidence, heavy rains in July and December and high air moisture and temperatures.

The most common cultivars for grain production were Coronado and Suregrain and for pasture "preta comum" (A. strigosa).

In 1981 the distribution of seed of the new cultivar UPF1, bred at the University of Passo Fundo, began. In 1982 the distribution of UPF 2, from the same University, and UFRGS-1, 2 and 3 from the Federal University of Rio Grande do Sul in Porto Alegre were distributed to the farmers.

BREEDING

The oat breeding program started in 1977 at the Faculty of Agronomy, was continued in 1982, based mainly on genetic stocks distributed by the project: "Breeding Oat Cultivars Suitable for Production in Developing Countries". The main objectives were: adaptibility to the different regions of Brazil, resistance to leaf and stem rust and high yield potential, for forage and grain.

The following trials were planted and harvested in 1982:
- Screening Nursery with 357 lines;
- Selection of segregating populations, 94 lines in F3, 337 lines in F4, 220 lines in F5, 318 lines in F6, 134 lines in F7 and 125 lines in F8, summing up, 1222 lines;
- Preliminary yield trial, 63 lines;
- Regional Yield trial, 21 lines;
- South Brazilian Yield Trial, 21 lines and
- Preliminary forage yield trial with 35 lines.

The research at the University of Passo Fundo also included: Grain and Forage yield at different sowing dates, and different cutting frequencies; resistance to aphids and identification of crown rust races.

The Regional and South Brazilian yield trials are coordinated, prepared and evaluated at the University of Passo Fundo. The trials are conducted by local institutions in the States of Rio Grande do Sul, Santa Catarina, Parana, Sao Paulo, Minas Gerais, Mato Grosso do Sul and Brasilia (D.F.).

CULTIVARS

In 1981 the University of Passo Fundo first distributed basic seed of the cultivar UPF-1. This oat was selected from FLA AB113, introduced through Prof. H. L. Shands in 1976. This cultivar was designated as line number UPF77S509. In table 1 there is a comparison of UPF-1 with the most commonly grown varieties, Suregrain and Coronado.

Table 1. Yield comparison of UPF-1, Coronado and Suregrain during four years (1977/80) in Passo Fundo and during 3 years (1978/80) at six different locations.

Cultivar	Passo Fundo kg/ha	%	Other locations kg/ha	%	Days to Flower
UPF-1	2857	194	2574	142	100
Suregrain	1472	100	1813	100	110
Coronado	1445	98	1788	99	110

Rust resistance was the main factor responsible for the high yield. In 1982, however, many fields were seriously damaged by crown rust, depressing yields very much.

In 1982, 11.00 kg of basic seed of the new cultivar UPF-2 was distributed. This variety originated from Wisconsin, X 2505-4 and was formerly designated as line number UPF 77S039. Its late maturity and high forage potential, make it a good dual purpose variety. Table 2 gives a comparison of UPF-1, UPF-2, Coronado and Suregrain during 1978/81 in Passo Fundo and 1979/81 at eleven locations.

Table 2. Average yields of UPF-1, UPF-2, Coronado and Suregrain in Passo Fundo during 4 years and at 11 different locations during three years.

Cultivar	Passo Fundo		Other locations		Days to Flower
	kg/ha	%	kg/ha	%	
UPF-1	2713	148	2215	121	100
UPF-2	2476	135	2299	126	120
Coronado	1833	100	1822	100	110
Suregrain	1665	91	1817	100	110

CROWN RUST

Susceptibility to crown rust (*Puccinia coronata*) and stem rust (*Puccinia graminis avenae*) is the biggest problem for oat development in south Brazil.

To obtain oat cultivars resistant to these diseases, the Agronomy Faculty started a program last year to determine incidence of races of crown and stem rust, and to identify resistant material for utilization in the breeding program.

In 1982 spores of crown rust collected in the oat nursery were used to inoculate seedlings of susceptible cultivars. Differential varieties were then inoculated with isolates from this material.

BREEDING FOR APHID RESISTANCE IN OATS

Claud Ivan Goellner, Elmar Luiz Floss, Lizente Eichler, and Sergio Schneider
Agronomy Faculty
University of Passo Fundo
Brazil

INTRODUCTION

Good oat cultivars have been selected from material furnished by the University of Wisconsin. Aphids are the main pest problem on oats, mainly the species Metopolophium dirhodum (Walker), Sitobion avenae (Fabricius) and Schizaphis graminum (Rondani). Yield loss is estimated at 35%, and 60-65% when including damage by Barley Yellow Dwarf Virus (BYDV).

The increasing complexity of insect pest control, has emphasized the need for more effective control measures. The use of resistant varieties is one promising possibility. Screening for resistance, and incorporating it in varieties with other desirable agronomic characteristics, is very important for oat development in Brazil.

THE PROGRAM

The aphid resistance breeding program is just starting and includes:

1) Screening for resistance sources in local and introduced collections, to the three species of aphids;
2) Determining the nature of the resistance, and;
3) Hybridization and selection from progenies of lines combining resistance with good adaptation.

SCREENING FOR GREENBUG RESISTANCE

Eighty-nine selections were tested in the greenhouse for their resistance to M. dirhodum and S. avenae. Three plants of each line were planted in small pots, and infected with fifty virus free aphids per plant at the one leaf stage. The evaluation was done after the death of the susceptible check.

1) Rating of Damage: "0" (without chlorosis) to "10" (plant died)
2) Kind of chlorosis: "1" limited spot
   "2" intermediate spot, "3" generalized spot
3) Number of aphids in green areas: "0" (without aphids) to "5" (large number of aphids on green areas)

The resistance was rated: 0 = apparently Immune (I); 1.2 = Highly resistant (RR); 3-4 = Resistant (R); 5-6 = Moderately Resistant (MR); 7-8 = Susceptible (S); 9-10 = Highly Susceptible (SS).

Table 1 shows the lines that were rated resistant.

Table 1. Oat lines[a] resistant to greenbug (S. *graminum*) in the Germplasm Collection, Passo Fundo, Brazil, 1982.

Lines	Pedigree	Aphid reaction	
		First test	Second test
77258-2-1-6B	Coker 1214 x ILL 1514	MR	MR
78320-46	X1779-2X-H2051-6	MR	MR
80S099	Coker 1217 (Bage)	MR	MR
80S097	X2055-1-(Bage)	R	R
79184-14	CI 1217 x (2590-9 x 2638-1)	MR	MR
PI 258637	PI 258637	RR	RR
79S017	TAM 312	MR	MR
CI 8250	CI 8250	MR	MR
79294-1-7	X2638-1 x Coker 1217	MR	MR
77104-75	Coker 234 x CI8235	MR	MR
CI 3223	CI 3223	RR	RR
CI 4770	CI 4770	RR	RR
80S071	TX73C73C32020	MR	MR
77256-5	CORONADO x X1779-2	MR	MR
CI 1579	CI 1579	RR	RR
PI 258644	PI 258644	RR	RR
77258-1-1-9b	Coker 1214 x ILL 1514	MR	MR
CI 5069	CI 5069	R	R
79176-1-8	CI 1217 x (CORO XBCLA)	MR	MR
UFRGS 78A04	DAL x CDA 292	R	R
UPF 79344	X1205 x FLA 1093	R	R
77286-4	X1913 x X 2357-1-1	MR	MR
80S084	79 Bul 3109 (Res.)	MR	MR
79229-1-7	TCFP x (2888 x ARK99-190)	MR	R
77258-5-1b	Coker 1214 x ILL 1514	MR	MR

Table 1 continued

PI 258612	PI 258612	RR	RR
CI 1580	CI 1580	RR	RR
77256-5-17	CORONADO x X11779-2	MR	MR
CORONADO	CORONADO	MR	MR
CI 4485	CI 4485	MR	MR
CI 5068	CI 5068	RR	RR
77S030	X2055-1	MR	MR
CI 5061	CI 5061	RR	RR
79192-1-7	IRWIN x (BS175 x ZYH60)	MR	MR
CI 4767	CI 4767	MR	MR

[a] The "PI" and "CI" lines were obtained from M. E. McDaniel (Texas A&M University, College Station, Texas).

ACKNOWLEDGMENT

We wish to thank Dr. Milton E. McDaniel (Texas A&M University, College Station, Texas) for his criticism, encouragement, and help in furnishing breeding materials.

NAKED-SEEDED OATS WITH A CHEVRON-TYPE SPIKELET

V.D. Burrows

Research Branch, Agriculture Canada

A naked-seeded oat with a very exaggerated multiflorous spikelet was isolated at Ottawa in 1981. Each spikelet is quite robust in size and possesses as many as 12 florets. The spikelet has been called a "chevron-type" spikelet because the arrangements of the florets resembles a chevron pattern. The trait was first isolated in hybrid number 02988 (Ottawa Research Station number) which was a cross between a moderately long-peduncled, small-seeded, dwarf parent and a large-seeded, naked, tall oat parent. The chevron-type oat was first observed on a dwarf plant which later segregated for plant height. The trait is expressed equally well in both dwarf and tall lines under field and greenhouse conditions. The seed is somewhat smaller than is commercially desirable but attempts are being made to rectify the problem by using a few of our very large-seeded oats derived from our daylength insensitive program as parents.

One of the problems that may be solved by this new spikelet is that of having a low incidence of covered oats in the threshed sample. Covered oats commonly arise at the tip of the spikelet in conventional naked cultivars. In the chevron-type spikelet, the apical florets are usually sterile and the lower florets produce naked kernels. This sterility at the tip of each spikelet has had the added advantage of eliminating very small kernels and making the kernel size of those kernels remaining more uniform.

The Effect of Oat and Barley Mixtures on Disease Development and Other Agronomic Traits of the Oat Component

R.V. Clark and D.A. Galway

Research Branch, Agriculture Canada

The influence of oat and barley cultivar combinations and oat and barley ratios within cultivars in mixtures on disease reaction, seed yield, kernel weight and protein content has been investigated for three years in field plots at Ottawa. Three cultivar combinations covering a range in maturity (Oxford/Laurier, Scott/Massey, Sentinel/Herta) were grown all three years while in a fourth early set the cultivars varied from year to year. Five mixture ratios were included in each set of cultivars (Pure oats, 3 oats:1 barley, 1 oat:1 barley, 1 oat:3 barley by volume and pure barley). The various mixtures were planted in 32 row plots 7.5 m long with 23 cm spacing in a randomized block design. Disease severity was assessed at the milky ripe stage of growth. At maturity four 6.1 m long x 1.2 m wide strips were harvested from each plot using a Hege combine and seed yields and kernel weights of the various components were compared. Protein content was determined on ground kernel samples using a Technicon for oat protein and the Kjel-Foss process for barley protein.

Disease development on the various oat components is shown in Table 1. In general as the amount of oats in the mixture were reduced the severity of disease development was reduced with the most dramatic difference between the ratio of 1 oat:3 barley and pure oats. The 1:1 and 1:3 ratios of oats to barley and pure barley significantly outyielded the 3:1 oats to barley and pure oats over the three years. The oats in the 1 to 3 ratio of oats to barley consistently had significantly higher kernel weights and protein content.

Table 1. Disease Reactions in Oat-Barley Mixtures

Mixture		Oat Crown Rust			Septoria
Component Cultivars	Ratio	1980[1]	1981[2]	1982[3]	1980[1]
Oxford/Laurier	Pure oats	16.5	7.53	20	26.25
	3 oat:1 barley	7.0	11.3	15	13.2
	1 oat:1 barley	9.0	13.73	10	18.5
	1 oat:3 barley	7.5	10.27	10	11.1
Scott/Massey	Pure oats	36.5	11.27	25	41.25
	3 oat:1 barley	31.0	8.37	15	39.5
	1 oat:1 barley	22.25	8.97	15	35.0
	1 oat:3 barley	14.0	6.97	10	19.0
Sentinel/Herta	Pure oats	34.75	16.53	15	19.75
	3 oat:1 barley	23.5	9.73	15	30.25
	1 oat:1 barley	22.6	10.13	15	16.2
	1 oat:3 barley	13.75	8.87	1	20.25

[1] Average % leaf area infected per plant based on top 2 leaves of 10 randomly chosen plants per plot.
[2] Average % leaf area infected per plant based on top 3 leaves of 10 randomly chosen plants per plot.
[3] Average % infection rated on plot basis.

OAT BREEDING AND BYDV TESTING IN SAINTE-FOY, QUEBEC

J.P. Dubuc and A. Comeau, Agriculture Canada

Breeding

We breed oats for increased yield, lodging resistance, earliness and BYDV resistance. We are also developing germplasm for other goals such as resistance to Septoria and resistance to flooding and wet soils. The Ste - Foy oat breeding program has produced 5 commercial cultivars in the last decade: Alma (1974), Lamar (1979), Manic (1979), Shaw (1981) and Kamouraska (1982).

BYDV resistance

A BYDV resistance trial was made once again to compare selected entries of *Avena sterilis* (Can. J. Plant Pathol. 4: 147-151) with the best resistant oat lines of other species such as reported in Oat Newsl. 1981, p. 46. The 1982 trial confirmed that *Avena sterilis* is the most resistant species and that it is significantly better than *Avena strigosa* for virus resistance. *Avena macrostachya* was not included in the 1982 test because it is a winter type.

A fourth report on "trials on the resistance of cereals to barley yellow dwarf virus (BYDV)" was prepared. It contains 93 pages of data on international trials (CIMMYT, ICARDA), and 39 pages on trials from Canada, USA, Australia, out of which 25 pages represent oat trials. Many of these trials contain a large number of BYDV-resistant lines. It seems that the BYDV resistant oat lines are gradually replacing the susceptibles in many oat breeding programs.

A summary of the most relevant information is presented in Table 1.

Table 1. BYDV reaction of selected entries

Quebec germplasm	
QO 199.27	7.0
QO 199.60	7.1
QO 209.8	3.1
QO 209.13	6.6
QO 209.19	2.5
QO 209.25	2.8
QO 209.42	3.1
QO 209.43	3.1
QO 209.44	2.6
QO 209.45	2.8
QO 209.48	3.6
QO 209.51	4.7
Susceptible checks	8.6 - 8.9

Lines of other origin	
Ogle (Illinois)	3.0*
West X OT 207/3/12 (Australia)	4.3
West X OT 207/3/2 (Australia)	4.1
OT 216 (Winnipeg)	3.3
82 R.A.T. no. 24 (Winnipeg)	3.5
Susceptible checks	7.8 - 8.9

*The score for Ogle is the average of data of 4 trials.

OATS IN MANITOBA - 1982

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1982 was a good year for oats in Manitoba and much of western Canada. Cool temperatures plus adequate rain produced heavy crops. As usual, a significant part of the oat crop was late sown and suffered significant frost damage in many areas during the week of August 25th. The frost damage along with rust damage on the eastern prairies reduced yield and quality significantly.

In Manitoba the rust resistant oat cultivar Fidler, released in 1980, was grown on 36% of the acreage and should increase significantly again in 1983 because all of the older rust susceptible oats such as Harmon and Hudson have been removed from the recommended list. A new cultivar Dumont has been licensed and released to growers in 1982 (see description).

The Oat Rusts

In Western Canada the oat rusts first appeared in mid July and developed slowly at first allowing early sown fields to escape with little or no damage in 1982. However, by mid-August both stem and crown rust infection levels ranged from 20-60% across Manitoba and into eastern Saskatchewan, and moderate to severe damage, particularly due to stem rust, occurred in many later sown fields of Harmon, Hudson and other susceptible varieties. No damage occurred in fields of the resistant cultivars Fidler and Dumont.

During the past two years there has been an increase in the number of isolates of crown rust virulent on the cultivar Hudson but it along with Harmon have been dropped from the recommended list and should soon disappear from the commercial scene.

Unfortunately, a new race of crown rust, with the *Pc*-gene avirulence/virulence formula 38, 45, 48, 50, 56, 58, 60, 61, 62, 63/35, 39, 40, 46, 59 was isolated in 1982 from a *Pc-39* trap nursery grown near a natural stand of buckthorn at Brandon, Manitoba. Gene *Pc-39* is the major resistance factor in Fidler and this new race attacks Fidler. Dumont which has *Pc-38* in addition to *Pc-39* is resistant. Buckthorn in Manitoba is not being controlled and its ability to spread naturally, continues to be of concern.

In eastern Canada NA25 was the predominant race of stem rust with 74% of all field isolates, while in the west NA27 comprised 96% of all field isolates. The late summer epidemic of race NA27 appears to have overwhelmed the diversity of races usually found in the west. The cultivars Fidler and Dumont are expected to provide adequate protection against both rust in 1983.

BYDV

There was a large area of late seeded cereals in the northern half of the Red River Valley at a stage susceptible to barley yellow dwarf virus (BYDV). However, only light to moderate populations of aphids (estimated at about 10 aphids per plant) developed during the middle of July, and losses from this virus in this area were therefore low. In western Manitoba, aphid vectors were scarce.

Aphid vectors consisted of the English grain aphid (*Sitobion avenae*) and the cherry oat aphid (*Rhopalosiphum padi*) in approximately equal numbers. Samples from the field revealed a predominance of the virulent, non-specific strain of BYDV. At least two unusual isolates of BYDV were found. These were of the type specific for the cherry oat aphid, but whereas symptoms are normally mild for this type, symptoms for the above two isolates were severe. Strains of the latter type were only recently recognized and reported by Paliwal in southern Ontario (Paliwal, Y.C. 1982, Can. J. Plant Pathology 4: 59-64).

During August, large populations of the corn leaf (*R. maidis*) aphid built up on the common weed, *Echinochloa crusgalli* (L.) Beav. (barnyard grass).

Oats and Oat Breeding in Saskatchewan 1982

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Acreage

Saskatchewan's 1982 oat acreage was down slightly to 1.40 million acres from 1.45 million acres in 1981. However, the total production was considerably higher since the average yield was up some 12%, thanks to an excellent growing season with adequate moisture in most regions.

Varieties

Harmon continues to be the most popular variety occupying more than 50% of the acreage with Kelsey still next most popular at about 11.0%. The most interesting development is the dramatic increase in acreage of the new high yielding variety Cascade which jumped from about 1% of the acreage in 1981 to nearly 10% in 1982. No other new variety has caught on this quickly in nearly twenty years.

Oat Breeding and Research at the University of Saskatchewan

Thanks again to the generous support of the Quaker Oat Company of Canada, we have been able to continue our modest oat breeding effort. We are continuing to try to develop high yielding, plump seeded, thin-hulled, high test weight cultivars useful both as forage or grain oats and adapted to the non-rust areas of Saskatchewan. Although we don't have the facilities to screen for rust resistance we are beginning to attempt to include smut resistance as a criterion in our breeding program thanks to the assistance of Dr. Jens Neilson at the Winnipeg Agriculture Canada Station.

We have two sister lines which were in the final year of Co-operative testing in 1982, OT307 and OT308. Both these lines combine high yield potential with thin hulls and high test weight. We anticipate presenting one of these lines for support for licensing as a variety early in 1983.

OAT BREEDING AT THE INSTITUTE OF PLANT BREEDING AT JOKIOINEN IN FINLAND AFTER THE SECOND WORLD WAR

Marketta Saastamoinen

Very great progress has been made with oat breeding at the Institute of Plant Breeding at Jokioinen in Finland since the Second World War. Of the 7 varieties released during this time, 6 have been put on the market during the last 12 years.

Dr. Kalevi Multamaki served as the oat breeder at the Institute of Plant Breeding from 1945-48, Mr. Oiva Inkila, M.Sc.Agr., from 1949-79, and the present writer since the year 1979. Mr. Oiva Inkila bred the 6 excellent oat varieties released during 1970-81. Prof. Rolf Manner has also made valuable contributions to the increased efficiency of the breeding work at the Institute of Plant Breeding.

Varieties released since the Second World War and their origins are as follows:

Variety	Origin	Released
Juha	Esa x Tahti	1951
Ryhti	irradiated Sisu x Blixt	1970
Reima	irradiated Sisu x Pendek	1974
Heikki	Blenda x Sisu	1975
Puhti	Hannes x Ryhti	1978
Nasta	Titus x Ryhti	1979
Veli	Titus x Sisu L	1981

Four of these varieties, Ryhti, Puhti, Nasta and Veli, are now being cultivated in Finland. Puhti is being grown commercially in Sweden and in Norway as well. Ryhti is earlier than the most widely cultivated variety in Finland, but Puhti is still grown to the greatest extent. Veli has been tested in official variety trials in Sweden and in Norway.

When the origins of the 7 Finnish varieties are compared, it is observed that apart from Juha these varieties are descended from the Sisu oat variety. Sisu was released from the Hankkija Plant Breeding Institute in Finland in 1948. The origin of Sisu is Vaasa x Ta 02272. The genetic base, which has been made use of in breeding the 6 varieties, Ryhti, Reima, Heikki, Puhti, Nasta and Veli, is not large. Only 6 varieties (Sisu, Blixt, Pendek, Blenda, Hannes and Titus) have been used in the breeding of these varieties and Sisu is found in the pedigree of all these varieties. In a marginal area of oat cultivation such as Finland, the availability of adapted genetic material is more important for breeding purposes than is large genetic variation.

The four oat varieties now in cultivation, Ryhti, Puhti, Nasta and Veli, have good resistance against lodging and yield well in relation to their growing time. Puhti has a very low hull percentage, while Nasta and Veli have a high protein content. All of them are very well adapted to Finnish conditions. More detailed descriptions of Puhti, Nasta and Veli have been published in earlier volumes of Oat Newsletter.

CELL-WALL CONSTITUENTS AND DIGESTIBILITY OF MULTICUT OAT VARIETIES

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In our region, oats are grown near towns and in intensive livestock development areas. In recent times the practice of growing multicut varieties for fodder has gained popularity which makes the fodder available for a longer period. The present investigations were conducted to determine the quality of different varieties. The crop was sown with 15 varieties and in a randomized block design in the month of November and two cuts were taken. The first cut was taken 75 days after sowing and the second at 50% flowering stage. The means of traits important in quality are shown in Tables 1 and 2.

Crude protein percentage ranged from 12.47 to 22.75 in the first cut and from 3.50 to 7.43 in the second cut. Neutral detergent fiber varied from 41.7 to 49.1 in the first cut and from 62.2 to 83.9 in the second cut. Acid detergent fiber variation was from 24.1 to 31.4 in the first cut and from 40.9 to 47.2 per cent in the second cut. Lignin percentage ranged from 2.3 to 4.1 in the first cut and 3.9 to 5.7 in the second cut. In vitro dry matter digestibility ranged between 69.20 and 79.20 in the first cut and 51.20 and 64.00% in the second cut, respectively. Crude protein and in vitro dry matter digestibility decreased in the second cut, whereas neutral and acid detergent fibers and lignin increased.

Averaged over the two cuts, the variation for crude protein yield was from 3.02 to 6.99 q/ha, and digestible dry matter ranged from 35.05 to 73.97 q/ha. On the basis of above results the most promising varieties are Chauri Patti, UPO-160 and OS-6.

Table 1. Cell wall constituents and *in vitro* dry matter digestibility of oat varieties.

Sr. No.	Varieties	CP %		NDF %		ADF %		Lignin %		IVDMD %	
		1st cut	2nd cut	1st cut	2nd cut	1st cut	2nd cut	1st cut	2nd cut	1st cut	2nd cut
1.	OS-6	20.56	4.37	42.9	72.5	28.2	46.5	3.4	5.0	78.20	52.40
2.	OS-7	22.75	4.81	43.9	73.6	28.9	44.6	2.8	4.4	77.80	57.20
3.	OS-8	20.34	3.50	46.8	67.6	31.0	44.8	2.5	4.5	76.00	59.60
4.	S-2688	19.46	4.37	44.6	68.4	29.6	43.3	2.9	4.7	76.20	59.60
5.	S-3021	18.59	5.46	46.9	62.2	29.5	40.9	2.3	3.9	69.20	61.20
6.	UPO-13	21.00	7.43	44.7	69.5	26.9	44.0	3.7	4.1	75.60	61.20
7.	UPO-92	19.25	4.81	48.2	69.7	27.8	43.6	4.1	4.6	71.60	59.80
8.	UPO-94	22.75	5.68	41.9	83.9	24.1	45.0	2.4	5.0	75.60	52.20
9.	UPO-160	17.27	6.56	41.7	71.3	27.6	47.2	2.6	5.6	75.80	57.00
10.	PO-4	18.15	5.03	46.5	68.7	31.4	44.6	2.7	4.6	76.60	64.00
11.	HPO-7-B-3	18.81	5.25	49.1	72.7	30.1	43.9	2.8	5.7	69.20	57.60
12.	Seira	12.47	4.15	43.9	68.2	30.0	41.2	2.7	4.1	79.20	57.20
13.	Chauri Patti	16.62	5.03	48.0	72.2	31.1	40.9	2.3	4.4	73.80	58.80
14.	Palampur-1	18.59	3.71	44.5	70.2	27.7	41.9	3.1	4.6	76.80	56.40
15.	Kent	14.65	3.93	48.4	82.3	30.2	44.9	2.6	6.3	75.40	51.20

Table 2. Crude protein and digestible dry matter yields (q/ha) of oat varieties.

Sr. No.	Varieties	CP Yield (q/ha)				DDM Yield (q/ha)			
		1st cut	2nd cut	Total	R	1st cut	2nd cut	Total	R
1.	OS-6	1.00	5.65	6.65	3	3.82	67.80	71.62	2
2.	OS-7	1.21	4.32	5.53	5	4.15	51.40	55.55	4
3.	OS-8	1.03	2.63	3.66	11	3.84	40.80	48.64	6
4.	S-2688	1.12	3.09	4.21	8	4.39	42.20	46.59	8
5.	S-3021	0.61	3.63	4.24	7	2.27	40.69	42.96	9
6.	UPO-13	0.69	3.95	4.64	6	2.50	32.55	35.05	15
7.	UPO-92	0.53	3.11	3.64	12	1.98	38.68	40.66	11
8.	UPO-94	0.37	5.38	5.75	4	1.25	49.46	50.71	5
9.	UPO-160	0.47	6.52	6.99	1	2.05	56.62	58.67	3
10.	PO-4	0.62	3.54	4.16	9	2.61	45.00	47.61	7
11.	HPO 7-B-3	0.61	3.33	3.94	10	2.25	36.53	38.78	12
12.	Seira	0.53	2.51	3.04	14	3.35	34.65	38.00	13
13.	Chauri Patti	0.83	6.01	6.84	2	3.67	70.30	73.97	1
14.	Palampur-1	0.84	2.57	3.41	13	3.49	39.02	42.51	10
15.	Kent	0.51	2.51	3.02	15	2.63	32.78	35.41	14

ASSESSMENT OF FODDER PRODUCTION POTENTIAL OF 38 NEWLY BRED STRAINS OF FORAGE OATS

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Oats (Avena sativa L.) is an important cereal forage that can provide good fodder even under water stress and poor management conditions. Being rich in protein, it plays an important role in human diet and animal feed. In India, oats are mainly grown as green fodder for animals, and systematic research efforts toward genetic improvement of this hitherto neglected forage have been intensified only recently. In the present communication, fodder production potential of newly bred strains of forage oats tested for two years is being reported.

In all, 38 promising strains of forage oats were tested in replicated field trials for green fodder and dry matter yields, separately under single cut as well as two-cut crop conditions during 1980-81 and 1981-82. For the sake of brevity the ten best strains were selected from these 38 strains, each for single cut and multicut conditions; data: are presented in Tables 1 and 2, respectively.

The green fodder yield (Table 1) ranged from 606.0 to 746.0 q/ha and 714.0 to 814.0 q/ha during 1980-81 and 1981-82, respectively. In the case of dry matter yield, the range was 114.0 to 166.4 q/ha and 141.7 to 176.2 q/ha during 1980-81 and 1981-82, respectively. For green fodder yield, OS-113, OS-110 and OS-96 were better than our newly released standard check variety OS 6. Further, OS-100, OS-107, OS-87 and OS-113 yielded more dry matter than OS 6. The relative ranking of strains varied during the two years, indicating presence of G x E interactions. However, OS-113 for green forage and OS-100 for dry matter yield maintained their superiority during both the years.

To increase the availability of green fodder for a longer time, emphasis has been laid on breeding cultivars having good regeneration capacity so that two cuts can be obtained from the same planting. Therefore, all the 38 strains were also tested under two-cut conditions. The total green and dry matter yields from two cuts for two years along with their average productivity and ranking are detailed in Table 2. Perusal of the data revealed that OS-86 showed the highest green fodder (843.0 q/ha) as well as dry matter (163.6 q/ha) yields. For green forage, OS-85 and OS-96 were the next best but for dry matter yields they ranked 5th and 6th, respectively. These strains were better in productivity than the recently released standard variety OS 7. Moreover, they were very leafy indicating better palatability and higher quality of their herbage. It became evident from the ranking patterns for green fodder and dry matter yields that dry matter percentage varied considerably in different strains.

A critical examination of data in Tables 1 and 2 indicated that three varieties viz., OS-86, OS-87 and OS-96 were among the best ten strains under both single cut as well as multicut crop conditions. Thus, these strains established their superiority for both one-cut and two-cut management conditions.

It may now be concluded that strains OS-113 and OS-86 have exhibited highest forage production potential under single cut and multicut crop management conditions, respectively. Further, the forage production potential of these promising strains was almost double that of the old standard cultivars under cultivation. After extensively testing in advanced breeding trials and also at the farmers fields if they maintain their present level of productivity, the release of these strains for general cultivation is expected to increase the forage production to a great extent. We also have good genetic material in the pipeline to meet our breeding objectives.

Table 1. Performance of the ten best strains (single cut) of oats.

Sr. No.	Genotype	Green fodder yield (q/ha)				Dry matter yield (q/ha)			
		1980-81	1981-82	Mean	R	1980	1981	Mean	R
1.	OS-86	680.0	714.0	697.0	6	156.4	142.8	149.6	6
2.	OS-87	620.0	734.0	677.0	10	136.4	176.2	156.3	3
3.	OS-93	640.0	794.0	717.0	5	140.8	142.9	141.9	9
4.	OS-96	660.0	814.0	737.0	3	145.2	146.5	145.9	7
5.	OS-100	606.0	774.0	690.0	9	145.6	170.3	158.0	1
6.	OS-101	632.0	754.0	693.0	7	114.0	158.3	136.2	10
7.	OS-107	640.0	746.0	693.0	7	166.4	149.2	157.8	2
8.	OS-100	732.0	746.0	739.0	2	143.0	141.7	142.4	8
9.	OS-113	746.0	814.0	780.0	1	141.8	162.8	152.3	4
10.	OS 6	700.0	746.0	723.0	4	147.0	156.7	151.9	5

Table 2. Performance of the ten best strains (two cut) of oats.

Sr. No.	Genotype	Green fodder yield (q/ha) 1980-81	1981-82	Mean	R	Dry matter yield (q/ha) 1980-81	1981-82	Mean	R
1.	OS-85	986.0	646.0	816.0	2	186.8	130.7	158.8	5
2.	OS-86	896.0	700.0	843.0	1	189.4	137.8	163.6	1
3.	OS-87	820.0	708.0	764.0	7	161.8	143.4	152.6	8
4.	OS-89	818.0	700.0	759.0	8	163.6	131.2	147.4	10
5.	OS-90	826.0	686.0	756.0	9	176.6	130.4	153.5	7
6.	OS-96	884.0	740.0	812.0	3	170.2	139.6	154.9	6
7.	OS-108	866.0	714.0	790.0	5	165.6	134.6	150.1	9
8.	OS 7	906.0	708.0	807.0	4	180.4	142.7	161.6	2
9.	Kent	866.0	674.0	770.0	6	193.2	128.4	160.8	3
10.	FOS 1/29	906.0	634.0	770.0	6	191.8	126.8	159.3	4

PROMISING OATS GENETIC MATERIAL

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Oats (Avena sativa L.), which occupies a significant place among the eight most important cereals of the world, is used for human consumption in addition to feed and fodder for animals. This crop is of relatively recent introduction in India and is exclusively grown for fodder. In northern India, especially for areas having restricted water supply, oats is the only reliable winter cereal forage. It is now gaining popularity among farmers mainly because of its multicut behavior and also due to the fact that it gives the highest green fodder yield per unit area per unit time with minimum irrigation. India is now strengthening its dairy industry and thus forage oats is certainly to play a significant role in the realization of the "White Revolution" in this country.

At this university, breeding work on genetic improvement in oats was initiated during the late 1970's. As a result of intensive research work on various aspects, three high yielding and nutritionally rich cultivars (HFO 114, OS6, OS7) with multicut behaviour were released for general cultivation. Now, oat genetic material has been diversified for various economic traits through the germplasm collection and hybridization program. Promising genotypes and their hybrids having good combining ability and stability over a range of environments have been identified by multilocation testing for different attributes.

Good general combiners as well as stable parents and also promising crosses are presented in Table 1. For green fodder (GF) yield, OS 6, OS-9, OS-15, OS-54 and OS-77 were found to possess phenotypic stability over a range of environments. It is interesting to observe that OS 6 and OS-54 exhibited stability for yield and most yield components were also good general combiners for green fodder yield. Similarly, for dry matter (DM) yield, good general combining strains with wider adaptability were also selected. It may be mentioned here that OS-54 was a good general combiner as well as stable for both GF and DN yields. These strains are now being utilized in the crossing programs aimed at developing high yielding and stable genotypes.

Promising hybrids having good combining ability and stability for forage yield and quality attributes were also identified (Table 1), which are now in the advanced generations of our breeding stock. These crosses have also been used for making multiple crosses to mop up the desirable genes and promising segregants will be selected. Exploitation of these genotypes for their specific desirable traits is expected to result in further advancement in terms of both genetic improvement as well as economic gain for this important winter cereal. Promising strains and hybrids with high protein content and better digestibility were also selected for use in oat breeding programs for evolving nutritionally superior, high yielding cultivars along with stability of production.

Table 1. Promising strains and hybrids of forage oats.

Character	Good Combiners		Stable Genotypes	
	Strains	Hybrids	Strains	Hybrids
Green fodder yield	OS 6, OS 9, OS 15, OS 54, OS 64, HFO 114	OX 84 x OS 8, 3021 x HFO 114	OS 5, OS 6, OS 7, OS 8, OS 9, OS 54, OS 77	OS 7 x Kent, OS 77 x Flamings gold,
Dry matter yield	OS 54, Weston-11, 3021, HFO 114	OS 84 x OS 8, 3021 x HFO 114	OS 5, OS 6, OS 7, OS 8, OS 9, OS 54, OS 77, 2688	OS 7 x Kent, OX-77 x Flamings gold
Number of tillers per plant	OS 54, 3021 HFO 114	OS 84 x OS 8, OS 163 x OS 54, HFO 114 x K 4263 F.G. x HFO 114	OS 5, OS 6, OS 7, OS 8, OS 9, OS 54, OS 77, 2688, Kent	2688 x Weston-11
Number of leaves	3021, OS 54	HFO 114 x OS 136, OS 163 x OS 54	2688	3021 x Weston-11
Plant height	3021	Kent x OS 7	OS 6, OS 7, OS 8, OS 9, OS 54	OS 7 x Kent, OS 77 x F.G.
Days to 50% flowering	OS 6, OS 7, HFO 114,	Kent x OS 196, Kent x OS 7	Weston-11	OS 7 x OS-77, 3021 x Kent
Dry leaf weight	OS 54, 3021, HFO 114	HFO 114 x OS 136, OS 163 x OS 54, F.G. x HFO 114, Kent x OS 7, Kent x K 4263	OS 5, OS 6, OS 8 OS 9, OS 54	--
Dry stem weight	OS 6, OS 54, 3021 HFO 114	3021 x HFO 114, OS 84 x OS 8	OS 5, OS 6, OS 8 OS 54	--
Protein	3021, Weston-11	2688 x Kent, Flamings gold x Weston-11, OS 77 x Weston-11	OS 6, OS 8, OS 54, OS-77, Weston-11	2688 x Weston-11, OS 7 x 2688
I.V.D.M.D.	Kent, OS-77	OS-77 x Flamings gold, Flamings gold x 2688, 2688 x Weston-11	OS 5, OS 6, OS 8, OS 9, OS 54, OS 77, 2688	OS 77 x F.G., 2688 x Weston-11

PERFORMANCE OF F_7 AND F_8 PROGENIES FOR GREEN FORAGE AND DRY MATTER YIELDS IN OATS

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There has been a significant increase in the area sown to oats in India during the last decade and thus also of the role of the crop in Indian Agriculture. Oats, in India, are primarily grown for green forage, hay or feed for livestock. With the development of an intensive livestock industry in the country the oat crop is playing a progressively more significant role and is attracting the attention of oat breeders on one hand and of crop management and livestock specialists on the other. Planned efforts toward developing improved oat varieties for forage and seed production at this university led to the development of a chain of high performing lines/varieties for cultivation. The oat breeding program at this university continues to develop high yielding cultivars with better nutritive value and adaptive to low management inputs under diverse agro-climatic regions of the country.

Twenty-nine progenies in the F_7 generation of adapted x unadapted and unadapted x unadapted cultivar crosses with three check cultivars ('Kent', 'UP094', and 'UP0160') and 33 progenies in F_8 generation of adapted x unadapted cultivar crosses with the check cultivar 'Kent' were evaluated separately in 3 replicate randomized complete block design in 1980-1981. The entries were evaluated for green forage yield (t/ha), dry matter yield (t/ha), and days to 75% heading in both the trials. Both the trials showed significant differences for the traits studied. The results of the superior progenies and the most adapted check cultivar, 'Kent', are given in Table 1. Going through the pedigrees of the progenies tested it appeared the the two-parent cross combinations showed less superiority than the three- and multiple-parent cross combinations in the F_7 progeny trial. More than 5 tons/ha of superiority was observed in 11 progenies for GFY and more than 1 ton/ha in DMY. The highest yielding progeny (83.3 t/ha GFY and 16.7 t/ha DMY) came from the multiple-parent cross combination. Of the F_8 progenies of all two-parent crosses evaluated, again 11 progenies exceeded the most adapted check cultivar 'Kent' by more than 2 tons/ha of GFY and DMY both. The highest yielding progeny (86.7 t/ha GFY and 19.3 t/ha DMY came from the cross 'Orbit' x 'Kent'. However, both F_7 and F_8 progenies took 12 to 15 days more in days to 75% heading than the check cultivar 'Kent'. This enhanced duration may help in supplying green forage over an extended period during the summer season when green forage becomes progressively scarcer. It was also of interest to note that the high yielding progenies were derivatives of adapted x unadapted cross combinations. It was also noted that these three traits were highly significantly correlated with each other. The study, therefore, signifies the importance of multiple-parent participation as compared to two-parent combinations in the development of high yielding genotypes. It also signifies the importance of crossing between adapted x unadapted cultivars.

Table 1. Performance of superior F_7 and F_8 progenies for days to 75% heading (DH), green forage yield (GFY), and drymatter yield (DMY) at Pantnagar, UP, india.

Progeny[a/]	DH	GFY(t/ha)	DMY(t/ha)
F_7:			
OX 76-6-6-2	100	75.5	16.1
-6-9-2	97	80.0	16.4
OX189-1-4-1	95	73.3	15.4
-1-22-1	91	71.1	12.6
-3-4-1	109	73.3	16.0
-7-10-2	95	71.1	14.6
-10-2-1	96	75.6	16.7
-11-6-1	101	73.3	11.5
-17-29-1	103	75.6	13.8
-12-29-2	101	82.3	15.0
-23-6-2	101	73.3	12.9
Kent (check)	84	64.4	10.3
F_8:			
OX8-19-3	122	91.1	17.2
-44-4	99	80.0	14.0
-44-13	108	77.7	14.2
OX12-10-4	105	82.2	15.5
-10-10	105	80.0	19.3
-10-13	104	84.4	19.0
-11-11	94	75.6	15.9
-13-2	93	75.6	16.0
-16-9	101	77.7	13.1
-24-3	98	86.7	14.8
-2-1	101	82.1	17.1
Kent (check)	82	73.3	10.3

a/OX 76 = (Portal-Kent)Rapida
OX189 = [(Kent-Rapida)(Orbit-Kent)]Indio
OX8 = Portal-Kent, OX12 - Orbit-Kent

HYBRID VIGOR FOR CERTAIN TRAITS IN A. SATIVA X A. STERILIS CROSSES

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The discovery of high groat % and disease resistance in *A. sterilis* L. (2n=6x-42) lines by Murphy *et al*. (1967), and their later extensive use in oat breeding, especially by K. J. Frey of Iowa State University, stimulated many others to use genes from this wild relative in the improvement of the cultivated type.

Avena sterilis L. (wild red oat) lines (CI 8077, PI 292549, PI 292561, PI 295909, and PI 295932) obtained through the courtesy of Dr. R. A. Forsberg of the University of Wisconsin, Madison, USA were evaluated for their total plant morphology and seed characteristics at the G.B. Pant University of Agr. & Tech., Pantnagar, India in the recombination nursery along with certain selected *A. sativa* cultivars of exotic origin. Some of the important traits, among others, for the forage type oats are plant height, leaf length and width, tiller number, and heading date. Some of the above lines of *A. sterilis* showed promise in some of these traits and, therefore, were crossed onto certain selected cultivated types in the year 1978-79. The only difficulty observed for the sterilis accessions was that of the deciduous nature of the mature spikelets causing difficulty in the collection of the seed. Moreover, the lemmas were very hairy with big awns and poor threshability.

The parents and their F_1s were planted in 2m long rows spaced 50cm apart in the F_1 nursery in 1979-80 for further observation and multiplication. Plant height (cm), leaf length (cm), leaf width (cm), tiller number, and days to 75% heading were measured on the parents and their F_1 hybrids. Heterosis (F_1 superiority over the mid-parent) and heterobeltiosis (F_1 superiority over the better parent) were estimated for quantifying the first generation heterozygote superiority in these interspecific hybrids. The results are summarized in Table 1.

Among the 16 F_1s studied, 13/16 showed earlier behavior with respect to the midparent and 10/16 showed earlier behavior with respect to the earlier parent for days to 75% heading. The combination 'Swan' x PI 295932 was the earliest. For plant height, 10/16 crosses exceeded the mid parent value and 7/16 exceeded the tallest parent. Maximum height was observed in the cross 'Orbit' x CI 8077' and was followed by 'Portal' x 'CI 8077'. Almost all the F_1s, excepting a few, showed increases in leaf length and leaf width. Leaf length was maximum in 'Portal' x 'CI 8077' followed by 'Wright' x 'CI 8077'. Leaf width was maximum in the cross 'WA 1470' x 'PI 295932' and it was followed by 'Portal' x 'CI 8077'. Several other F_1s, such as 'Orbit' x 'CI 8077', 'Swan' x 'PI 295932' and 'D1336' x 'PI 295932' also showed significant increases in leaf width over the better parent. Number of plants was greatly increased in these interspecific hybrids. There was about 7-110% increase in heterosis and 1.3-95.9% increase in heterobeltiosis. Maximum increase in tiller number was noted in the cross 'D 1336' x 'PI 295932' followed by 'WA 1470' x 'PI 295932', and 'Forward' x 'CI 8077'. It therefore, appeared that the sterilis lines 'CI 8077' and 'PI 295932' were important in contributing toward improvement.

In general, the F_1 hybrids showed nondeciduous nature of spikelets, and decrease in hairiness and awn length. The reproductive characteristics of these interspecific hybrids indicated intermediate reaction with respect to the parents.

The present endeavor to utilize sterilis genes thus indicated their usefulness in obtaining certain heterotic effects in the sativa x sterilis crosses. The segregating generations further indicated certain very useful recombinants with a combination of such morphological traits which when fixed will produce superior cultivars with increased forage production.

Table 1. Heterosis and Heterobeltiosis for Certain Traits in <u>Avena</u> <u>sativa</u> x <u>A</u>. <u>sterilis</u> crosses.

Cross	Days to 75% Heading		Plant height (cm)		Leaf length (cm)		Leaf width (cm)		No. of tiller/ plant	
	Heterosis (%)	Heterobeltiosis (%)	Heterosis (%)	Heterobeltiosis (%)	Heterosis (%)	Heterobeltiosis (%)	Heterosis (%)	Heterobeltiosis (%)	Heterosis (%)	Heterobeltiosis (%)
Forward x CI 8077	-1.2	1.6	15.6	15.2	31.1	12.8	17.7	2.6	110.0	78.4
Holden x "	10.4	28.5	13.2	8.0	28.6	17.1	2.3	-7.8	57.0	1.03
Wright x "	-4.5	1.6	-3.4	-13.1	37.3	22.3	13.6	-2.3	98.0	63.9
Portal x "	9.2	9.2	41.6	23.2	58.0	45.7	68.9	52.0	-38.0	-61.5
Clintland 64 x "	-9.4	-7.2	-3.1	-4.1	3.1	-5.3	16.8	4.3	26.0	15.0
Orbit x "	-10.9	-9.5	36.4	32.0	34.0	14.2	49.5	42.0	23.0	5.7
Cocker 72-27 x PI 292549	-4.9	2.6	12.9	-1.3	8.6	1.3	13.0	6.6	9.4	3.6
Holden x PI 292561	-3.1	-0.8	20.3	9.0	9.1	7.5	12.5	10.7	49.3	31.1
Menominee x "	-3.3	-3.2	5.2	1.9	15.0	13.5	2.2	-12.1	63.5	45.3
Lang x PI 295932	3.3	6.8	-9.2	-16.0	7.0	9.0	-1.6	0.0	-22.7	-30.3
Nodaway x "	-5.9	-4.2	7.8	-2.3	4.0	2.8	10.9	10.9	7.0	1.3
Swan x "	-18.7	-16.9	10.3	-11.6	14.0	6.6	53.3	40.0	33.3	30.8
Montezuma x "	-13.1	-2.0	-1.2	-18.8	24.4	18.8	24.4	12.0	59.1	33.2
WA 1470 x PI 295932	-10.8	-2.9	-10.8	-11.2	61.7	33.7	68.2	60.8	153.2	87.0
D 1336 x "	-6.3	-2.8	-1.4	-14.1	21.1	16.3	32.0	28.9	108.6	95.9
Burt x PI 292509	-5.3	-2.5	15.9	14.3	22.9	18.2	1.7	-8.1	11.2	-3.7

PERFORMANCE OF BIP, DII, AND DIRECT DESCENT PROGENIES IN OATS

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In order to minimize undesirable linkage effects, the use of populations derived by mating the F_2 individuals of a cross has been advocated in the self-pollinated crops. Presumably, recombination would occur at a high rate and the resulting populations may provide a wider spectrum of variability. The following three types of progenies were developed from the F_2 generation of crosses 'Portal' x 'Orbit', 'Bingham' x 'Rapida' and 'Kent' x 'Indio'.

1. Bip progenies - by mating selected F_2 plants in pairs,
2. DII progenies - by mating selected F_2 plants in all possible combinations, usually taking a set of 4.
3. Direct Descent progenies - the selfed progenies of the best selected F_2 plants.

These three types of progenies were evaluated after 5 generations of self-pollination and pedigree selection was used as a breeding procedure. A trial of such progenies was laid out in a randomized complete block design in two replicates. Each progeny was planted in a 3m x 1.25m plot. Observations were recorded on plant height (cm), days to 75% heading, and green forage yield (t/ha). A summary result is presented in Table 1.

The performance of the two types of progenies developed by intermating the F_2 plants was superior to the direct descent progenies in all the three crosses. However, the cross 'Kent' x 'Indio', of adapted x unadapted cultivars, showed better results in terms of green forage yield than the crosses 'Portal' x 'Orbit' and "Bingham' x 'Rapida' of the unadapted x unadapted cultivars. The results also indicated differences among the two types of progenies developed by intermating of the F_2 plants, i.e., bips and DIIs. These two types of progenies showed differential response in different crosses. The bip progenies showed better response in comparison to the DII progenies in the cross 'Bingham' x 'Rapida'. But it was just the reverse in the case of the cross 'Kent' x 'Indio' where the DIIs were better than the bips. The progenies also showed superiority in plant height, which is considered as a desirable trait in forage oats. The number of days to heading was not affected much and this may be because of the intermating of the phenotypically similar individuals with the same date of heading.

The study demonstrated the practical utility of progenies developed by intermating selected F_2 phenotypes. The superiority of such progenies over the direct descent progenies may be due to breakage of some undesirable linkage blocks which restricted the occurrence of such new combinations in the direct descent group of progenies.

Table 1. Performance of bip, DII, and Direct Descent progenies in oats.

Pedigree*	Plant height (cm)	Days to 75% heading	Green forage yield(t/ha)
OX37-11-1	150	125	72.0
-11-2	158	123	72.0
-15-1	137	122	69.4
OX37(bip)-4	159	127	74.7
-6	156	124	76.0
-8	167	130	80.9
OX63-3-1	143	127	55.2
OX63(bip)-4	144	121	70.7
-6	149	120	73.4
-9	158	120	76.0
-11	147	128	74.7
OX63(DII)-3	148	125	69.4
-6	142	121	62.2
-14	142	119	61.4
OX68-3-2	157	116	57.4
-36-2	155	115	58.2
-57-1	136	123	57.4
OX68(bip)-7	153	122	70.7
-8	136	121	69.9
-9	156	121	69.4
-10	151	114	69.6
OX68(DII)-11	132	123	68.8
-20	161	116	76.0
-21	141	117	69.4
-31	145	117	80.9
Group means:			
OX37(bip) progenies	161	127	77.2
Direct Descent prog.	148	123	71.1
OX63 (bip) progenies	150	122	73.7
OX63 (DII) progenies	144	122	64.3
Direct Descent prog.	143	127	55.2
OX68 (bip) progenies	151	120	69.9
OX68 (DII) progenies	150	118	73.7
Direct Descent prog.	145	118	57.6

*OX37 = Portal x Orbit, OX63 = Bingham x Rapida, OX68 = Kent x Indio

OAT IMPROVEMENT IN SOUTH AFRICA

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The oat improvement program in South Africa during 1982 involved selections and cultivars planted at two periods during the year.

The first planting was made on March 10 for dryland conditions. Plots were fertilized prior to planting with 50 kg N/ha and 16 kg P/ha and irrigated after planting. These plots consisted of 400 selections for forage and frost evaluation. An observation nursery consisted of 341 selections. A replicated yield study, involving 50 cultivars and selections, was made for forage evaluation. The international oat rust nursery (IORN) was planted for disease evaluation. The materials in the forage evaluation trials were planted in 3 row plots, 5 m in length. One row was cut once, the second row was cut twice while the third row was left uncut. Plants were cut seven weeks after planting and again three weeks later. Forage samples were analyzed for protein content. Regrowth of plants was evaluated 20 days after cutting. Evaluation of frost damage was made on June 30. The IORN was inoculated with virulent cultures of *Puccinia graminis* avenae collected near the Centre in 1981. Cultures were avirulent on Pg 13, Pg 16 and Pg a.

The July planting was a duplicate test of the forage evaluation, yield study and international oat rust nursery. In addition, 236 lines were planted for the germplasm collection and 340 selections were from the Quaker Oat Nursery. All selections were grown under irrigated conditions as needed during the season following planting. The check plots (Perdeberg or Florida 500) in the forage evaluation study were inoculated with the same cultures as used in the March planting. Stem rust readings were recorded in late December. The July planting provided material for recording flowering but not for frost evaluation. Additional notes were recorded on the nurseries for stand, forage potential, plant type and awn character. A rating system of 1 = good or awned to 9 = poor or awnless was used for all characters, except plant type (1 = prostrate, 2 = intermediate and 3 = upright). Values were summed for all characters (possible total value of 63) to obtain a low index value for selecting encouraging materials for 1983.

Frost damage occurred throughout the nurseries. None of the 1,000 plus selections were immune, although several selections looked encouraging. The most promising included: Ajax, Coker 234, Cortex, CI 6912, Dal, DLM 3, E 176, Heros, H 547, H 548, Lyon, Mesquite, MN 759101, Otee, Pennal Perdeberg (Florida 500), Santon Strain, Sel DL, TAM-0-301 and TAM-0-312. Other selections from Coker, Florida, Illinois, Iowa, Minnesota and Wisconsin looked promising for further testing in 1983.

Frost damage occurs in early fall planted (February-March) cereals. Injury occurs from May to September. During 1981 and 1982 some oat selections were damaged so severely that plants died. Regrowth of others was slow but plants eventually recovered.

An analysis of the weather data for Bethlehem shows that the average maximum temperatures for May through September varied from 15.5° C to 19.8°C while the average minimum for this period varied from -3.7° to 6.4° C. June, July and August were the coldest months. In 1981, the number of days recording zero or below for May through October were 9, 22, 26, 14,8 and 3.

Temperatures of 12, 28, 25, 18, 0 and 0 were recorded for the same period in 1982. Further analysis of the daily conditions reveal that the greatest day/night differential for a single day in 1981 and 1982 were as follows:

Month	Maximum 1981	Differential 1982
April	20.6°C	20.2°C
May	20.1°C	22.0°C
June	23.4°C	25.1°C
July	23.2°C	24.0°C
August	25.4°C	25.1°C
September	26.0°C	22.3°C
October	26.4°C	20.8°C

Low temperatures occur at Behtlehem during the nights of late April to October. However, day time temperatures are apparently high enough to break winter dormancy activating spring growth. When this happens temperatures of -2°C or below apparently result in frost damage. The variation that occurs in parts of South Africa explains why frost damage is so common and emphasizes the need for frost tolerance in oat selections grown in South Africa.

Studies involving forage yield and regrowth potential were made on 400 lines. Cutting one row at a time resulted in poor regrowth and reduced forage and seed yield (an average of 29% of seed yield from non-cut plots). The seed yield of 2-cuts averaged 11% of the non-cut plots. Forage yields were comparable in reduction. Regrowth following the 1-cut was better than on plants after 2-cuts.

As can be expected forage yields (Table 1) were higher on irrigated plots than on non-irrigated plots. The average yield for 50 selections was 5.46 t/ha vs. 1.98 ton/ha for dryland conditions. The highest yield for a single cut was in TAM-0-312 and Rodney grown under irrigated conditions. Under dryland farming the maximum yield was 2.91 t/ha (CI 7086). Some selections showed marked increases in yield under irrigation (Chilocco, Big Mac, CI 8163, TAM-0-301, Florida 500 (Perdeberg), MN 65B 1989, DLM 3, Tex 46-44-401, AB 110 and CI 6912). Under dryland conditions the second cut of replication 1 was far less than the yield of the first cut. The first cut of replication 2 was less than expected. Apparently dry conditions decreased the weight of leaves and stems. By contrast, yields of the second cut of replication 1 was higher than that of the first cut. The yield of the first cut of replication 2 was, in some cases, more than double the total of the 2-cut plots.

Protein values were highest in plants grown under dryland conditions. The range of values for the first cut was 19.2% to 27.1%, averaging 23.5%. Under irrigated conditions the range was 3.0% to 24.8%, averaging 18.9%. The value for the second cut, dryland conditions, ranged from 9.1% to 15.9%, averaging 12.1%. Values for irrigated plants ranged from 6.8% to 17.0%, averaging 9.9%. Protein values of delayed cut for dryland plants ranged from 7.7% to 14.6%, averaging 11.0% while values for irrigated plants were 8.4% to 18.3%, averaging 12.4%. The difference in values for 1 and 2 cuts is apparently due to greater leaf tissue while the second cut contains a greater percentage of stem tissue.

The following table shows a breakdown of selecting for different characters from the different nurseries. Many selections were outstanding for two or three characters. These will be used in the winter crossing program in the greenhouse in 1983.

Number of oat selections made for different characters from different nurseries in 1982.

	Characters				Multiple	
Nursery	Frost	Forage	Stem rust	Low index	two	three
Forage	4	25	1	2	19	2
Observation	6	3		31	17	2
Quaker			156[a]			
IORN	5		31			
Yield	6	24				

a/Stem rust was the primary character but many selections were outstanding for forage and regrowth.

The primary oat diseases in South Africa in 1983 were stem and crown rust, although dry weather prevented their development. Isolated fields throughout the country had trace amounts of one or both diseases but no damage resulted. Early in the season bacterial and halo blights were observed but soon disappeared as hot weather continued.

Table 1. Total yield (dry wt t/ha) of March (dryland) and July (irrigated) plantings for selected oat cultivars.

Cultivar	Date of planting: March, 2 cuts, rep 1	March, 1 cut, rep 2	July, 2 cuts, rep 1	July, 1 cut, rep 2
Witteberg	1.78	1.20	5.70	6.64
Chilocco	1.61	0.37	5.44	8.70
Mesquite	2.35	0.60	4.76	7.05
Coker 234	2.08	0.54	4.07	8.65
Coker 76-20	2.15	0.60	4.37	8.40
NY 5977-6-44	2.22	0.74	5.24	10.09
NY 5279-59	2.00	1.54	4.29	8.48
IL 73-2186	2.47	0.91	4.26	9.24
Lang	2.53	0.91	5.27	10.70
Aurora 13	2.20	1.02	4.56	7.24
Aurora 22	2.46	0.85	4.79	6.74
CI 8163	1.50	0.43	4.89	10.07
NY 6640-37	2.42	0.67	4.71	7.96
Orbit	2.33	0.71	6.19	9.98
Stout	2.21	0.91	6.65	8.78
Fla 64-377	2.03	0.85	7.32	7.21
DLM 3	2.02	0.57	7.81	8.73
CI 7169	2.24	0.89	5.29	7.50
Jasiri	2.02	0.98	5.23	6.45
Cortex	1.77	0.58	5.45	7.21
TAM-0-312	2.42	0.31	5.36	11.46
NEBR 521710	2.45	1.02	6.67	8.82
CI 7166	2.56	0.84	6.01	8.26
AB 110	2.11	0.98	6.74	8.05
CI 7168	2.84	0.93	6.07	6.90
CI 7086	2.91	0.70	6.22	8.41
Rodney	2.18	0.78	6.18	10.53
Oneida	2.56	0.81	6.87	7.80

USE OF EMBRYO CULTURE TO INCREASE THE NUMBER OF GENERATIONS OF CROSSING PER YEAR

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With the use of embryo culture and supplementary lighting we have been able to achieve three generations of crossing in one year. Crosses are made in the greenhouse; supplementary lighting being provided during the winter months. Approximately 18 days after fertilizations, immature seeds are removed and surface sterilized in sodium hypochlorite solution (7% w/v available chlorine) for about 2 minutes followed by several washes with sterilized water. Embryos are then removed in a sterile air cabinet and placed in tubes containing Gambourg B5 medium without 2,4D or kinetin. At this stage of development there is no dormancy effect and the embryos develop into seedling with good root growth in 7 days. During the first few days the embryos on culture medium are kept in a dark incubator until they have germinated and formed a distinct coleoptile and primary root. The tubes are then transferred to a growth chamber, or during spring/summer, when natural light is sufficient to a laboratory bench near a window. Usually after 7 days in the culture medium the seedlings are at the first leaf stage and can be transferred into John Innes compost. A variation of this procedure can also be used successfully to break the dormancy of recently harvested mature grains. After surface sterilization as described previously the grains are soaked for 12-24 hrs in sterilized water and the embryos then removed and placed in tubes containing the culture medium, and grown as indicated above.

Under optimum growing conditions and following this procedure the seedlings are at the 3-4 leaf stage in the time it would have taken for the seeds to mature had they been left on the plant. Generation time is considerably reduced by using embryo culture and this enables us to save 3-4 weeks at each generation and achieve up to 3 generations in one year. Under the conditions in Aberystwyth we aim to complete the final cross of the year before October, because even with supplementary lighting in the greenhouse there are distinct sterility problems if plants flower during the October-January period.

PROPERTIES OF NEW OAT LINES

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New high-yielding European varieties of oats were used as parental varieties. Their characteristics were described in the OAT NEWSLETTER, 1980. Three years average yields were as follows:

Variety	Average yield 1976-1978 tons/ha
1. Astor	5.8
2. Condor	5.6
3. Bento	6.0 ++
4. Marino	5.8
5. Mustang	5.3
6. Tarpan	5.6
7. Mg. 8023	5.8

All parental varieties have short straw and are resistant to lodging. New crosses were made in 1976 using these varieties. F_1 to F_4 generations were grown in spaced plantings. In F_5 the best lines were sown at normal spacing in plots of 5 m^2, without replication. In this generation 26 lines were observed. The best lines were selected in the F_6 generation. They were grown on plots of 5 m^2 in 5 replications. Astor was used as a check variety.

Table 1. Yield of F_5 Generation Lines.

No.	Combination	No. of Lines (n)	Yield of grain from - to tons/ha	Average
1.	Marino x Astor	2	5.5 - 5.7	5.6
2.	Mustang x Astor	5	6.3 - 7.2	6.7 ++
3.	Bento x Mg. 8023	8	5.0 - 6.5	5.9
4.	Tarpan x Condor	11	5.2 - 6.3	5.9
Total:		26		

Yield of F_5 lines varied from 5.0 - 7.2 tons/ha. The highest average yield was from the cross Mustang x Astor, and ranged from 6.3 - 7.2 tons/ha, with an average for 5 lines of 6.7 tons/ha.

Heading date, in different lines varied from June 1 to June 7. Tarpan x Condor gave the earliest lines and Mustang x Astor, the latest (Table 2).

Height of Lines, varied from 85 cm in the first cross to 112 cm. in 2nd and 4th crosses. On the average, the shortest plants came from Marino x Astor, with average plant height of 86.5 cm. Also of short stature were lines from Tarpan x Condor. Average height was 97.5 cm. Lines of the second and third crosses included some lines with taller plants.

The frequency of lines in different plant height groups is as follows:

Range of height	Height of plants 83 85	86 88	89 91	92 94	95 97	98 100	101 103	104 106	107 109	110 112	
Frequency	1	2	--	4	3	3	3	5	1	4	= 26
Number of short, medium and tall lines			7				14			5	= 26

Lines are arranged according to height in three groups or classes.

First class with height of 83 - 94 cm had 7 lines,
Second class with height of 95 - 106 cm had 14 lines, and
Third class with height of 107-112 cm had 5 lines.

As the height of lines varied from 85 - 112 cm, it was easy to select any desired phenotypes. Generally all lines were short or semi-short in stature, and they are promising for intensive agriculture.

Table 2. Heading date and height of lines from certain crosses.

No.	Parents	Range of heading dates	Range of height in cm	Mean in cm	
1.	Marino x Astor	June 4-6	85 - 88	86.5	short
2.	Mustang x Astor	June 3-7	97 - 112	105.0	tall
3.	Bento x Mg. 8023	June 2-6	96 - 110	103.2	tall
4.	Tarpan x Condor	June 1-6	92 - 112	97.5	short

Yield of Lines, in the F_6 generation varied from 4.7 to 5.7 tons/ha.

Table 3. Yield of F-6 generation lines.

No.	Parents	Number of lines (n)	Yield of grain from - to tons/ha	Mean tons/ha
1.	Marino x Astor	2	5.0 - 5.7	5.4 ++
2.	Mustang x Astor	5	4.9 - 5.3	5.1
3.	Bento x Mg. 8023	1	- 5.1	5.1
4.	Tarpan x Condor	3	4.7 - 5.5	5.1
	Astor/check variety			5.5

In 1982 the summer was dry and the yields were a little lower than the previous year. Line 288/13 was the highest yielder with 5.7 tons/ha. This line originates from the cross Marino x Astor. Also, line 448/13 from the cross Tarpan x Condor yielded 5.5 tons/ha. Nine of the 11 lines tested had yields of 5.0 tons/ha. Considering the dry summer, this yield is good.

Protein content varied from 11.7 to 14.4%.

Table 4. Protein content in the F-6 generation lines.

No.	Parents	Number of lines (n)	Protein content from - to (%)	Mean %
1.	Marino x Astor	2	13.5 - 13.9	13.7
2.	Mustang x Astor	5	12.7 - 14.0	13.6
3.	Bento x Mg. 8023	1	- 12.7	12.7
4.	Tarpan x Condor	3	11.7 - 14.4	12.8
	Astor /check variety		14.4	14.4

The highest protein content was in lines from Marino x Astor and Mustang x Astor. Astor is very high in protein content and hybrids which originate from this variety have high protein content.

Weight of 1000 kernels varied from 29.2 to 34.3 grams.

Table 5. Weight of 1000 kernels of F_6 generation lines.

No.	Parents	Number of lines (n)	Weight of 1000 kernels from - to (g)	Mean (g)
1.	Marino x Astor	2	29.9 - 31.1	30.5
2.	Mustang x Astor	5	31.7 - 34.4	33.0
3.	Bento x Mg. 8023	1	- 32.2	32.2
4.	Tarpan x Condor	3	29.2 - 34.3	31.8
	Astor/check variety		30.9	30.9

On the average, all lines had higher weight of 1000 kernels than the check variety Astor.

In conclusion, we can say that our lines are promising for yield and kernel weight. The next step will be testing our best lines in State Commission trials.

ARKANSAS

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

Production: Oat production in the state was low during the past season; according to the Crop Reporting Service, Arkansas farmers planted 45,000 acres and harvested 33,000 acres of oats which averaged 62 bu/A. Based on acreage grown for certification, Bob, Nora, Coker 227, and Coker 716 were the most widely grown varieties.

A small acreage of Walken was grown for seed purposes. Stem rust severely damaged the variety; there were reports of farmers harvesting 25 bu/A from fields of Walken which normally would have produced 100 + bu/A.

Diseases: Other than stem rust on Walken, diseases did not appear to limit prodution in 1982. There were scattered incidents of barley yellow dwarf, smut, downy mildew, and crown rust. Race 264B was the most prevalent crown rust race identified during the 1982 season.

Personnel changes: J. P. Jones is on an assignment in Egypt. M. L. Fouts has completed a M.S. degree and has accepted a breeding position with Rohm-Haas at Marion, AR.

Indiana

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

Production: The Indiana Crop and Livestock Reporting Service estimated oats harvested for seed in Indiana in 1982 at 95,000 acres, up from 85,000 acres in 1981. Yields averaged 64 bu/A. Oat seeding was delayed due to cold and wet conditions through mid April. Oat development remained about a week behind normal until mid-June. Adequate rain and cool temperatures helped produce good yields and good quality grain. Oat yields in our nursery trials were high and test results were very meaningful.

Barley yellow dwarf virus (BYDV) was severe and widespread in our nurseries and in Indiana. Crown rust was present in fields beginning at about flowering, but did not develop into a severe epidemic. Losses due to crown rust were mostly negligible.

Research: Oats breeding research with emphasis on combining yield and resistance to barley yellow dwarf virus (BYDV) was continued and much progress was made.

In 1982 we initiated the practice of applying a 'normal' rate of fertilizer N (70 lb/A) to two replicates of our yield tests and applying an additional 60 lb/A of N to the third and fourth replicates. P and K were ample. Many lines (particularly the tall, late lines in the Uniform Midseason Nursery) lodged early and severely, and some yielded less in the high N plots compared to the 'normal' N plots. We plan to continue this practice for our yield trials.

BYDV was severe and widespread in our nurseries and in Indiana. We transplanted hill plots of each yield entry into the field. The hills had been infected with BYDV strain PAV or RPV, or were not infected (control). Because of the severe contamination by natural infection in the field, we were unable to make observations on specific strain X variety interactions, but we did have a good test on relative variety resistance to BYDV. Because of the natural infection we had to abandon David Beltenberger's thesis research in 1982. We will repeat it in 1983.

We have completed the second cycle of intercrossing between a set of 8 winter oat lines (sent to us by Dr. M. E. McDaniel, Texas) and 8 spring oat lines. We plan to intercross within the F_1 population twice more in the greenhouse and then proceed with a recurrent selection scheme for various agronomic characters, and resistance to BYDV and crown rust. Intermating in oats has been limited compared to corn and wheat.

In the early 1970's, Noble represented the best level of resistance to BYDV and Stout had the best level of crown rust resistance in our program. These are effective resistances even currently. However, we have made much progress, particularly for BYDV resistance. Most of the lines in our program today have a more effective level of BYDV resistance than Noble.

We have used ELISA (enzyme-linked immunosorbent assay) to make accurate and reproducible comparisons of the virus contents of cereal cultivars infected with barley yellow dwarf virus and grown for 1 month after inoculation in controlled conditions in growth chambers. Initial comparisons were of symptomatically resistant (R) and sensitive (S) pairs of wheats (Abe, S; and Elmo, R), oats (Clintland 64, S; and Porter, R), and barleys (California Mariout, S; and CM 67, R), inoculated with a "PAV-type" isolate (i.e. non-specifically transmitted by *Rhopalosiphum padi* and *Sitobium avenae*).

Differences in virus content followed symptomatic response in the barley and oat pairs, though not in the wheats. In the barleys, the differences were also consistent with the presence or absence of the Yd2 resistance gene, and this was also true when comparisons were extended to other barleys. However, different results were obtained with a vector-specific isolate of BYDV ("RPV" - specifically transmitted by *R. padi*), indicating that resistances are strain-specific.

The results obtained in growth chamber experiments were validated by experiments carried out during an entire growing season with field-grown plants. Thus, we have confirmed that results relevant to the field situation can be obtained in growth chamber experiments taking 1 month. Moreover, the comparisons under controlled conditions gave more uniform results and required relatively few plants.

ELISA was also used to identify the strains of BYDV in 66 oat samples sent to Purdue from 9 states. These isolates were predominantly of the "PAV" type. We would be interested in receiving further samples during 1983.

IOWA

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

About one million acres of oats were harvested for grain in 1982, with a production of ca 50 million bushels. Oats were sown late, and due to cool temperatures throughout the early growing season, they grew tall. This led to severe lodging late in the season, with resultant low test weights. Crown rust was epidemic throughout central and north eastern Iowa, and many oat fields were damaged severely by barley yellow dwarf virus. Oat production in Iowa in 1982 provided an excellent demonstration of the need for continued emphasis on resistances to crown rust and barley yellow dwarf virus in oat cultivars.

Several years ago, with grants from the ISU Graduate Dean's Office, the Iowa Committee for Agricultural Development, and International Harvester Company, a project was initiated at the Iowa station to determine the "Feasibility of Oats as an oilseed crop." Most research on this project was conducted by Dr. Ann Marie Thro. From the many facets of her study on oat oil, she found that (a) alleles for high groat-oil content from *Avena sativa* and *A. sterilis* were different and complimentary, (b) most gene action involved in the inheritance of groat-oil percentage was additive, (c) there was little genotype x environment interaction for groat-oil content, and (d) the heritability of groat-oil content was sufficiently high that single plants could be used as selection units for this trait. These results have caused us to establish a recurrent selection program for high groat-oil content in cultivated oats. The population for this breeding program was initiated from three-way matings that involved single crosses among lines of *A. sativa* and *A. sterilis* with high-oil content being mated to adapted Corn Belt cultivars. F_1's from the three-way matings were intercrossed several times before recurrent selection was begun. This population is now in its third cycle of recurrent selection.

We have begun to upgrade the field plot and data handling machinery on the oat project at Iowa State. First, a computing laboratory has been set up, which, for most data sets, permits us to do our own data management and summary. Hand-held computers permit us to enter data directly into the computer without using field books for collecting data in the field or laboratory. The data-collection computers can be connected to other ancillary equipment such as automated scales and bar code readers. All hardware in the computing laboratory is of Hewlitt-Packard brand. It is a first step in our movement toward complete automatic data collection, management, and summary. Mr. Bill Beavis has been appointed as a three-quarter time graduate assistant to manage the computing laboratory.

Several changes have occurred in the ISU oat project personnel during 1982. Ann Marie Thro, Karen Kuenzel, Dan Rodgers, Darrell Cox, and Jim Oard have finished their Ph.D. degrees and have graduated. Dr. Thro is now a forage breeder at Louisiana State University, Dr. Kuenzel is a rice breeder at the University of Arkansas-Stutgart, Dr. Rodgers is a sorghum breeder at Kansas State University, Dr. Cox is a winter wheat breeder at North Dakota State University, and Dr. Oard is doing postdoc work in plant pathology at Iowa

State. Larry Robertson, who received his Ph.D. degree on the oat project at Iowa State in 1980, has completed a two-year postdoc at ICRISAT at Hyderabad, India, where he worked on breeding of pearl millet. In fall, 1982, Larry accepted a permanent position as the director of broad-bean research for ICARDA, the international research center at Aleppo, Syria. New faces on the small grain project are Luis Barrales from Chile, who is studying for a Ph.D. degree, and Narimah md. Kairudin from Malaysia, who is studying for an M.S. degree.

MARYLAND

D.J. Sammons
University of Maryland

Maryland farmers harvested a total of 19,000 acres of oats in 1982, slightly less than in 1981. Statewide, oat yields averaged 58 bu/A for a total state harvest of 1.1 million bushels. Oats are a relatively minor crop in Maryland, and the involvement of the small grain program with this crop is limited to variety testing. Maryland is a transitional state for oat production. There are risks in the production of both winter and spring oats in the state. Winter oats are risky in most areas of the state except on the Eastern Shore because of the danger of winter kill. Spring oats are successful in the western region of the state if they are planted early enough (March) to mature grain before the excessive heat of early summer.

The results of the 1982 Spring Oat Variety Trial for Maryland are summarized in the accompanying table. Yields in 1982 were not outstanding, although test weights were good to excellent for most entries in the test. Temperatures in 1982 were cool through the early spring weeks. In late April and much of May, a severe drought occurred, and the plots experienced substantial water stress. This drought was followed by nearly three weeks of rainy weather lasting until mid-June. This erratic weather pattern is probably an explanation for the late head dates and the reduced yields observed in 1982. Additional yield-limiting stress was imposed by a severe infestation of cereal leaf beetle (Oulema melanopus). Diseases were generally not a problem in 1982. The top yielding spring oat variety in Maryland in 1982 was Lang.

Performance of spring oats for several characteristics, Clarksville, Maryland, 1982.

Entry	Yield Bu/A	Bu.Wt.	Percent Lodging	Head Date	Height (in.)
Ogle	59.5	30	10	June 5	34
Garry	55.6	32	18	June 6	38
*Otee	56.7	32	12	June 4	35
Astro	58.6	28	0	June 12	33
Clintford	58.6	32	22	June 5	30
*Lang	72.8	28	3	June 2	33
Larry	60.3	32	0	June 4	34
*Noble	65.6	36	18	June 6	33
Dal	72.4	34	10	June 13	38
Mariner	64.6	34	30	June 11	39
Jaycee	60.2	36	90	June 3	30
Clintland 60	64.2	32	13	June 8	35
PA 7836-6571	53.4	36	0	June 3	29
PA 7836-9925	59.6	36	0	June 4	26
PA 7967-11759	78.0	28	0	June 7	31
PA 7967-11690	65.1	32	0	June 8	34
PA 7967-11498	66.2	36	0	June 2	32
PA 7967-6689	66.3	36	3	June 7	31
PA 7967-11655	68.8	32	0	June 6	29

Conducted at: Forage Research Farm
Soil type: Manor Silt Loam
Date Planted: March 24, 1982
Date Harvested: July 21, 1982
Fertility: 40 lbs. N/A, 60 lbs. P_2O_5/A, 60 lbs. K_2O/A
*Recommended variety in Maryland.

MINNESOTA

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

Production

Oat production in Minnesota exceeded 107 million bushels in 1982. Acreages, both planted and harvested, and yields were all higher than in 1981. The average yield (67 bu/A) was the second highest ever. The planting season was early in most of the State and the growing season generally quite favorable. Bushel weights were relatively reduced, however, due to a combination of high temperatures early in July and relatively heavy infestations of yellow dwarf virus in some areas and crown rust in others.

The favorable growth conditions in northwest Minnesota resulted in several record yields in our variety trials at Crookston. One line averaged 166 bu/A over three replications, eleven entries exceeded 150 bu/A, and the entire group of 40 entries averaged 145 bu/A. Bushel weights were also quite high.

At St. Paul we had better than anticipated success using several hawks to control birds in our plots. Based on this success, we plan to fly the hawks again starting about when the oats and other small grains begin to head through the middle of July. Details will be provided upon request.

Personnel

Jim Luby finished his Ph.D. program and is now employed in the Horticulture and Landscape Architecture Department at Minnesota as a fruit breeder. His thesis research indicated that *Avena fatua* can contribute useful germplasm to cultivated oats. He was unable, however, to demonstrate a measurable relationship between micronuclei frequency and levels of genetic recombination.

Mr. Nick Haugerud will soon join our program to pursue a Ph.D. He is currently finishing a M.S. at North Dakota State. A little later Mr. Phillip Bregitzer will join our project to begin work on his M.S. degree. He is currently finishing a B.S. program at Iowa State.

Dr. Robert Wych, small grain physiologist, left the Department last fall to join Pioneer Hi-Bred International, Inc. at Johnston, Iowa.

MISSOURI

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

Production: Approximately 160,000 acres of oats were seeded in 1982 according to the Crop Reporting Service. About 78,000 or 49% of the planted acreage was harvested for grain. Sizeable acreages not harvested for grain are grown for hay. The average yield of 41 bu/acre was 20% below the 51 bu/acre reported for 1981. Continuing rains and cloudy conditions in May and June resulted in excessive vegetative growth (and ultimately severe lodging) and widespread damage from crown rust. Some oats were seeded rather late because of adverse weather which also contributed to lower yields.

Diseases: Crown rust was prevalent statewide, being enhanced in its spread by the wet, humid weather conditions. A Helminthosporium leaf blotch also caused some yield reduction in a few varieties. Barley Yellow Dwarf Virus was present but the damage was usually not severe.

Varieties: Seed of the Bates, Lang, Otee and Noble varieties were certified in 1982 with 55% of the acreage being Otee. The Ogle variety produced the highest yields of varieties tested in 1982. Unusually mild temperatures late in the growing season did not place late maturing varieties at a disadvantage.

NEBRASKA

John W. Schmidt

Nebraska produced a record 58 bu/acre yield on 425,000 acres to rank seventh in total U.S. oat production with 24,650,000 bushels. Conditions for oat production were nearly ideal with ample moisture and mild temperatures during grain filling. 'Ogle' has been the most productive and most popular variety but 'Larry' was equally well received by our certified growers in 1982. There were no major disease problems in 1982.

New York

M. E. Sorrells and Gary C. Bergstrom

1982 Spring Oat Production. The 1982 oat crop for New York State averaged 65 B/A on 280,000 acres, about the same as for 1981. Astro is still the most popular variety; however, Ogle is expected to move in rapidly this year. There is also interest in Porter and Marathon.

Crown Rust. This year we had an opportunity to evaluate cultivars and lines in our regional trial at Jefferson County for resistance to prevalent races of crown rust. Dr. Gary Bergstrom and I rated them using two different scales. He rated them on percent leaf area infected and I gave the plot a 1 to 9 visual score based on the overall severity of the disease. Our ratings were almost perfectly correlated. Dr. Bergstrom's scores, with mine in parenthesis, for several cultivars are as follows: Astro - 50 (6.7), Orbit - 70 (7.0), Garry - 53 (6.7), Marathon - Trace (1.0), Ogle - 8 (2.7), Larry - 15 (3.7), and Porter - 7 (2.0).

Introgression of Tetraploid and Diploid *Avena* spp. Leaf guard cell size and pollen size were measured on five ploid levels for use in identifying octoploids from heterogeneous decaploid populations. No consistent ploidy effect was observed. Somatic instability was present and similar in the five decaploid crosses. Seed fertility and harvest index were highly variable but not heritable. No significant changes were observed for harvest index following two cycles of selection. A tetraploid parent in the pedigrees of these five crosses may explain the similar behavior in somatic instability and lack of response to selection. Eight additional pentaploids involving tetraploid and hexaploid parents have been successfully doubled. Harvest index measurements were taken on A_1 plants of these crosses grown in 1982. Results of these experiments indicate that the bulk breeding method followed by chromosome counts of pureline selections is the most efficient approach to developing new octoploids from 4x·6x crosses. Current efforts are focused on the production of octoploids via 2x·6x crosses.

Atracomp Germplasm. Dr. N. F. Jensen developed a spring oat composite called NY Oat Atracomp that may be of use to oat researchers. NY Oat Atracomp was developed by annually recycling genotypes of spring oats (*Avena sativa* L.) that survived when planted in soil pretreated with near-lethal applications of atrazine. The composite was first grown in 1978 and has experienced a total of 9 cycles (it was not grown in 1969). In the first year, the composite was planted over 5 treatment levels of atrazine (1.1, 2.2, 3.4, 4.5, and 5.6 kg/h); in the second year, 2 levels (6.7 and 9 kg/h); in the third year, 4.5 and 9 kg/h; thereafter, 2 years at 5.6 and 11.2 kg/h, 3 years at 11.2 kg/h, and in the final year, 1977, 16.8 kg/h of atrazine. Each year harvested seed was screened on an air cleaner separator to remove small or light seed. The germplasm base of the composite is somewhat imprecise because of occasional additions; however, the principal ingredients were: 1) Cornell bank germplasm, 2) all 1967 Cornell early generation materials; 3) part of the World Collection of Small Grains; and 4) NY Oat Composite I. Information on genetic gain for tolerance to atrazine comes from trials conducted at Ithaca in 1979. NY Oat Atracomp, 'Astro', and 'Dal' were grown on soil pretreated the previous June with 0, 2.2, 4.5, 9.0, and 13.4 kg/h of atrazine. Since the 0, 2.2, and 3.4 kg/h treatment levels were not significantly different, the mean of these treatments was compared to the mean of the 9 and 13.4 kg/h treatments. Grain yields of NY Oat Atracomp, Astro, and Dal were reduced 78, 83, and 87 percent, respectively. Reductions in percent survival were nearly identical. Compared to these cultivars, NY Oat Atracomp selections appear to produce a few more tillers per plant. No other morphological traits are readily visible; although, since atrazine severely stunts root growth, a more vigorous root system may be present. The composite was not registered since the Atracomp did not show a clear superiority for tolerance to atrazine. Seed is available upon request from M. E. Sorrells.

Publications:

Cooper, D. C. 1983. Studies on the disease reaction of pure-lines and the inheritance of resistance to Barley Yellow Dwarf Virus in Oats. M. S. Thesis.

NORTH CAROLINA

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

This program has been engaged for 15 years in attempting to introgress high protein from *A. sterilis* into agronomically desirable genotypes. Only for the past decade, though, have we paid particular attention to total protein production in our conventional breeding material. It is of interest to note the yield and protein production (Table 1) of five North Carolina cultivars and a Coker cultivar which have been used as checks. Using the popular cultivar Carolee as a base, we have realized a yield increase of about 24% and a protein production increase of nearly 40%. Protein production was a consideration in the release of both Brooks and Madison.

Table 1. Mean yield and protein production of oat cultivars tested at two locations in North Carolina during the period 1980-82

		Grain Yield bu./A.			Protein Prod. lbs./A.		
Cultivar	Year Released	Clayton	Rowan Co.	Overall Mean	Clayton	Rowan Co.	Overall Mean
Carolee	1960	58.2	81.8	**70.0**	215.7	303.8	**259.8**
Salem	1974	52.1	95.6	**73.7**	211.7	435.9	**323.8**
Firecracker	1976	63.6	80.0	**71.8**	248.2	323.6	**285.9**
Brooks	1978	54.6	102.0	**78.4**	214.0	434.5	**324.3**
Coker 716	1980	68.2	95.8	**82.0**	228.1	361.3	**294.7**
Madison	1982	75.0	98.8	**86.9**	303.7	421.1	**362.4**

North Dakota

Michael S. McMullen

Production

The North Dakota Crop and Livestock Reporting Service reported 62,100,000 bushels of oats were produced in North Dakota during 1982, approximately a 40% increase relative to the 44,160,000 bushels produced in 1981. The planted acreage increased from 1,200,000 in 1981 to 1,300,000 in 1982 and the acreage harvested for grain increased from 960,000 to 1,150,000 acres from 1981 to 1982, respectively. The 54 bu/a average yield is well above the five year average of 42.8 bu/a. Favorable growing conditions occurred over most of the state, but severe drought did limit yield in some localized regions in southeast and south central parts of the state. Porter yielded well at most locations.

Diseases

Barley yellow dwarf virus (BYDV):

Serious losses were not encountered in most oat fields, but symptoms were more prevalent late in the season than have been encountered in the past. Some late planted fields were severely damaged by the virus. Natural infection in early generation breeding nurseries was uniform and allowed selection for tolerance.

Crown rust and stem rust:

Stem and crown rust infections were serious enough to cause considerable yield losses in the northeastern corner of the state.

Personnel

William Laskar is completing a study of the inheritance of barley yellow dwarf virus tolerance from sources that are utilized in our breeding program as his Ph.D. thesis.

OKLAHOMA

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

Production: The Oklahoma State average oat yields and acreage fluctuate, from year to year. The 1982 oat crop harvested for grain amounted to 3,420,000 bushels and was harvested from 90,000 acres with a yield of 38.0 bushels per acre. Harvested acreage was down 15,000 acres from the past year. This was the smallest acreage of oats harvested since records have been recorded. Most of this loss can be attributed to a very wet and late harvest. Normally about one-half of the seeded acreage is harvested for grain and the rest is used for pasture and hay crop.

Oat Varieties: Most of the oat acreage is seeded to winter oats. However there seems to have been an increase in spring oat seeding in the state for the past two or three years. Popular varieties are still Cimmarron and Chilocco; followed by Okay and Nora. A small acreage of Bob and Walken have been planted the past three years. Some Barley Yellow Dwarf was observed on Nora. However, winterkilling had the most detrimental effect on yields of this variety in 1982.

Research: Work is continuing on the development of a greenbug resistant oat variety for Oklahoma. Most of this work is with the bio-type "C" resistance. However, screening tests in the greenhouse in 1982 indicated that oat lines resistant to "C" was also resistant to bio-type "E." We are in the process of screening this and some newer material with the "E" bug. In other research, two selections, with two years of yield testing, show good promise and they are both (OK79601 and OK80602) from a cross of OK64201-63/Nora.

SOUTH DAKOTA

D. L. Reeves and Lon Hall

Production: The 1982 crop was an excellent one for South Dakota as records were set for average yield and total production. Oats were planted on 2,450,000 acres an increase of 200,000 over last year, and yielded 60 bushels per acre thus producing a total of 133,800,000 bushels. This was only the third year that the state average has exceeded 50 bushels per acre. The previous highs were 54 bushels per acre in 1971 and 1977. Total production had previously exceeded 130 million bushels only in 1945 and 1977.

Good late summer moisture has been present the past three years. As a result, the later varieties have been producing better and farmers have shifted to later varieties. On a statewide basis, Burnett is still planted on more acres than any other variety. Farmers like the large white kernels that Burnett produces almost regardless of the weather.

Crown rust was present in many fields in the eastern part of the state but generally developed too late for significant losses. Some barley yellow dwarf was present in the southeastern corner of the state.

Jack Ingemansen is working on a study of insects in farm stored oats. Many farmers are doing a poor job on their stored oats. Moisture percentage and foreign material appear to be closely related to insect populations.

TEXAS

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

Production: The 1982 seeded acreage of oats in Texas decreased to 1,300,000 acres, the lowest acreage seeded in the state since the 1951 and 1952 drought seasons. The 1982 harvested acreage in Texas was 290,000 acres; the state yield average was 37.0 bushels per acre. The Texas oat acreage has been drastically reduced since 1974, primarily due to abandonment of acreage restrictions on wheat. The oat acreage is expected to rebound somewhat due to initiation of new incentive programs designed to reduce the acreage of wheat, and of other major cash crops. Although the new payment in kind (PIK) program was announced after most of the Texas wheat acreage was seeded, it undoubtedley will reduce the harvested acreage, since compliance will require growers to plow down, graze or bale part of their crop. Planting intentions for other major crops in Texas for the 1983 season (based on February 1 Texas Department of Agriculture estimates) are as follows: cotton, 4.8 million acres, down 17% from 1982; sorghum, 4.0 million acres, down 33% from 1982 and the lowest planted sorghum acreage since 1929; rice, 300,000 acres, down 37% from 1982 and the smallest planted acreage since 1940; corn, 1,000,000 acres, down 17% from 1982; soybeans, 400,000 acres, down 60% from the 1982 crop. Oats are the only major crop in Texas for which the 1983 indicated acreage is larger than that for 1982 crop. The 1983 estimated seeded acreage of oats in Texas is 1,400,000 acres, a modest increase of 8% over the 1982 crop.

The 1982 season was not particularly good for oat production in Texas, although the state's average yield was reasonably good. Drought was the primary factor which limited yield in 1982; harvest losses also were excessive in many areas as protracted rains caused severe lodging as the crop matured. Disease losses in oats were relatively minor in most areas of the state. In contrast, wheat leaf rust was devastating in south, central, and east Texas in the 1982 season. Wheat varieties which were hit particularly hard included the previously resistant varieties Coker 68-15 (the most popular soft red winter wheat variety in the state) and TAM 106, a relatively new Texas hard red winter variety. The variety Vona also suffered very severe damage in central Texas.

Research: We continue a strong emphasis of breeding for resistance to crown rust, stem rust, and to the greenbug aphid. We observed a disturbing level of stem rust virulence on C.I. 9221 derivatives in 1982 nurseries at Temple and Dallas. The "breakdown" of resistance occurred rather late in the season. No additional virulence was detected in seedling tests of cultures taken from the Temple and Dallas nurseries (Paul Rothman, personal communication). Adult-plant reactions of differential varieties to these cultures have not yet been determined. C.I. 9221 derivatives continued to show excellent resistance in Mexico, in several countries in South America, in Kenya, and in South Africa in 1982.

No additional virulence was detected in 1982 crown rust collections made at several locations in Texas.

U T A H

R. S. Albrechtsen

Utah State University

Production. A cold, wet spring delayed planting of spring grains in Utah. Nevertheless, planted and harvested acres of oats were both up slightly over those of the previous years. A good supply of irrigation water contributed to a record-setting yield of 64.0 bushels per acre. Essentially all of our oat acreage is irrigated. Diseases are generally minimal; occasional fields show losses from smut. Our oat acreage is small, but present levels of production are expected to continue.

Oat Program. Because of a small acreage, our oat program in Utah is confined largely to the identification of adapted cultivars from other programs, through growing of the Uniform Northwestern States Oat Nursery.

WISCONSIN

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

The 1982 statewide average grain yield of oats in Wisconsin was estimated at 51 bu/a, a decrease of 7 bu/a from the 1981 average and 8 bu/a lower than the 5-year average for 1977-1981. Wisconsin farmers planted 1,180,000 acres of oats in 1982, an increase of 80,000 acres over 1981, and harvested 940,000 acres for grain and straw. Most of the 240,000 acres not harvested for grain and straw were harvested as oatlage at heading. There were reports of high yields of oatlage and excellent establishment of alfalfa stands in the state.

Conditions during the early part of the 1982 oat growing season in Wisconsin were excellent throughout the state. Planting dates, soil moisture levels, and temperatures during April and May were ideal in most areas. Consequently, good stands with considerable tillering were established. Unfortunately, the potential for high grain yields did not materialize in many areas of the state, primarily because of a severe infestation of aphids which transmitted the red leaf virus (BYDV).

Aphid populations during May and June of 1982 were tremendously larger than normal. Apparently, a large percentage of the aphids were viruliferous, for the BYDV symptoms were so pronounced in some oat fields that the farmers harvested their oats as hay or oatlage because it was obvious that grain yields would have been very low. On a statewide basis the grain yield reduction attributed to BYDV has been estimated at 15 to 20 percent. The BYDV epidemic was the worst since 1959. The ELISA diagnostic testing procedure at Purdue University has identified the PAV strain of the virus in samples from Wisconsin.

The BYDV infestation also contributed to poor grain quality in 1982, as there were many reports of light, hully kernels with low bushel weights. Leaf rust and lodging were also prevalent in some areas and probably contributed to the reduction in kernel quality. The disease and lodging problems did not have a noticeable affect on straw yields in most areas of the state.

Wisconsin selection X4024-7 has been named "Centennial" and was released to Certified Seed Growers in January, 1983. It will be available for farm production in 1984. A complete description of Centennial is in the section of this Oat Newsletter that describes new cultivars.

USDA OAT QUALITY LABORATORY

Dr. Chris Brinegar completed his Ph.D. in February, 1983 under the supervision of Dr. Peterson. He submitted a thesis titled "Isolation and characterization of oat seed globulin and synthesis of oat seed storage proteins", in which he demonstrated a remarkable similarity between oat seed globulin and several legume globulins in terms of their synthesis, processing and structure.

Dr. Peterson has completed a study of oat endosperm structure at the light and electron microscope level, in cooperation with Dr. Roy Saigo of University of Wisconsin - Eau Claire. He continues his research on long distance transport and source-sink interactions as related to grain composition and yield.

Dr. Langston-Unkefer extended the studies of the lectin from oat groats. She initiated an investigation of the inactivation of glutamine synthetase (a central enzyme in nitrogen metabolism) by the toxin produced by Pseudomonas syringae, the causal organism in halo blight. She also initiated an investigation of the regulation of pyruvate dicarboxylase, a rate limiting enzyme in the anaerobic fermentation carried out by germinating seeds and by flooded roots.

Dr. Robert Welch from the Welsh Plant Breeding Station, Aberystwyth, Wales, is expected to spend a year in the Oat Quality Lab beginning in July 1983 doing research on oat fibre with Dr. Peterson.

THESIS RESEARCH PROJECTS

Mr. R.S. Karow is in the final phase of his Ph.D. thesis research which is composed of two main studies, a fatty acid inheritance study and a study of the enzyme lipoxygenase. He intends to complete his graduate program by mid-1983.

Mr. P.D. Brown has completed his academic course work and his thesis research, and presently is writing his Ph.D. thesis. He is employed by the Canadian Department of Agriculture at Winnipeg, Manitoba. Mr. Brown's thesis research has dealt with the transfer of stem rust resistance from Avena barbata to A. sativa using monosomic alien substitution lines.

Mr. D.T. Caine has been completing requirements for the M.S. degree while working for Dr. D.C. Arny in the Department of Plant Pathology. His research has centered on the inheritance of smut resistance from old and new breeding stocks.

Mr. Baldwin Miranda and Mr. James Stevens initiated their M.S. thesis research projects in 1982. Baldwin is evaluating the relationship between transpiration resistance and drought tolerance in early generation lines from four oat crosses, and Jim will evaluate the agronomic performance of a series of backcross lines derived from Avena fatua.

Akiyutaka - A New Forage Oat

T. Kumagai and S. Tabata

Akiyutaka was developed at the Hokkaido National Experiment Station by the derived line method in early generations, and the pedigree selection method in later generations from the cross Carter's Luxter/ Newton Oat in 1980. Akiyutaka is a mid-early variety being four days earlier in heading, having early vigor, longer culms, shorter panicles, smaller culm diameter, a larger panicle number and lighter thousand kernel weight than Zenshin, a leading variety widely adapted in Japan. Akiyutaka is susceptible to crown rust and is somewhat lower than Zenshin for lodging resistance. The forage yield when sown in late August at Sapporo, Hokkaido, outyielded Zenshin and Moiwa, a recommended variety in Hokkaido, by 43 and 31 percent, respectively. It compared favorably with the other varieties. It appears widely across Hokkaido, where oats are used for green manure purposes late in fall. The results from performance tests when sown in September in the southern part of Japan, where forage oats are widely grown, showed that Akiyutaka had yielded 14 and 30 percent better than Zenshin and Hiugakairyo Enbaku.

Akiyutaka is a double purpose variety, for animal feed or silage and green manure.

BARMAH

J. B. Brouwer

Barmah has been registered by the Department of Agriculture, Victoria, Australia for grain production in rust-liable areas. It was selected by J. B. Brouwer from the cross Algeribee/Garry/Avon made in 1969 by J. Davies.

Barmah is a mid-season oat variety maturing 3-4 days earlier than Bulban, and is slightly taller. It is similar to Bulban in resistance to grain shedding and in escaping serious grain losses by bending over at maturity. Barmah and Bulban appear equally tolerant of wet soil conditions.

In trials from 1976 to 1981 Barmah has shown to be well adapted to the north-eastern region of Victoria with an average yield advantage of 4% and 7% over Bulban and Swan respectively whereas its average yields are 3% and 6% lower than those of Bulban in the southern and north-central regions. The average gain compared to Swan is 21% in the southern region, while both varieties yield equally well in the north-central region.

The grain has an attractive creamy colour and its physical quality as measured by test weight, groat percentage and 1,000 grain weight, is similar to that of Bulban. Although suitable for milling it is less attractive than Swan, the kernel percentage being lower. The oil and protein contents of Barmah are equal to or slightly higher than those of Bulban.

In seedling tests Barmah appears to have two major genes (Pg-2 and Pg-4) for resistance to oat stem rust, and although not resistant to all strains of the pathogen, it has consistently shown a lower infection rate than Bulban in field trials. It is resistant to prevalent strains of oat crown rust in Victoria and shares Bulban's tolerance to barley yellow dwarf virus. It is as susceptible to cereal cyst nematode as Bulban.

DUMONT OATS

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

Dumont, a spring oat (Avena sativa L.), was developed by the Oat Rust-Area Project Group which is co-ordinated from the Agriculture Canada Research Station, Winnipeg, Manitoba. It was grown in preliminary yield trials as accession W78286 in 1978 and 1979, and as OT219 in the Western Co-operative Oat Test from 1980-1982. It has been included in the USDA Midseason Oat Nursery starting in 1982. Dumont was licensed in Canada in 1982.

Dumont originated from the cross Harmon HAM x Double Cross 7 made in 1974. Harmon HAM is a backcross derivitive of Harmon with stem rust resistance genes Pg-9 and Pg-13 added to Pg-2 already present in Harmon. Double Cross 7 is a four-way cross involving Harmon HAM, the Australian cultivar Kent, a Pendek backcross line with crown rust resistance genes Pc-38 and Pc-39, and RL2900 a sister line of Hudson. Three generations were grown at Gore in New Zealand, while the three alternate generations were grown at Winnipeg in artificially inoculated rust and smut nurseries.

Dumont has better rust resistance than Fidler and excellent smut resistance. The combination of Pc-38 and Pc-39 gives resistance to all known isolates of crown rust. It has good stem rust resistance conferred by genes Pg-2 and Pg-13 but is susceptible to the rarely occurring race NA26. Like Fidler, it is resistant to all races and collections of oat smut to which it has been tested. It has some tolerance to BYDV.

Dumont although lacking strong straw, is best adapted to the eastern Canadian Prairie area where rust is a hazard. Kernels are cream in color, large, plump with no awns or basal hairs. The test weight is high and the hull content low. Dumont is three days later in maturity than either Harmon or Fidler which may contribute to its yield advantage.

Approximately 1500 kg of seed were sown in 1982. Breeder seed will be maintained by the seed section, Agriculture Canada, Research Station, Regina Saskatchewan. Dumont is named after Gabrielle Dumont a Metis leader born in 1837, died in 1906.

FIX

B. Mattsson

Fix is a new nematode resistant cultivar released from Svalof AB, Sweden. It is resistant to the main races of the cereal cyst nematode (Heterodera avenae) that occur in Sweden. The line was selected from the cross Nem.res. Sol II x Astor x Sv 67317.

Fix outyields the two nematode resistant cultivars Nema and Hedvig, and is equal in yield to the non-resistant Selma.

The strawstiffness is comparable with that of Selma, and Fix is somewhat earlier ripening than Selma. Fix gives a higher protein yield than Selma and the fat content is fairly high.

Fix is well adapted for different regions of the south and middle of Sweden.

Fix was granted Plant Breeder's Rights in 1981 and added to the Official Swedish List of Cultivars in 1982.

MADISON

C. F. Murphy

'Madison', C. I. 9404, is a winter oat cultivar developed by the North Carolina Agricultural Research Service. It was derived from the cross 'Delair'/'Carolee'//'Coker 69-20'. The final cross was made in 1972 and the final selection (F_6) was made in 1977.

Madison has exceptionally high protein yield and grain yield potentials, an intermediate level of winter hardiness, very short straw, and extremely good lodging resistance. In all North Carolina tests in the Coastal Plains it has outyielded Carolee by 32%, 'Brooks' by 25%, and Coker 716 by 3%. Yields of Madison in the Piedmont (where it was hurt during one severe winter) exceeded Carolee by 34% but were 6% lower than Coker 716 and 7% lower than Brooks. Test weights of Madison are about one pound higher than those of Brooks and about one pound lower than those of Coker 716. Madison is about five inches shorter than Brooks or Coker 716 and the average lodging percentages for Coker 716, Brooks, and Madison were 37.5, 26.7, and 3.4, respectively.

The name Madison was selected to draw attention to the cooperative state-federal relationship, which is so important to agricultural research, by recognizing the value of the USDA Oat Protein Laboratory at Madison, WI.

UPO 94

S. N. Mishra, J. S. Verma, and R. Rastogi

"UPO 94" was released in 1982 from the Department of Plant Breeding, G.B. Pant University of Agr. & Technology, Pantnagar 263145, UP, India, on an all India basis after performing consistently well in the National Varietal Trial of oats (multicut). It was released as a multicut variety for fodder production. It was increased from a single plant selection from a segregating lines OGP73-M94 of the oat germplasm collection being maintained at the G.B. Pant University of Agriculture and Technology, Pantnagar, India. It was selected primarily for its multicut nature, which is due to its superior regrowth capacity.

UPO 94 is suitable for irrigated parts of the country with appreciable cold during its growing period. It is also very suitable for higher altitudes. It does excellently in soil of medium to high fertility and under irrigated conditions.

It gives on an average 15% higher green forage yield and 3 to 5% more dry matter yield than the most popular oat cultivar 'Kent'. It also has apparently a higher percentage digestibility than 'Kent'. The average green forage yield of UPO 94 is about 60 t/ha. It is a medium late (165-170 days) variety. Plants are tall (135 to 140 cm at 75% heading) having light green stem with dark green foliage, 8-12 tillers, leaves mid-sized, broad, semi-upright. Panicles are 28-30 cm long, 30-33 branches with 60-65 spikelets/panicle; lemma yellow-white at maturity, awnless, panicles equilateral.

UPO 94 is best suited for use as a multicut variety and can give more than three cuts. Its regrowth is very fast and uniform. It has an abundance of leaves with soft foliage of high quality. It can even be recommended for sown pastures due to its growth habit and multicut nature, which can withstand trampling and overgrazing.

This variety is also high in grain yield. It is medium-late in maturity. Grains are yellowish-white, midlong and mid plump; kernel weight 38-40 g/1000, grain size 1 cm x .3 cm; 1000 groat weight 25-27 g, groat size .9 cm x .25 cm, threshability good.

UPO 94 is tolerant to stem rust, crown rust, smuts and leaf blights. It is also resistant to lodging, shattering and frost.

On an overall assessment UPO 94 is considered superior in yield, regrowth, and palatability to the most popular oat cultivar 'Kent'.

CENTENNIAL OATS

R.A. Forsberg, M.A. Brinkman, R.D. Duerst,
D.C. Arny, and E.S. Oplinger
University of Wisconsin - Madison

Centennial oats (P.I. 476810) was released in January, 1983, to Certified Seed Growers and it will be available for farm production in 1984. It was tested as Wisconsin selection X4024-7, and it is a Garland-Holden type oat with the following pedigree:

Holden 5x Garland 3x 6x-amphiploid x C.I. 6936 2x C.I. 6936 4x Garland 6x Froker x Stormont.

The development of X4024-7 was quite unique. First, a 6x-amphiploid (a synthetic hexaploid), an original parent, was used as a source of leaf rust resistance--carrying resistance from diploid *Avena strigosa*. Second, thermal neutrons were used to achieve incorporation (translocation) of the resistance from an alien chromosome into a normal oat chromosome within one of the three normal oat genomes.

Yield testing of Centennial began at Madison, WI in 1979, and it was an entry in the USDA Uniform Midseason Oat Performance Nursery in 1981 and 1982. In Wisconsin tests, Centennial has had higher grain yield averages than all named varieties except the new varieties Ogle from Illinois and Porter from Indiana.

Centennial is a midseason oat, heading 1/2 to 1 day earlier than Wright or Lyon and 1 day later than Ogle. It has attractive, yellow kernels with high test weight, high groat percentage, and plump groats. It is 2% lower in groat protein than Dal, equal to Froker, Lodi, and Porter, and 1% higher than Ogle.

Plant height of Centennial is 1 inch shorter than Dal and 4 or more inches shorter than Wright, Moore, Lyon, or Lodi. Straw strength is equal to or better than that of most current midseason varieties. The straw tends to have "staying power" and does not degenerate rapidly at maturity.

Centennial has very good resistance to prevalent races of crown (leaf) rust and smut. It shows susceptibility to the barley yellow dwarf virus (oat red leaf) in some artificial tests but there is good evidence that Centennial possesses some field tolerance to this virus. It possesses two genes for stem rust resistance (A, B) which provide adequate protection at the present time.

Centennial has had below-average yields in performance tests conducted on sandy soils at Hancock and Spooner, Wisconsin. Consequently, production of Centennial on very light or sandy soils is not recommended.

REPORT FROM THE SMALL GRAIN COLLECTION

D.H. Smith, Jr. Curator
USDA ARS PGGI BELTSVILLE, MD

The principal activities of the Small Grain Collection are collection, maintenance, evaluation, and distribution of cereal germplasm. However, there are ancillary activities which need to be reviewed from time to time so that our clientele can make full use of the services that are available.

Based on the recommendation of the GRIP Coordinating Committee that a system of unique identifiers be used for germplasm accessions. CI numbers are no longer issued and all new accessions are assigned PI numbers through the Plant Introduction Office. Seed and a description of the line/cultivar should be sent to me and I will forward them to Dr. G.A. White, Principal Plant Introduction Officer who will assign the Plant Inventory (PI) number.

The clearance of cultivar names is also a service that is rendered through the Small Grain Collection. This is done by contacting the Seed Regulatory Branch of the Livestock, Meat, Grain, and Seed Division of the Agricultural Marketing Service. This group checks their files for prior usage and trademark restrictions. They then make a recommendation as to the validity of the proposed name which is returned to us for transmittal to the requestor. The following statement regarding variety name clearance rules was furnished by Al Burgoon of the Federal Seed Laboratory, "In cases where the name has been used for more than one variety of the same kind, the only legal one is the variety which was named first. The act of naming a variety is when the variety is officially released, or when it is first introduced into commerce. Clearance of a variety name through this office or any other office does not insure that the name is legal, and does not reserve the name for a particular person or institution. Thus if we clear a name for you, and someone else decides to use the same name for a variety of the same kind in the interim between our clearance and the time you release your variety, then their variety name has legal precedence." It is helpful to us if names are cleared prior to the issuance of a PI number.

Seed requests from overseas to plant breeders in the field can be sent to us for reshipment to the requestor. We will send it through the Plant Quarantine Office where a phytosanitary certificate will be issued after the seed has been inspected. Please include correspond-dence relative to the shipment with the seed.

Catalogs of accessions are available only on microfiche. There are three types of listings: numerical by CI/PI numbers, alphabetical, and species within a crop. The microfiche are updated annually and are available upon request.

OAT PI NUMBERS ASSIGNED IN 1982

PI No.	Name/Designation	Pedigree	Class	Source
466859	PA 7219-19	PA 65-22-7/Maris Quest	Winter	Pennsylvania
466860	PA 7307-13	CI 7162/3/BL/4/WTK//WTK S/HC/3/CG/ALO	Winter	Pennsylvania
466861	PA 7307-70	CI 8310/NC 2469-3	Winter	Pennsylvania
466862	PA 7307-87	CI 8310/NC 2469-3	WInter	Pennsylvania
466863	PA 7408-15	1973 Composite 11 Selection	Winter	Pennsylvania
466864	PA 7408-174	1973 Composite 11 Selection	Winter	Pennsylvania
466865	PA 7409-39	1973 Composite 11 Selection	Winter	Pennsylvania
466866	PA 7409-122	1973 Composite 12 Selection	Winter	Pennsylvania
466867	PA 7409-125	1973 Composite 12 Selection	Winter	Pennsylvania
466868	PA 7409-151	1973 Composite 12 Selection	Winter	Pennsylvania
466869	PA 7507-8	1974 Composite 12 Selection	Winter	Pennsylvania
466870	PA 7507-34	1974 Composite 11-1 Selection	Winter	Pennsylvania
466871	PA 7507-144	1974 Composite 12-1 Selection	Winter	Pennsylvania
466872	PA 7606-51	Nora/Pennwin	Winter	Pennsylvania
466873	PA 7616-247	PA 65-22-42/PA 64 Comp 1-1// PA 65-22-7/PA 65-22-42	Winter	Pennsylvania
466874	PA 7616-916	1973 Composite 11 Selection	Winter	Pennsylvania
466875	PA 7628-457	Egdolon 23/Otee	Winter	Pennsylvania
466876	PA 7733-648	Egdolon 26/Otee	Winter	Pennsylvania
466877	PA 7733-1268	Jaycee/Wis X1656-1		Pennsylvania
466878	PA 7733-1269	Jaycee/Wis X1656-1		Pennsylvania
466879	PA 7733-1281	Jaycee/Wis X1656-1		Pennsylvania
466880	PA 7733-1315	Otee/Noble		Pennsylvania
466881	PA 7733-2583	Egdolon 26/PI 355001		Pennsylvania
466882	PA 7733-2647	Egdolon 26/Noble		Pennsylvania
466883	PA 7836-2093	Egdolon 23/Jaycee		Pennsylvania
466884	PA 7836-2317	Otee/Noble		Pennsylvania
466885	PA 7836-2334	Otee/Noble		Pennsylvania
466886	PA 7836-2523	Orbit/Noble		Pennsylvania
466887	PA 7836-4831	Dal/Noble		Pennsylvania
466888	PA 7836-7385	Mapua 70/Noble		Pennsylvania
466889	PA 7836-8288	NC 2469-3/Clintland		Pennsylvania
466890	PA 7836-9710	Otee/Noble		Pennsylvania
466891	PA 7836-9745	Otee/Noble		Pennsylvania

PI No.	Name/Designation	Pedigree	Class	Source
466892	PA 7836-10,314	Orbit/Noble		Pennsylvania
466893	PA 7836-10,330	Orbit/Noble		Pennsylvania
466894	PA 7836-10916	Otee/NC 2469-3		Pennsylvania
466895	PA 7836-10970	Dal/NC 2469-3		Pennsylvania
466896	PA 7836-11294	Mapua 70/Noble		Pennsylvania
466897	PA 7836-11528	CI 7762/NC 2469-3/Mapua 70/Noble		Pennsylvania
466898	PA 7967-1	1979 PA Composite 24 Selection		Pennsylvania
466899	PA 7967-5110	Mapua 70/Noble		Pennsylvania
466900	PA 7967-8806	Otee/NC 2469-3		Pennsylvania
466901	PA 7967-11500	Egdolon 26/Noble		Pennsylvania
466902	PA 7967-11634	Egdolon 26/Otee		Pennsylvania
467882	Border	Otana//Coker X648-1-1-2/Cayuse		Wyoming
469104	Pennline 116	James/CI 8447	Spring	Pennsylvania
469105	Pennline 6571	Astro/Noble	Spring	Pennsylvania
469106	Pennlo	Egdolon 26/Otee	Spring	Pennsylvania
469108	B525-73	Selection from a mutagenized bulk population		Iowa
469109	B525-336	Selection from a mutagenized bulk population		Iowa
469110	B525-593	Selection from a mutagenized bulk population		Iowa
469111	Y20-3-8	Garland (A. sativa)/PI 292555 (A. sterilis)//Holden (A. sativa)		Iowa
469112	Y22-15-9	Garland (A. sativa)/B433 (A. sterilis)//Holden (A. sativa)		Iowa
469113	Y201-150-8-19	Grundy (A. sativa)//Clintford (A. sativa)/66AB335 (A. sterilis)		Iowa
469265	SD 751187	X848-1-1-2/Cayuse//CI 8457		South Dakota
469266	SD 760062	Froker//Clintland 64/Garland		South Dakota
469267	SD 770064	Clintland 64/Garland//Froker		South Dakota
469268	SD 770290	Chief/Kelsey		South Dakota
471906	AR 143-3	Florida 500/Midsouth//CI 8362/3/ Bob Sib.	Winter	Pennsylvania
471907	AR 144-5	Bob Sib./Coker 234	Winter	Pennsylvania
471908	NC 79-5	Salem/Windsor	Winter	Pennsylvania
471909	NC 79-43	Windsor/Firecracker	Winter	Pennsylvania
471910	PA 7507-136	Parentage unknown	Winter	Pennsylvania

GRAVIMETRIC SELECTION AND ITS RELATIVE EFFICIENCY TO THE PEDIGREE METHOD IN - OATS. (*Avena sativa* L.)1/

Carlos A. Jiménez G., 2/ José D. Molina G., Uriel Maldonado A. y Andrés Iruegas E.

S U M M A R Y

This study was conducted to compare the relative efficiency of the gravimetric and the pedigree methods in the selection of superior yielding lines in oats. A total of 400 lines (377 lines obtained by the gravimetric selection method ; 15 lines obtained by the pedigree method,and 8 commercial varieties), were tested in four different environments: Chapingo, Méx., and Tulancingo, Hgo., during the summer, and Chapingo, Méx., and Roque, Gto., during the winter.

As it is known in the pedigree method only a few lines are selected from a cross at the end of the selection process, whereas with the gravimetric selection method it is posible to select a for greater number of lines. In the pedigree method, selection was based on several phenotypic attributes. In the gravimetric selection method, the selection criterion was only kernel plumpness and yield *per se*.

The results indicated that a greater number of high yielding lines were obtained with the gravimetric selection method, than with the pedigree method (Table 1)

Furthermore, the gravimetric selection method is considered easier to carry out and cheaper than the pedigree method.

Based an stem rust scoring it is assumed that with gravimetric selection method would be posible to find genotypes with horizontal resistance.

1/MC. Thesis. C.P., Chapingo, Mex. 1982. Genetics Center
2/Student and professors, C.P., Chapingo, Mex.

TABLE 1. GRAIN YIELD AND DIFFERENT CHARACTERS OF OATS LINES FROM THE GRAVIMETRIC SELECTION METHOD (GSM), THE PEDIGREE METHOD (P) AND A COMMERCIAL VARIETY.

METHOD		YIELD (g/PLOT)	MATURITY (DAYS)	HEIGH (CM)	STEM RUST	PANICLE LENGTH (CM)	KERNEL PER PANICLE	KERNEL WEIGHT (1000)	PORCENT GROATS (%)	PROTEIN GROATS (%)
GSM	219	577.95	129	113	75 MS	23.3	74.5	22.3	63.1	19.1
"	212	543.77	131	112	17 MR	19.2	54.0	20.7	69.0	19.8
"	114	537.90	131	107	65 MS	19.9	74.0	21.6	70.7	19.9
"	80	528.15	132	107	30 MR	21.4	49.9	21.3	71.6	20.3
"	109	524.52	123	99	75 MS	18.3	52.3	21.8	70.0	20.9
"	247	522.77	126	106	15 MR	20.2	60.5	20.7	61.7	19.4
"	12	521.02	130	109	35 MR	19.3	62.4	23.0	75.1	20.4
"	291	519.65	129	113	55 MS	19.6	62.7	22.1	68.6	19.1
"	232	512.52	126	109	7 MR	18.5	42.9	21.7	58.8	20.9
P	46	436.90	128	104	27 MR	18.8	57.1	17.6	67.0	22.0
T		443.27	130	102	45 MR	17.9	70.1	20.1	69.2	17.0
HSD (0.05)		139.46	9.5	15.2	17.2	4.4	23.7	4.9		

P : Higher yielding line of the pedigree method (Check).
T : Superior yielding variety.

VII. MAILING LIST

BENBELKACEM ABDELKADER
INSTITUT DES GRANDES CULTURES
STATION EXPERIMENTALE
KHROUB - W CONSTANTINE
ALGERIA
STATE ZIP
COUNTY NUMBER

BRYCE C ABEL
AGRONOMY
PLANT INTRODUCTION STATION

AMES STATE IA ZIP 50011-1010
COUNTY NUMBER

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