1958

OAT NEWSLETTER

Vol. IX

March 1, 1959

Sponsored by the National Oat Conference

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Vol. 9

Multilithed and edited in the Department of Plant Breeding, Cornell University, Ithaca, New York. Costs of preparation financed by the Quaker Oats Company, Chicago, Illinois.

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Neal F. Jensen, Editor

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I. CONFERENCE AND REGIONAL NOTES

Report of the Chairman, National Oat Conference

The activities of the last meeting of the National Oat Conference were reported in Vol. VIII of the Oat Newsletter. Since this meeting two items of business have been transacted.

Several of the papers presented at the National Oat Conference meeting at Purdue merited publication as technical articles and presentation at the meetings of the Agronomy Society. In view of the importance of reporting significant research at the Agronomy meetings, it was suggested that a half-day symposium on oats be organized for the Society meetings at Purdue August 4-8. Time was an important factor; however, an excellent session pertaining to wheat and oats was organized with the cooperation of Dr. H. F. Robinson, Program Chairman, Division VII - Crop Breeding, Genetics and Cytology.

In compliance with the motion passed by the National Oat Conference, a committee to explore the matter of standardization of genetic nomenclature in oats has been appointed. The committee is composed of M. D. Simons, Iowa State College, (Chairman); W. M. Myers, University of Minnesota; F. L. Patterson, Purdue University; N. F. Jensen, Cornell University; and E. G. Heyne, Kansas State College.

W. H. Chapman, Chairman

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Secretary's Report - National Oat Conference

No meetings of the Conference Committee were held during the year. However one sectional meeting of some interest to the Conference was held, that of the Northeastern Agronomists in New York City, January 5, 1959. At that meeting no actions were taken which concerned the Conference.

The membership of the Conference Committee remains as reported in Vol. VIII of the 1957 Oat Newsletter.

Northeastern Region:	N. F. Jensen and Steven Lund
North Central Region:	E. G. Heyne, John Grafius and Fred Patterson
Northwestern Region:	Harland Stevens and Calvin Konzak
Southern Region:	W. H. Chapman (Chairman) and I. M. Atkins

Franklin A. Coffman
Secretary to Committee

Report on Oat Monograph

Except for one chapter the completed manuscripts of all chapters of the Oat Monograph have now reached the Editor's desk. A total of eight have been forwarded to the editors of the American Society of Agronomy. Of those not yet forwarded four have received considerable editorial attention and several should shortly be cleared for final approval before being forwarded.

Chapters originating in the Cereal Crops Research Branch or on which the name of some member of that Branch appears as an author require special treatment in that all citations must be checked by U.S.D.A. personnel and manuscripts must be submitted for editorial attention and Department approval prior to authorization for publication. The extended absence of the Branch editor for a period of weeks has impeded the progress of several chapters. With her return it is anticipated that shortly the remaining chapters will start moving forward to the Society Editorial Staff.

Franklin A. Coffman
Oat Monograph Editor

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Report of Committee to Explore the Standardization of Genetic Nomenclature in Oats

In 1958, the chairman of the National Oat Conference appointed a committee to explore the standardization of genetic nomenclature in oats. The committee consists of Drs. F. L. Patterson, W. M. Myers, N. F. Jensen, E. G. Heyne, and M. D. Simons. To date, the committee has studied the subject only in a preliminary way. However, the committee has already decided there is a need for a detailed investigation of the problem. Such a study is now being initiated. Present plans call for a final report to be submitted to the chairman of the National Oat Conference late in 1959.

M. D. Simons, Chairman

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II. SPECIAL INTEREST ARTICLES

The 1958 Oat Crop

H. C. Murphy (U.S.D.A.)

An all-time record high yield and high test weight oat crop was harvested in the United States in 1958 from the smallest oat acreage since the drought year of 1934. Total production was 6.7 percent above average on a harvested acreage 15.8 percent below average. The average yield of 44.7 bushels per acre was 6.4 bushels higher than the previous 1955 record and 9 bushels higher than the average for the past ten years. The heavy producing States of Wisconsin, Minnesota, Ohio, Illinois, Indiana, Michigan, and Iowa had all-time record high average yields of 58, 54, 42, 51, 51, 51, and 47 bushels, respectively. The North Central Region produced 82 percent of the Nation's oat grain crop on 77 percent of the acreage with the "Big Five" (Iowa, Minnesota, Wisconsin, Illinois, and South Dakota) producing 60 percent of the total.

A late, cold, and wet spring in much of Kansas, Missouri, Illinois, and Indiana, and in some other States; excessive rainfall during harvest in some East Central and Northeastern sections; and an unfavorable fall and winter seasons for fall-sown oats in the South prevented a record production on the below average acreage.

Oat diseases caused only minor losses nationwide. There was unusually heavy rust and yellow dwarf infection in the Western Region, and sporadic but generally light infection of crown rust, Septoria, yellowing, stem rust, and other diseases in some other areas. An unusually cold winter in the South inhibited the overwintering and build-up of the rusts and their northward movement into the heavy oat-producing areas.

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Why the Advancement of Winter Oats Northward

by T. R. Stanton

Increasing interest in the growing of winter oats in more northern areas of the eastern United States in which this crop was almost unknown just a relatively few years ago, has been a phenomenon of considerable interest to the writer as an observer sitting on the side lines. It was believed all that was necessary to check this rather unexpected development would be the occurrence of a few abnormally cold winters and the crop thus suffering a disastrous set back. So far this has not happened and a change of thinking seems to be in order.

There has been much speculation on the part of agronomists, oat breeders, and grain men in general, regarding the factors involved in bringing about this better adaptation of winter oats in areas in which they had been previously grown only as an occasional experimental crop.

It is well-known that winter (fall-sown) oats in areas in which they have been grown, are superior in yield, and quality, and in many other characteristics. In addition, they also provide a highly satisfactory soil cover, valuable late fall and early winter grazing as well as an excellent hay crop if desired. Fall-sown oats, too, ripen earlier, thus enabling more timely seeding of the crops that follow. Still other factors that have contributed to their more successful culture, include better seed bed preparation, more timely seeding, the more rational use of fertilizers and the growing of varieties with better cold resistance, or with better adaptation.

It is the writer's opinion that the more rational use of fertilizers to the crop undoubtedly, insuring better root development and a more vigorous seeding growth before the occurrence of severe freezing weather, has contributed more than is ordinarily believed to the successful growing of winter oats in many areas.

Nevertheless, there is no convincing argument against the fact that the breeding and selection of varieties with a superior type of winter resistance, in other words with better adoptation, accounts primarily for this northward march of the crop. Resistance to the common oat diseases, such as the smuts and rusts, likewise has played a part.

Varieties

There is no doubt concerning the contribution hardier and better adapted varieties has made to the advance of fall-sown oats northward. The writer recalls that in June 1907 when he first observed winter oats being grown in nursery and field plots at College Park, Md., and later at Arlington Farm in Virginia, under the direction of the late C. W. Warburton, there were only a relatively few hardy varieties such as the strains of the old Winter Turf and Culberson types, available to recommend as dependable varieties for fall sowing; regardless of their many other rather undesirable characteristics.

Winter Turf oats at that time were being grown to a limited extent in Virginia, the Carolinas, Tennessee and other southern states. It was grown in western Oregon under the name of Oregon Gray and on a very small acreage in California.

The weak straw, late maturity, rather grayish striped grains, and high susceptibility to nearly all the major oat diseases were among the many disadvantages of Winter Turf.

Only a very few Culberson-type strains have been distributed for farm production. Dwarf Culberson, a short-strawed oat originating in Tennessee, was grown at one time on a limited acreage in that state. It, like Winter Turf, was quite hardy, but because of low-yielding power and other weaknesses, never attained much economic importance.

Harry Culberson, selected at the Arlington Farm, a winter oat with small culms and grains and low-yielding power failed to show any special adoptation in the eastern states, including those north of the Mason-Dixon line. However, rather widely conducted tests for relative winter hardiness showed it to be one of the hardiest fall-sown varieties.

Tech, a hardy black oat selected from Culberson by the Virginia Station at Blacksburg, likewise proved to be of no special economic value. Tech's color, of course, was undesirable, being a serious handicap to the variety.

Wintok, probably the hardiest fall-sown variety developed, having many of the characteristics of its Hairy Culberson parent, likewise failed to show any special adaptation north of the Mason-Dixon line. Wintok was distributed from the Oklahoma Agricultural Experiment Station in which state it became at one time the most important fall-sown variety to be grown in that state. However, it failed to compete with other varieties in the eastern states, showing poor adaptation in Maryland, New Jersey and Pennsylvania. Wintok, contrary to belief, proved to be low-yielding, showing rather poor adaptation as compared with its excellent performance under the drier and colder climate of Oklahoma.

Lee, an improved variety, originating from a cross between Winter Turf and Aurora, at the Arlington Farm, has proved to be one of the outstanding newer varieties of winter oats. Although not as hardy as some of the older varieties, such as Winter Turf and Culberson, Lee has been superior in yield, quality and straw strength. It was the first variety to be grown to some extent in southeastern Pennsylvania. Lee has been followed by LeConte and Dubois, which have outyielded Lee.

Lee was first distributed to farmers in small quantities from the Arlington Farm in the early nineteen-twenties. However, T. W. Wood and Sons, Seedsmen, of Richmond, Va., became interested, increased Lee and placed it on the market under the trade name of Lee Coldproof, thus giving the new variety a distinct boost. In later years the culture of Lee spread from Virginia to Maryland and Pennsylvania. This resulted in establishing a small annual acreage of fall-sown oats in these states. The acreage of winter oats was estimated as 56,000 acres in 1957 for Pennsylvania, mainly located in the Southeastern part. As previously stated, the writer for a long time held the view that in the long run no winter oat was available that would prove to be sufficiently satisfactory for growing in Pennsylvania. Thus it may be said that the distribution of Lee really marked the beginning of an era in the culture of fall-sown oats north of Maryland or the Mason-Dixon line.

The fact, however, must not be overlooked that one of the most important advances in winter oat improvement, especially in the field of breeding for greater winter resistance, or better adaptation was the selection of the so-called Winter-Fulghum type strains at Arlington Farm in 1920. In the summer of 1919 at which time Fulghum oats had been but little exploited, selections were made by the writer from several mass stocks of Fulghum, carrying C. I. Nos. 699, 708 and 850. Fulghum was originated near Warrenton, Ga., by a farmer named Fulghum, as a single plant selection from a field of Red Rustproof (Red Texas).

At harvest in 1919 several hundred panicle selections were made from these mass lots of Fulghum and sown in head rows that fall. In 1920 it was noted that in a relative small number of rows a more vigorous, slightly taller and later type of Fulghum was appearing. After being further examined at harvest, most of these progenies were uniform in plant and grain characters. However, one Sel. 699-2011 (later accessioned as C. I. 2499) was decidedly more variable than the other selections of the group. Small quantities of seed of each of these so-called Winter Fulghum selections were distributed to several agricultural experiment stations in the upper South for testing, mainly for cold resistance. From this seed, to make a long story short, the now well known varieties such as Fulwin, Tennex and Forkedeer were developed from selection of 699-2011 (C. I. 2499) as reselections made and tested at the Tennessee Agricultural Experiment Station at Knoxville, Tenn. Of the three varieties, Forkedeer has become the most extensively grown. All have been used to some measure in oat crosses.

One of the best known varieties resulting from such crosses has been the Arlington oat.

Arlington was originated by F. A. Coffman from a cross between Fulwin and a Lee-Victoria selection at Arlington Farm. It is a very productive, crown-rust resistant, tall, hardy variety with excellent grain quality. It is grown in Virginia, the Carolinas, Georgia, and other Southern States, not being sufficiently hardy for growing farther north.

Other new varieties that are being grown by farmers in New Jersey and Pennsylvania are LeConte developed by the Tennessee Station (Knoxville) and Dubois distributed from the Indiana Station (Lafayette), the latter was especially recommended for Pennsylvania for the crop year 1957-58.

Space forbids the discussion of still other newer varieties of winter oats.

New Techniques Reported

Much progress also has been made in the development of improved techniques for the breeding of winter oats.

The building of a workable "satatron" for use in growing plant progenies from irradiated seed for observation and study, as well as for crossing and insuring an increase of seed, has been a recent development of much interest. (See Research Report for Jan. 1958, Fla. Agrl, Expt. Station).

The development of a rapid laboratory technique of testing many thousands of seeds in the seedling stage for the detection and isolation of disease-resistant mutants has been a marked contribution to oat improvement. This method was found to be exceedingly valuable in the isolation of resistant mutants to Victoria blight occurring in Victor-grain 48-93 oats, a variety rather susceptible to this disease. The new Victoria blight-resistant Midwest variety as reported from the Mississippi Agricultural Experiment Station (Statesville) by Dr. Ivanoff, is a product of this new technique. Midwest is typical of the extensively grown Victorgrain 48-93 variety in practically all plant and grain characters, except for resistance to Victoria blight.

By going back to the treatment of other Victoria-derived varieties, such as Boone, Tama and Vichland, spring oats and Letoria, Stanton and DeSota, winter oats, mutants resistant to Victoria blight, also might be equally well isolated and become available for testing.

Mention should be made of the use of nullisomic oats in avoiding some of the pitfalls in conventional breeding, also many offer great possibilities. The isolation of a new nullisomic red oat with exceptional vigor has been reported recently from the Agricultural Experiment Station at Davis, California.

Many other new genetic techniques are being evolved which undoubtedly will be applied to the breeding of many new oat varieties in the next few decades. A review of this phase of oat breeding would require a special article by one who is more fully abreast of the developments in plant genetics at this time.

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The Quality of Seed Oats Planted in New York

by W. F. Crosier, G. H. Gibbs, L. W. Nittler, and E. C. Waters[1/]

In 1957 inspectors of the State Department of Agriculture and Markets sampled 155 seedstocks of spring grains either being planted or ready for planting. Of the

1/ Pathologist, Seed Technologist, Agronomist, and Seed Technologist, respectively, New York State Agricultural Experiment Station, Cornell University, Geneva, New York. The Departments of Agriculture and Markets and of Education, Albany, New York and the State College of Agriculture, Ithaca, New York cooperated.

140 seed oats collected, 79 were on-farm grown, while 61 had been purchased. According to owners' statements, 55 of these 61 commercial lots were certified seed.

Recommended varieties, Garry and Rodney, were being planted on 114 farms, while common varieties, Advance, Ajax, Beaver, Clinton, Craig, and Mohawk, were taken from 23 farmers. Not all of the seedstocks were marked correctly as to variety and several, including those represented as Garry and Rodney, contained seeds of other varieties.

Since the 1957 seed oat survey was the first conducted in New York since 1937, it was continued in 1958 on an enlarged state-wide basis. Through the cooperation of Vo-Ag teachers and students in 71 schools, 588 samples were collected directly from farmers' barns or drills. A student collected one from his own farm and another from a neighbor. The samples, with pertinent information supplied by each farmer, were assembled by the state seed inspectors and brought to the Department of Seed Investigations at Geneva.

To prevent contamination, each sample was divided and placed in three clean envelopes for laboratory analysis, disease examinations, and field trials.

The varietal purity was determined by a combination of two or three methods - (1) Fluorescence of dry seeds under ultra-violet light; (2) Performance of plants grown from the samples; and (3) Rust reaction of seedlings. The third method rather than the second was used for 78 samples of Garry and Rodney that could not be planted in the field.

A summary of varieties as stated by the participating farmers and as determined in tests is given for 588 seed lots in Table 1. Four hundred ninety-one (84%) of these samples were stated to be the recommended varieties, Garry or Rodney, although tests at Geneva showed that 36 samples were slightly mixed, 33 were highly mixed, and 20 were misnamed. As shown in Table 1, 45 of 96 samples not labeled as Garry or Rodney were either mixed or misnamed. These values indicate that only 53 percent of the samples represented as non-recommended or mixed varieties were correctly named as contrasted to 82 percent for the recommended varieties.

About 33 percent of the cooperating growers planted seed certified in New York State or elsewhere. Of the 244 purchased seedstocks, 209 were marked as Garry or Rodney and of these, 196 were stated to be certified.

The combination of resistant varieties and mercurial seed treatments have almost eliminated oat smuts. Only 18 of the field plots grown from the 588 samples contained smutted panicles. On the basis of varieties, the incidence of smut was: Beaver - 2; Clinton - 4; Garry - 1; Victory - 1; White Star - 1; and Unknown or mixed - 9.

On the basis of source of seed the smutted samples were distributed thusly: Farm-grown not cleaned - 5; Farm-grown and cleaned - 7; Farm-grown custom-cleaned - 1; neighbor - 1; and retail dealer - 4.

According to statements from cooperating farmers, 200 purchased seed already treated, 171 had their seed custom treated, 31 treated their seed on the farm, and 191 lots were not treated. As shown in Table 2, at least 33 of these statements

were incorrect or the treatments were too ineffective to control storage rots, pink mold, scab, and/or smut.

As might be expected only a few farmers treated, but did not clean, their seed. Unfortunately 74 farmers cleaned their own seed but only 12 applied an effective treatment. The ratio of treating to cleaning is, naturally, much higher for custom cleaned and purchased seed. The average size of the fields was smaller when treated than when not treated seed was planted.

The distribution of samples according to source and cleaning methods is also shown in Table 2. About 59 percent (345 samples) were grown on the cooperators own or neighboring farms. In the 1937 survey, 83 percent of the seedstocks were home-grown.

The place of cleaning has also changed since 1937. At that time, 72 percent of the farm-grown seed was cleaned at home and only 6 percent by a custom grower. In 1958, however, only 22 percent was cleaned at home, but 48 percent had been custom cleaned.

As measured by average pure seed content, cleaning did increase the planting value of farm-grown seeds. Average percents of purity were: Not cleaned - 95.83; Farm-cleaned - 98.09; and Custom-cleaned - 98.76. The purchased seed was somewhat cleaner with average purities of 99.37 percent for retail dealer and 99.85 percent for seed purchased through a sales agent.

Freedom from weed seeds is an important factor in the evaluation of oat seed. The occurrences of several noxious and common weed seeds as shown in Table 3 indicate that on-the-farm cleaning does remove many seeds. The average percents by weight of weed seeds were: Not cleaned - 0.348; Farm-cleaned - 0.059; Custom-cleaned - 0.075; Retail dealer - 0.027; and Sales agent - 0.005.

Germination seemed not to be materially affected by cleaning or source of seed. The average percents of germinable seed were: Not cleaned 96.8; Farm-cleaned - 97.4; Custom cleaned - 96.9; Neighbor's - 97.3; Retail dealers - 95.9; and Sales Agents - 96.1.

In terms of ability to meet quality seed standards, the purchased seed lots were superior to the farm-produced ones. As shown in Table 4, excessive amounts of impurities, especially inert matter and weed seeds, were the most common causes of failure.

The 1958 survey indicated that seed oats have been improved during the last 20 years, due to development of disease-resistant varieties, more complete removal of weed seeds, more attention to germination, and better seed-testing materials and practices.

Table 1. Varieties of Oats as Stated by Farmers and as Determined in Laboratory and Field Tests

Variety stated by farmers	Number of samples found to be					
	As stated	Off-type from stated variety by				
		1-5%	6-11%	12-20%	21-90%	91-100%	Total
	Seed Grown on Own Farm						
Garry	198	23	7	5	12	12	257
Rodney	15	2	0	0	3	1	21
Ajax	6	0	0	0	0	0	6
Clinton	4	3	0	2	7	1	17
Mohawk	3	1	2	0	0	1	7
Others	5	8	5	0	4	1	23
Mixtures	8	2	1	0	2	0	13
Total	239	39	15	7	28	16	344
	Seed Purchased From Dealer or Sales Agent						
Garry	158	10	3	1	5	9	186
Rodney	23	1	0	0	0	3	27
Ajax	4	0	0	0	0	0	4
Clinton	1	0	0	0	0	0	1
Mohawk	2	0	0	0	1	0	3
Simcoe	4	0	0	0	0	0	4
Others	10	1	2	0	1	1	15
Mixtures	4	0	0	0	0	0	4
Total	206	12	5	1	7	13	244

Table 2. Seed Treatments: Number and Acreage of Farms Using Each Type of Treatment

Type of treatment	Type of seed treatment found to be present on seed lots stated by farmer to have been					
	Grown on own farm, and					Grand total
	Not cl.	Farm cl.	Custom cl.	Total	Purchased	
	Number of Samples					
Red-dyed	0	2	63	65	156	221
Not-dyed	11	10	63	84	59	143
Not treated	94	62	40	196	28	224
Total	105	74	166	345	243	588
	Acreage Involved					
Red-dyed	0	18	1335	1353	2922	4275
Not-dyed	157	266	1265	1688	794	2482
Not treated	1641	1471	922	4034	468	4502
Total	1798	1755	3522	7075	4184	11,259
	Average Size of Fields					
Red-dyed	--	9	21.2	20.8	18.7	19.3
Not-dyed	14.3	26.6	20.1	20.1	13.5	17.4
Not treated	17.4	23.7	23.0	20.6	16.8	20.1
Average	17.1	23.9	21.2	20.5	17.2	19.0

Table 3. Occurrence of Noxious and Common Weed Seeds in Oat Samples

Common name of species	Percentage of samples containing weed seeds according to source or cleaning				
	Grown on own farm			Purchased	
	Not cl.	Farm cl.	Custom cl.	from dealer	Total
Legally Noxious:					
Corn cockle	1.0	--	--	--	.2
Quackgrass	55.0	37.8	23.5	9.0	24.8
Wild mustard	40.0	23.2	27.2	8.6	21.1
Wild radish	5.0	3.7	3.7	1.2	2.9
Common:					
Barnyard grass	24.0	13.4	8.6	2.9	9.5
Yellow foxtail	70.0	30.5	27.8	7.0	26.7
Ladysthumb	50.0	14.6	10.5	3.3	14.8
Common ragweed	21.0	8.5	13.6	2.9	9.7
Wild buckwheat	34.0	19.5	27.2	8.6	19.4
Other Weeds	67.0	45.1	25.3	11.1	29.3
Total number of samples	100	82	162	244	588

Table 4. Ability of Samples to Meet Quality Seed Standards[a/]

Status of samples	Number of samples that meet or fail to meet standards when source or cleaning was					
	Own farm production				Retail	Sales
	Not cl.	Farm cl.	Custom cl.	Neighbor	dealer	agent
Meets, total	0	7	31	7	139	20
Fails, total	98	67	123	22	79	8
Variety	32	17	28	7	28	3
Pure seed	96	55	91	19	48	4
Inert	93	54	83	18	46	4
Weed seeds,						
Noxious	57	24	35	10	20	2
Common	80	42	70	17	30	3
Crop seeds	43	14	39	9	24	2
Germination	10	6	21	3	19	2
5 factors	42	13	18	10	4	0

a/ These standards are minima of 99.50% mechanical purity, 99% varietal purity and 90% germination and maxima of 0.03% total weed seeds, 0% noxious weed seeds, 0.50% inert matter, and 10 per pound of crop seeds.

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Septoria Avenae and Other Fungi In, and Chemical Treatment of, Oat Seeds

by W. F. Crosier and E. C. Waters[1/]

It is well known that the blackstem fungus, Leptosphaeria avenaria, infects the floral as well as other tissues of the oat plant. Yet the fungus in its imperfect, Septoria avenae, stage has been isolated only once from some 650,000 seeds examined during 1956, 1957, and 1958. About three-fifths of these seeds had been produced in New York State, the others in Alabama, Illinois, Iowa, Maine, Michigan, Minnesota, Ohio, Ontario, Vermont, North Ireland, and Scotland.

The failure to obtain Septoria avenae from oat seeds produced on infected culms was anticipated since Simons and Murphy[2/] and Crosier[3/] had reported that the fungus did not persist in mature seeds. Noble and Montgomerie[4/], however, have isolated S. avenae from seed lots in Scotland.

These somewhat contradictory results may conceivably be due to differences in fungus strains or in methods of isolation. But they are better explained by the facts that the Scottish mycologists worked with field-run seed stored in a naturally cool, moist atmosphere, whereas the New York, and probably Iowa, pathologists examined cleaned seed lots held in warm dry storage.

The diagnostic black stains from Septoria avenae were observed frequently in chemically-treated lots of the 1956, 1957, and 1958 crops. As shown in Table 1, discolored grains were present in seed lots from Illinois, Maine, Minnesota, New York, Ohio, and Ontario.

The data in Table 2 indicate that no variety examined, certainly not Garry or Rodney, is resistant to Septoria avenae. Totals for treated samples containing black-stained seeds are: Garry and Rodney - 425 of 620, and all other varieties - 168 of 298 samples examined.

1/ Pathologist and Seed Technologist, respectively, N.Y.S. Agricultural Experiment Station, Cornell University, Geneva, New York.

2/ Simons, M. D. and H. C. Murphy. 1952. Kernel blight phase of Septoria black stem of oats. Pl. Dis. Rptr. 36:448-449.

3/ Crosier, W. F. 1955. Septoria avenae and other fungi of oats. Proc. Assn. Off. Seed Anal. 1954:182-185.

4/ Noble, Mary and Isabel Montgomerie. 1956. Griphosphaeria nivalis and Leptosphaeria avenaria on oats. Trans. Brit. Mycol. Soc. 39:449-459.

Other species of Septoria infecting seeds of ornamentals, vegetables, and wheat have been isolated from stored lots. Fungi other than Septoria avenae known to infect oat inflorescences have been isolated from cleaned seed one to five years after harvesting.

The fungi most commonly associated with oat seeds are Alternaria tenuis, Epicoccum neglectum, and E. purpurascens. These organisms are usually saprophytic, are carried in dead lemma tissue, and hence are easily controlled by either mercurial or non-mercurial fungicides. As shown in Tables 1 and 2, 704 of the 729 untreated samples were heavily infested with A. tenuis whereas this fungus vegetated on only a few seeds in 56 of the 960 treated samples.

Epicoccum spp., like Alternaria tenuis, are usually superficial on the paleas and lemmas, rarely in the groats. The sterile, rather sparse mycelium is a deep chrome to orange color, rarely bittersweet orange to orange chrome, hence may be confused with Fusarium spp. The total numbers of samples carrying some, usually 0.5 to 2 but rarely 3 to 8 percent, Epicoccum-infested seeds are untreated, 296 and treated, 6. The incidence of this fungus has been increasing steadily since 1950. It has been isolated from every variety of oat seed sold in New York.

The incidence of Fusarium spp. varies from year to year. From examination of a few samples it appears that the 1958 New York crop, produced under very cool moist conditions, is more heavily infected than any recent crop. Some records of infection for untreated seed lots are: 1955 - 9 of 201; 1956 - 96 of 486; 1957 - 47 of 283; and 1958 - 16 of 40 lots infected.

Infected seeds or seedlings usually carry a copious growth of mixed carmine (rose doree to ox-blood red) and orange (salmon orange to orange chrome) mycelium. However, a single infection may destroy 25 percent of the seedlings in a germination test without the development of distinctly-colored aerial mycelium.

No culture of Helminthosporium avenae or H. victoriae has been obtained since 1954 from Canadian or northern U.S.A. grown seed. They have been isolated from seed originating in Alabama. Seed lots from North Ireland and Scotland produced vigorous growths of H. avenae.

The percentage of non-colored chemically-treated lots decreased from 19 in 1956 to 14 in 1957, then increased to 16 in the 1958 crop of oats. The percentage of samples marked with a red dye increased from 32 in 1956 to 50 in 1957 and to 53 in 1958.

Mercury-poisoned seedlings were observed in 189 of the 720 red-dyed samples and in 101 of the 278 non-dyed samples germinated in 1956, 1957, and 1958.

Table 1. Incidence of Fungi in Oat Seedstocks Sold in New York in 1957 and 1958

Stated origin of seedstock	Total number of samples	Number of samples during germination exhibiting signs or symptoms of: Alternaria tenuis	Epicoccum spp.	Fusarium spp.	Septoria avenae
		Non-Treated Samples			
Maine, Ontario	2	2	0	1	1
New York	11	11	3	1	0
Other States	2	2	0	1	0
		Chemically-Treated Samples			
Maine, Ontario	60	1	0	2	41
New York	73	1	1	0	43
Other states	36	0	0	0	22

Table 2. Incidence of Treatment Injury and of Fungi in Oat Seeds Received from Dealers and Farmers in 1957 and 1958

Variety, type, or group of oats	Type or color of treatment material	Number of samples germinated on paper towels: Percent of chemically injured seedlings was None	Tr.-1	1.5-3	3/	Carrying seeds infected with or stained by: Alt.	Epic.	Fus.	Sep.
				1956 Crop					
Advance, Clinton, Mohawk	None	24	--	--	--	21	5	4	2
	Red-dyed	38	3	0	1	4	0	0	29
	Non-dyed	31	9	5	4	3	0	0	15
Craig	None	22	--	--	--	22	7	7	0
	Red-dyed	4	1	2	0	2	0	0	4
	Non-dyed	7	7	3	2	0	0	0	7
Garry	None	221	--	--	--	210	60	52	17
	Red-dyed	111	31	29	4	26	2	12	18
	Non-dyed	41	18	9	4	2	0	1	54
Rodney	None	40	--	--	--	39	3	11	6
	Red-dyed	17	2	3	5	0	0	1	22
	Non-dyed	2	0	0	0	0	0	1	2
Others, Mixed, Unknown	None	102	--	--	--	101	28	20	9
	Red-dyed	12	0	4	0	1	0	0	10
	Non-dyed	7	1	1	0	0	0	0	7
				1957 Crop					
Advance, Clinton, Clintland, Mohawk	None	5	--	--	--	5	3	1	0
	Red-dyed	3	1	0	0	0	0	0	3
	Not-dyed	6	2	1	0	1	0	0	5

Table 2. Continued

Variety, type, or group of oats	Type or color of treatment material	Number of samples germinated on paper towels							
		Percent of chemically injured seedlings was				Carrying seeds infected with or stained by			
		None	Tr.-1	1.5-3	3/	Alt.	Epic.	Fus.	Sep.
Ajax, Beaver	None	5	--	--	--	5	1	1	2
	Red-dyed	9	1	0	0	0	1	0	8
	Not-dyed	0	1	0	0	0	0	0	1
Craig	None	2	--	--	--	2	1	0	1
	Red-dyed	1	0	0	0	0	0	0	0
	Not-dyed	5	1	1	0	1	0	0	3
Garry	None	189	--	--	--	180	123	29	8
	Red-dyed	172	31	5	0	7	1	8	148
	Not-dyed	30	8	1	0	2	1	1	29
Rodney	None	35	--	--	--	32	19	8	1
	Red-dyed	26	5	0	1	0	0	0	26
	Non-dyed	3	1	0	1	0	0	0	2
Others, Mixed, Unknown	None	36	--	--	--	36	21	3	2
	Red-dyed	10	5	1	1	1	0	0	11
	Yes	4	0	0	1	0	0	0	4
		1958 Crop							
Ajax, Beaver, Simcoe	None	1	--	--	--	1	0	0	0
	Red-dyed	2	2	0	0	0	0	0	4
	Not-dyed	0	0	0	0	0	0	0	0
Clinton, Clintland, Mohawk	None	7	--	--	--	7	7	5	2
	Red-dyed	10	0	0	0	1	0	5	7
	Not-dyed	3	0	0	0	0	0	1	1
Craig	Not-dyed	1	0	1	0	0	0	0	0
DuBois	None	1	--	--	--	1	0	0	0
	Red-dyed	2	0	0	0	0	0	0	2
	Not-dyed	3	0	0	0	0	0	0	3
Garry	None	15	--	--	--	15	13	5	0
	Red-dyed	23	3	2	0	3	0	3	23
	Not-dyed	1	0	0	1	0	0	0	0
Rodney	None	6	--	--	--	6	6	1	0
	Red-dyed	2	4	1	0	0	0	0	1
	Not-dyed	1	0	0	0	0	0	0	0
Mixed, Others, Unknown	None	5	--	--	--	5	3	1	0
	Red-dyed	2	0	0	0	0	0	0	1
	Not-dyed	1	0	0	0	0	0	0	1

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Puerto Rico Oat Rust Nurseries

H. C. Murphy (U.S.D.A.)

The presence on the North American Continent of extremely virulent new races of oat rust, such as 264 of crown rust and 13A of stem rust, emphasizes the importance and value of the oat rust testing facilities now being made available by the Federal Experiment Station, Mayaguez, Puerto Rico, and by Substations of the Puerto Rico Agricultural Experiment Station. The Crops Research and the Territorial Experiment Station Divisions, Agricultural Research Service, U. S. Department of Agriculture, are cooperating in this recently expanded program. Dr. Thomas Theis, Assistant Officer in Charge, Federal Experiment Station, Mayaguez, Puerto Rico, is in charge of the program in Puerto Rico. The Puerto Rico oat and wheat rust testing program in the Crops Research Division is being coordinated at Beltsville, Maryland.

As a result of the unexpected epiphytotics of races 264 and 290 in Florida and nearby areas early in the spring of 1957, and the general presence of these races in trace amounts later in the season throughout the eastern parts of the United States and Canada, a special race 264 nursery was grown at Isabela, Puerto Rico, during the winter of 1957-58. It included the USDA active World Oat Collection of about 3.600 entries and approximately 1,200 experimental selections entered by numerous oat breeders and pathologists in the United States and Canada. Thirty-six entries among the World Oat Collection and several experimental entries were found to possess satisfactory adult resistance to race 264. (A Summary of the results from this nursery, prepared by T. Theis and H. C. Murphy, is available upon request.)

Remnant seed of the entries in the World Oat Collection found to be resistant to race 264 was distributed to numerous breeders and pathologists by D. J. Ward for planting in 1958. Some panicles of the most promising resistant experimental entries were harvested in Puerto Rico and sent to the originating stations in time for planting in the spring of 1958. After increasing these selections, these stations have been generous in making seed available to other workers.

As a result of the very successful 1957-58 race 264 nursery in Puerto Rico, additional assistance and funds were made available to expand the program. A memorandum was sent to oat breeders and pathologists in the United States and Canada informing them of the availability of Puerto Rico facilities for testing experimental entries with virulent races of crown and stem rust of oats during the winter of 1958-59. There was virtually 100-percent response and expression of interest in the program. Workers from 12 experiment stations submitted seed of experimental entries for testing with four individual races at four separate locations. The location, rust race, and approximate number of rows being grown in each oat nursery in Puerto Rico during the winter of 1958-59 are as follows:

Crown Rust

Location	Race	Total Rows
Isabela	264	4800
Lejas	290	1200
Ponce	216	600

Stem Rust

Location	Race	Total Rows
Mayaguez	13A	540

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Physiologic Races of *Puccinia graminis* var. avenae in the United States in 1958 1/

D. M. Stewart, R. U. Cotter, and B. J. Roberts

From over 200 rusted samples from 17 States, 246 isolates of oat stem rust were identified in the Cooperative Rust Laboratory at St. Paul, Minnesota. Race 7 (combined with 12), first in prevalence for the ninth consecutive year, decreased from 59 percent in 1957 to 52 percent in 1958. Subrace 7A comprised 5 percent of the isolates, a decrease of 1 percent from 1957. Race 8 (combined with 10) increased from 21 to 28 percent. Race 2 (combined with 5) was identified in 14 percent of the isolates, an increase of 3 percent.

Subrace 7A, which can attack oat varieties with the so-called Canadian type of resistance at both low and high temperatures, decreased in distribution from 10 States in 1957 to 7 in 1958, as follows: Indiana, Iowa, Kansas, Minnesota, North Dakota, South Dakota, and Texas.

The potentially dangerous race 6 was isolated only three times, once each from Iowa, New York, and Wisconsin.

Race 8 was identified for the first time from California in 1958 on the varieties Ventura and Indio. Both varieties have the Richland type of stem rust resistance and heretofore have been highly resistant throughout California.

The virulent subrace 13A, identified for the first time in 1957, was not found in the survey in 1958.

Table 1. Physiologic races of oat stem rust in the United States in 1957 and 1958.

Race	Percentage of isolates	
	1957	1958
2 and 5	11	14
6	2	1
7 and 12	59	52
7A	6	5
8 and 10	21	28

1/ Preliminary results as of January 15, 1959.

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The Need For Complete C.I. Records

by
F.A. Coffman and D.J. Ward

It has been customary to assign C.I. (Cereal Investigation) numbers to all new selections that are included in the cooperative oat uniform yield, hardiness, rust, smut or international rust nurseries. Pertinent facts relevant to the name, pedigree, source, history, special attributes, etc. of these accessions are recorded on C.I. cards by the Oat Section. Properly completed accession records are necessary for the preparation of reports in which the results of the coordinated nurseries are summarized. Cooperators growing these nurseries are entitled to know what they are growing. Oats assigned C.I. numbers are entered into the World Collection. The data on C.I. cards constitute the basic records of the nature of collection entries. This information is frequently of value not only as an historic record, but also as a clue to probable sources of genes for plant characters of economic importance.

In recent years records submitted with new oats proposed as entries for these nurseries have frequently been very incomplete. In order that all research workers who have oats for inclusion in the coordinated nurseries may be familiar with the kinds of information that are needed to adequately describe a new oat in the C.I. files, a facsimile of the C.I. record card now in use by the Oat Section is presented below:

Assigned consecutively in a series used only for oats.

Usually added later if a hybrid line indicates superiority after being tested for several years.

DEPARTMENT OF AGRICULTURE
Field Crops Research Branch
C. I. Form No. 119

Name: CLINTON C. I. No. 3971

P. I. No. Class: Avena sp.

Should be indicated where strain has been selected from a P.I. entry.

Source: Ames, Iowa

Date obtained: Feb. 10, 1941 Accessioned: 2/12/41 Quantity: 100 gms.

Should include full parental background for hybrid lines.

History: Cross:D69 x Bond. XM3218, Sel. 1335-3, 1940 plot No. 259.
(D69 = Richland x Green Russian) Cross made at Ames by
H. C. Murphy in 1932

May be useful in future for planning experiments and tests.

Description: Yellow grain color, plump kernels, and thin hulls; straw mid-tall and strong; resistant to rusts, smuts, and Victoria blight.

It is hoped that all cooperators will submit the types of information that are desirable for maintaining a useful C.I. accession file.

CI Numbers Assigned During 1958

Number	Designation	Source
7393	Wintok x Clinton-2 x Santa Fe: C.I. 6740 Resel.	U. S. D. A.
7394	Early Clinton x Mo. 0-205	Missouri
7395	Do	"
7396	(Fulton x Clinton) x Mo. 0-205	"
7397	Osage x /(Bonda x Hajira-Joanette) x Santa Fe/	USDA, Idaho
7398	Do	" "
7399	/(Bond-Rainbow x H-J) x Landhafer/ x Andrew-3	Minnesota
7400	Clinton x /(Landhafer x (Mindo x H-J)) x Santa Fe x Cl-4/	Iowa
7401	/H-H:C.I.4025 x (Fulwin x Lee-Victa)-(Bond-Anth)/-Landhafer x Colo	"
7402	/(Bonda x H-J)-Santa Fe/ x (Clinton-Marion: C.I. 5648)	Maine
7403	(Fulgrain 3-Suregrain)X(Coker's 56-21):Coker's 58-7	So. Carolina
7404	Arkwin Sel: Okla. Strain 55G491	Oklahoma
7405	Letoria (Cl-2-SF)-64	No. Carolina
7406	(Fulwin x Wintok) x /(RR x V-R) x Lee/: Ky.54-1844	Kentucky
7407	Wintok x Clinton-Hairy Culberson: Mo.04784	Missouri
7408	Do Mo.04785	"
7409	Do Mo.04787	"
7410	Wintok x Dubois: Mass. 2A-4-56	Massachusetts
7411	(H.Culberson x New York Sel.) x Dubois: Mass.4A-6-56	"
7412	(Wintok x H. Culberson) x (H.Culb.x N.Y.Sel)Mass. 10A-8-56	"
7413	Arlington x(CI 6740:Wintok x Clinton-2-SF):Sel.Md.58-232	U.S.D.A.
7414	Hairy Culberson x N.Y. Sel.: Md.-5191	Massachusetts
7415	Fulwin x Arlington: Md.'57 297	U. S. D. A.
7416	Arlington x C.I. 6740: Md. '58 222	"
7417	Do Md. '58 251	"
7418	Victorgrain: Dr. H.H. Lukes H. victoriae resist.Sel. No. 284-2	"
7419	Do Sel.No.303-9	"
7420	Floriland(Irradiated): Sel. Ab-180	Florida
7421	Suregrain x(Bond-Fulghum x Victorgrain):Coker 57-20	So. Carolina
7422	Letoria x (Cl-2-S.F.):Miss Sel.HVR 167 from C.I. 6921	Mississippi
7423	Abyssinica x Strigosa Tetraploid (Ames 56-76)	Iowa
7424	Curt: Calif. #5160	California
7425	Alamo: Miss. H.V. Resistant 340	Mississippi
7426	Floriland (Irradiated): Sel. AB-189	Florida
7427	(Wintok x Cl-2-S.F.)x/(H-J x BR x S.F.)x Southland/: Md. '58 301	U. S. D. A.
7428	Do	"
7429	Arlington x (C.I. 6740: Wintok x Cl-2-S.F.): Md.'58 223	"
7430	Delair x /(Bonda x H-J x S.F.)/: Ab.'58 2001-10	"
7431	(Woodgrain-Suregrain) x Coker's 56-21: Coker's 58-6	So. Carolina
7432	/Winter Turf x(Clinton-2-Santa Fe)/:C.I.7162 Ark.Sel.1	Arkansas
7433	Do : " Ark.Sel.2	"
7434	Do " Ark.Sel.3	"
7435	Do " Ark.Sel.4	"
7436	G.A. 50: (Erban x Boone)	Canada

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Breeding Super Winter-Hardy Oats

Franklin A. Coffman (USDA)

The breeding of definitely hardy winter oats is not an easy assignment. Compared with this, producing acceptable oats for spring seeding is easy, and the production of moderately hardy winter oats is not at all difficult.

By definitely hardy oats we mean oats with winter resistance superior to that found in such varieties as Fulwin, Mustang, Cimarron, Dubois, etc., and oats equalling or exceeding the "elite" Wintok, Ballard (C.I. 6980), and New York Selection. If winter oats are to become a successful crop in the more northern areas, such a level of hardiness is a "must"; and greater hardiness than that found in the present "elite" oats is a desirable objective.

A long-time breeding program to obtain increased hardiness in winter oats was initiated in 1951. Since that time results have been obtained that indicate some progress in the attainment of this objective.

This long-time program included 7 stages, as follows:

1. Making Hardy x hardy oat crosses.

2. Testing bulk hybrids in a uniform hardy x hardy nursery to determine their levels of hardiness.

3. Head selecting among the most promising bulk populations.

4. Growing the proven "elite" hardy selections from different locations in a uniform regional nursery where hardiness is checked against our most hardy varieties.

5. Growing the most promising selections from the "Elite" Hardy Oat Nursery, in either the Uniform Winter Hardiness or the Uniform Northern Winter Oat Nursery, or both.

6. Increasing, naming, and distributing oats found sufficiently promising to growers.

7. Making additional crosses among the most outstandingly hardy oat selections to produce still more hardy oats.

Beginning in 1951, 11 superior winter oats differing in agronomic type have been used. Each has finally been crossed on all the others in the group.

For several years a uniform hardiness nursery of bulked hardy x hardy oat hybrids has been grown. Results indicate a wide difference in relative hardiness of oats from different parental combinations. Data at hand reveal crosses with Wintok have given bulk hybrids with a superior degree of winter hardiness, whereas crosses with Winter Turf have usually given bulk populations with moderate to inferior hardiness.

Data on the Elite Hardy Selection Nursery which includes selections from these bulks are available for only one year. They indicate:

(1) From different F_1 combinations between identical parents, selections obtained may show marked differences in their levels of hardiness. This might indicate oats that are homozygous for agronomic characters may be heterozygous for some physiologic character such as winter hardiness.

(2) Groups of selections (75 strains) have been obtained from at least one parental combination which in one year have appeared to average 2.3 percent more hardy than Wintok.

(3) Certain individual selections among these 75 have in these limited hardiness tests given evidence of being 10 to 20 percent more hardy than Wintok.

Wintok has in numerous comparisons appeared to be only 3.4 percent more hardy than Fulwin, for example. Consequently, we believe that, as a result of this breeding program, we now have oats that exceed Wintok, Ballard (C.I. 6980), and New York Selection in hardiness, although we can hardly look for a "break-through" of as much as 10 to 20 percent.

It might be stated that several selections resulting from these crosses entered regional uniform nuerseries of stage 5 of this program in 1958-59.

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Barley Yellow Dwarf Virus and Oats in New York

W. F. Rochow (USDA-Cornell)

Some of the first records of the Extension Service in the Department of Plant Pathology at Cornell, recently uncovered by R. S. Dickey, suggest that oats in this region were infected by barley yellow dwarf virus (BYDV) at least as early as 1907. Although the disease may be an old one, work on it in New York has been in progress only since 1956 when the U.S.D.A. and Cornell initiated a joint virus research program that included studies on BYDV. This article is a brief review of the research on BYDV in New York since that time.

It was soon learned that the disease was as widespread in this region as in other areas of the United States, but that the apple grain aphid, which usually has been used as the vector in studies on this virus in other areas, rarely transmitted the virus from infected oats in New York. A detached-half-leaf method was developed to test field plants for BYDV by simultaneous use of the apple grain (AG) aphid and the English grain (EG) aphid. These two aphids have been found by B. F. Coon in Pennsylvania to be the most common grain-infesting aphids in this area.

In 1957 and 1958, a total of 80 oat plants from New York with symptoms of the disease were tested for BYDV by means of AG and EG aphids. Virus was transmitted from 67 of these samples by EG aphids only, from 2 samples by AG aphids only, and from 6 samples by both aphids. These results are in striking contrast to similar studies in other areas. In Washington, for instance, G. W. Bruehl and H. V. Toko

tested a total of 62 samples over a 2-year period with the same 2 aphids. Virus was transmitted from all but 2 of these samples by both AG and EG aphids. Cooperative tests with Dr. Bruehl have shown that the "vector specificity" of the New York isolates of BYDV is based on differences among the virus isolates and not on differences between the aphids used in New York and in Washington.

It is quite possible that other "vector specific" isolates of BYDV exist. Of the 80 New York samples mentioned above, virus was recovered from all but 5 samples. It is possible that these 5 samples were not actually infected with BYDV and that the symptoms resulted from some other cause. It is also possible that the virus would have been recovered from the samples if a different aphid had been used in the tests -- some half-dozen aphids already are known to be vectors of this virus.

Four of the "vector specific" isolates of BYDV that were obtained from New York have been studied in the greenhouse in an attempt to learn more about the nature of this virus variability. All of the isolates retained their original "specificity" after 10 serial transfers carried out over a period of about 18 months. Host ranges of the isolates were variable -- as had also been found by Bruehl and Toko for the Washington virus strains -- and illustrated the danger of generalizing about the host range of BYDV. Tests with single aphids demonstrated unequivocally the persistence of the isolates in their aphid vectors.

Each of the virus isolates has been transmitted by the "other" aphid at least a few times. Under certain conditions, fairly efficient transmission of the isolates regularly transmitted only by AG aphids has been obtained with EG aphids. These AG-isolates probably are no different from those in other areas that have been found to be transmitted efficiently by AG aphids and less efficiently by EG aphids. The isolates regularly transmitted only by EG aphids, however, appear to be more "vector specific." Only a few transmissions of these EG isolates have been obtained in hundreds of tests to date with AG aphids. These occasional transmissions by the "other" aphid are of special interest since they illustrate that the "specificity" observed with the New York isolates of BYDV is relative and not absolute.

Breeding for resistance generally appears to offer the best hope for control of this virus disease. Observations have been made on natural infection of various oat breeding lines under study by Neal F. Jensen. A few lines were relatively free of the disease in field plots where other varieties of oats and barley were heavily infected by BYDV. Seed of 2 of these lines has been distributed to other workers who are interested in possible sources of resistance to the disease in oats. No major emphasis has yet been placed on breeding for resistance, however, because it is felt that much more basic information is needed before any breeding and testing program in this region would have a firm foundation. We need to know more about the strains of the virus that occur in the Northeast, we need to know more about the aphids that are present in our grain fields and what role each is playing in spreading the virus, we need to know about the over-wintering hosts of the virus and how these hosts are related to life cycles of the aphids, and we need to know whether it would be better to attempt to breed for resistance to the virus or for plants on which the important aphid vectors will not feed.

BYDV is of special interest to virologists because it is a representative of a relatively small group of viruses -- those that are persistent in their aphid vectors - whose properties are totally unknown. One goal of the Cornell program is

to develop methods that will enable study of the nature and properties of BYDV. In this connection, a technique has been developed for the transmission of BYDV acquired from liquid preparations by EG aphids feeding through membranes. At least some transmission occurred in all but 1 of 38 experiments, but the amount of transmission varied from test to test. Oat stems were a better source of virus than were leaf blades. Virus was transmitted from liquid preparations of crude juice as well as from partly purified virus preparations. Active virus was recovered from liquid preparations that had been frozen or stored at 3° C for several days, as well as from juice prepared from frozen plant tissue. This membrane feeding technique shows promise for fundamental studies on BYDV.

BYDV References

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Oat Strains of the Barley Stripe Mosaic Virus, and Mutation

H. H. McKinney, Pathologist, U.S.D.A., A.R.S., C.R.D.,
Plant Industry Station, Beltsville, Md.

Oat-infecting isolates have been derived from five field collections of the barley stripe mosaic virus, one each from California, Montana, and Oklahoma, and two from Minnesota. One of the latter is from the type strain of the virus. In each case, the oat-infecting strain appeared only in the occasional oat plant, the remaining inoculated oat plants being free of signs. Transfers of virus from these infected oat plants have, in each case, given cultures that infected all the inoculated oat plants with as much regularity as the non-oat-infecting strains infect barley plants.

These oat-infecting strains differ in virulence with respect to the degree or extent of the chlorotic stripe mosaic they induce in oats and barley, but all go into what may be regarded as an intermediate range of virulence.

Additional oat-infecting strains have been isolated from the above strains, and the virulence of some of these is outside of the intermediate range. One such

strain induces exceedingly mild chlorotic striations in the leaves of oats and barley, but many leaves show no visible signs. Thus far, this strain has blocked reinfection by each of the more virulent challenging strains that has been used in a second inoculation.

A second strain induces a moderate amount of chlorotic striping in oats and barley and an excessive amount of dwarfing and tillering in both hosts. Seedlings frequently are killed by this strain. Although these signs suggest a synergistic reaction induced by a mixed-species culture, attempts to demonstrate the presence of another species of virus in this culture have failed.

A third strain induces white-leaf in barley, and chlorotic patches, stripes and spindle markings in oats. In barley, the chlorosis induced by this strain equals or exceeds that induced by another white-leaf strain that does not infect oats.

From studies with an avirulent strain isolated from Pilot spring wheat, it is reasonably evident that the virulent strains which have been isolated from it represent mutations. It is believed that the oat-infecting strains also represent mutations that arise occasionally from the non-oat-infecting strains.

Transmission of the oat strains from infected experimental plants to the next plant generation has occurred in from 3 to 8 percent of the oat seeds tested.

The test plants used in these studies were Cherokee and "Statesville" (Palestine x Dawn, C.I. 4230) oats, and Atsel barley.

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Genetic Considerations in Winter Oat Breeding

Neal F. Jensen (Cornell University)

Several years of comparative data accumulated by the USDA in cooperative nurseries over the United States indicate that Wintok and Nysel C.I. 5364 are essentially equal in their winterhardiness ratings. These 2 winter oats are, however, strikingly different in their total performance, including hardiness and yield, under different environmental conditions as might be deduced from their origins, Wintok in Oklahoma and C.I. 5364 selected in New York (see Oat Newsletter Vol. 2, pp. 46). Yield (bushels per acre) performances in New York in several recent tests are given in the following table (figures in parentheses are percent survival):

	1956	1957		1958			3-year 5-test Average
	Test A	B	C	D	E	F	
Nysel C.I. 5364	48 (67)	91 (42)	89 (58)	35	93 (84)	65	70.2 bpa (63% survival)
Wintok	24 (21)	83 (37)	46 (49)	23	50 (43)	38	44.0 bpa (37%)

It seems obvious from these experiences that C.I. 5364 contains genes, other than those conditioning winter survival, which are distinctly advantageous under Northeastern conditions (of course, the opposite might be true in other areas).

Recognition of these differences has provided us with a curious and interesting breeding problem: how to transfer the hidden quantitative genes controlling both yield and hardiness (presumably many) from C.I. 5364 to a commercially satisfactory oat. C.I. 5364 is not commercially acceptable because of a combination of these factors: black kernel color, extremely weak tall straw, apparent broad disease (rusts) susceptibility, and late maturity.

Experience with the best selections obtained to date out of crosses where C.I. 5364 was one parent has shown that it is very difficult to make more than a partial recovery of the desirable C.I. 5364 genes. This is not unexpected. Performance data on our present 2 best lines illustrate this point:

	1957		1958			2-year 5-test Average
	Test A	B	C	D	E	
Nysel C.I. 5364	89 (58)	91 (42)	35	93 (84)	65	74.6 bpa (61% survival)
Nysel X Advance	73 (47)	110 (42)	32	58 (41)	46	63.8 bpa (43%)
Nysel x Craig	82 (47)	106 (54)	25	58 (31)	65	67.2 bpa (44%)

Typical of the performance of these and other selections is that they frequently measure up to C.I. 5364 on individual points, e.g., cold resistance, yield under certain conditions, and the like. Typically also, however, when tested extensively they fail to show the ability of C.I. 5364 to perform well under a broad range of conditions. This, obviously, is an extremely valuable characteristic.

In consideration of the above we have broadened our breeding procedures to include the 4 following approaches in the hope that they may lead to greater progress in the breeding of a generally satisfactory variety for use in the Northeast.

1. Backcrossing. The use of C.I. 5364 as the recurrent parent to transfer genes for quantitatively controlled characters is an admitted "corruption" of the backcross method, but it may do the trick. Essentially, selection will be for stiff straw and kernel color with immediate backcrossing of selected segregants to C.I. 5364. Progress will be on the slow side because of the length of time required in each cycle for selecting and testing. From this program a number of isogenic lines, with the genome otherwise of C.I. 5364, may be developed.

2. Recurrent Selection. This approach was suggested by Dr. Henry Munger. Working with cucumbers, Dr. Munger found in several cases that cucumbers of outstanding qualities were obtained as segregants from crosses of lines which were in themselves not of outstanding merit. The lines used as parents were segregants from, in different cases: a) the same cross, b) a series of crosses having common parents, or c) a series of parallel crosses one of which diverged, for example, for an additional outcross and/or backcross. In these crosses Munger found transgressive

segretation for disease reaction, length of fruit, color of fruit, and vigor. The appearance of such great variability in progenies of hybrids between closely related lines is astonishing. Applying this to winter oats gains may be possible through: a) crossing lines selected from the same cross, e.g. (Nysel x Craig); b) crossing lines obtained from 2 hybrids having one common parent, e.g., Nysel x Craig (A) times Nysel x Ballard (B); c) crossing lines obtained from hybrids of more complex parentage, e.g., Nysel ^{2}/x Craig (A) times Nysel x Burnett-Dubois (B): The reason why this approach may be fruitful is that each segregant from a cross obtains certain genes from the Nysel parent but only in the unlikely coincidental case would these be serially the same in different selections. Therefore, further hybrids of derived lines afford the opportunity for a more favorable recombination (more total favorable genes) in one individual. It must be assumed that the magnitude of the upgrading would be of a limited order, i.e., it would be too much to expect that recombination of any 2 (random) derived lines would reproduce the total favorable gene complement of the common ancestral parent (Nysel). Repeated selection and recrossing of derived lines should, however, result in a closer and closer approximation (accumulation) of genes for the desired quantitatively inherited characteristics. In summary, it would seem that this breeding method might be most useful to make a small but necessary advance in a borderline case, as for example (in wheat) where a cross has yielded truly outstanding agronomic types which on examination, as frequently happens, are found to be below accepted quality standards in one or more respects. Based on knowledge of the parents and the range of variability shown by the different lines for the quality factors intercrossing of the better lines may yield lines with the desired quality attributes and the same agronomic characteristics. To further this program several oat selections from hybrids with C.I. 5364 as one parent have been collected from other breeders (Bespalov, Coffman) for intercrossing with our lines.

3. Hybridization. If C.I. 5364 and Wintok are equally hardy over an average of conditions but distinctly different in individual situations, it follows that they may contain genes which when brought together in a new recombination may supplement each other (additive) and result in oats of greater hardiness. This hybrid combination and other seemingly similar ones are being examined. This particular combination (F_1 pollen) is being used as a parent for other crosses.

4. "Universal" varieties. Certain oat varieties possess the characteristic of yielding relatively well under many different environments. Plant breeders recognize the spring oat varieties, Ajax and Mo. 0-205, for example, as belonging to this category. C.I. 5364 also may belong in this group. If so, are there possibilities for winter oat improvement in crosses between C.I. 5364 and other "universal" varieties? Early observations on bulk-planted F4 progenies of C.I. 5364 x Mo. 0-205 in 1958 would indicate that there are. In survival and growth response this progeny rated a ranking of 1 or 2 among 28 progenies grown from different hybrids in 1958. Unfortunately, dark kernel color predominates in this cross.

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III. CONTRIBUTIONS FROM OTHER COUNTRIES

CANADA

Cereal Crops Division, C. E. F.
Ottawa, Canada
by R. A. Derick and F. J. Zillinsky

Increased yields of oats in Canada in recent years reflect the distribution of new improved varieties during the past decade. Ten year average yields in all provinces except one, have shown an increase of from two to nearly eight bushels per acre over the average yields in the previous ten year period.

In 1958, oat yields in general, were above average. Weather conditions were favorable for seeding in most areas but poor harvest weather prevailed in many sections of Eastern Canada. Late maturing varieties in these sections lost popularity and many growers have shown increased interest in earlier varieties for 1959 seeding.

No new varieties were distributed in 1958. The three varieties Fundy, Glen and Shield, released in 1957 were grown to a limited extent chiefly by seed growers in Eastern Canada. Reports on their performance vary but some of the unfavorable reports may have resulted from the varieties being grown in areas to which they are not adapted.

Crop losses from rusts in Eastern Canada were confined largely to local areas, crown rust being the most prevalent. Races of crown rust capable of parasitizing derivatives of Victoria were quite common in 1958 while those attacking Landhafer derivatives were found only occasionally and late in the season. There was a natural build up of race 13A in the eastern section of Lanark county of Ontario. This race spread to other areas of the province where it was found in trace to light amounts by late August. Very little damage was caused however because of its late appearance. It does however present a source of inoculum for barberry bushes occurring in scattered areas.

Red leaf of oats was again general in eastern Ontario in 1958. An estimated 10 to 15 percent of the oat plants showed signs of infection in most fields in the Ottawa area. A co-operative project with John T. Slykhuis of the Plant Pathology section was set up to study this disease. A severe isolate of the virus obtained from timothy was used in an experiment in which the aphid Rhopalasiphum padi was a vector to infect Clintland and Garry oats and Montcalm and York barley in field plots. Yields of both varieties were reduced by about 75 percent when inoculated at the 1 to 2 leaf stage, 50 percent at the 4 to 5 leaf stage, and 25 percent at the shot blade stage. Similar results were obtained with Montcalm barley, but the variety York was affected only slightly by the isolate of the virus used. No reduction in yield resulted from the feeding of non-viruliferous aphids during these experiments.

Vern. Clark is continuing studies on the Septoria disease of oats. The program deals mainly with epidemiology of the disease and the life history of the fungus. The search for greater resistance among hybrid strains and introduced varieties is also continuing.

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Canada Department of Agriculture Research Laboratory, Winnipeg

B. Peturson, G. J. Green, J. N. Welsh

Rust was not prevalent on oats in Canada in 1958. In spite of this fact the artificially induced epidemic at Winnipeg, which included a mixture of 9 stem rust races and 12 crown rust races, was excellent. The World Oat Collection was grown under such rust conditions and a number of varieties were resistant to either stem rust or crown rust. One of the better sources of stem rust resistance that emerged from this test was C.I. 4023 (Hajira-Joanette). It was not only resistant in the field, but when tested in the greenhouse it was found to be resistant to 8A and 13A as well as to all other races and sub-races. Another variety, a selection from R.L. 524 (Hajira-Banner) showed similar resistance. At high temperatures, however, C.I. 4023 produced a 3+ infection type with chlorosis and the R.L. 524 Selection a (4) type pustule to race 7A. At ordinary greenhouse temperatures both of these varieties give a much higher type of resistance to 13A than does Canuck or Justrain. Hajira has been a remarkable source of stem rust resistance as it has contained genotypes that offer resistance to all races so far identified.

The most important feature of the 1958 stem rust race situation was the presence for the second consecutive year of races 8A and 13A in Eastern Canada and the appearance for the first time of race 6A, which is similar to race 13A but more dangerous. In 1957 races 8A and 13A were found only in a naturally infected rust nursery at Ste. Anne de la Pocatiere in Quebec. This year 12 isolates of 6A and 17 isolates of race 13A were obtained from different varieties at six locations in eastern Ontario and Quebec. The prompt reappearance at several locations of races 8A and 13A and the presence of race 6A makes the fate of our commercial varieties uncertain. A great many factors will influence the increase and spread of these threatening races. It is to be hoped that they do not soon spread into the rust area of the great plains region.

There was no significant change in the relative prevalence of the various crown rust races isolated in Canada in 1958. Races pathogenic to Victoria (213, 216, 264, 274, 275, 276, and 279) comprised 30% of all isolates. The two Landhafer races (264 and 293) which were isolated comprised 6% of all isolates and occurred in both Eastern and Western Canada. These two groups of races were slightly less prevalent than in 1957. Five isolates of races 275 and 280 were found. These two races are of special interest because they are pathogenic to Ceirch du Bach, one of the few sources of resistance to the Landhafer races.

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MacDonald College, Quebec Province

H. R. Klinck, Agronomy Department

Work with oats at Macdonald College centres mainly around the development of new, more productive varieties. The program is designed to develop varieties possessing resistance to all the important forms of stem and crown rust occurring in eastern Canada. Considerable emphasis is also placed on selecting for resistance to Septoria avenae, although really resistant material is difficult to obtain. To some extent material resistant to the smuts is selected.

With the increased use of fertilizers and improved management practices on many farms the problem of lodging becomes more and more acute. Hence, an important phase of the program involves the development of varieties with greater resistance to lodging.

Other objectives in the breeding program include the selection of varieties with good quality grain (low per cent hull), suitable straw length and suitable maturity for conditions in eastern Canada.

Close cooperation in the breeding and testing work is maintained with the Canada Department of Agriculture Experimental Farms, and particularly with the Farm at Ste. Anne de la Pocatiere, Quebec. All material reaching the preliminary testing stage is now tested at both Macdonald College and Ste. Anne de la Pocatiere, providing selection of more widely adapted strains. At later stages this material is tested at 5 or 6 locations for further screening, and the best strains eventually are entered in the Eastern Cooperative Tests.

The variety, Glen, developed at Macdonald College and released in 1957, continued to give very high yields in the 1958 Eastern Cooperative Tests. Basic seed stocks of this variety as well as of Shefford, Roxton, Cartier and Mabel are maintained by Macdonald College.

From the standpoint of research work, some experiments currently are being conducted to determine the influence of fertilizer applications on the yield and quality of oats on various soil types. Only a brief discussion of some of the more significant results from a few locations can be presented here, and these are summarized in Table I.

The figures in the Table reveal the marked differences that occurred in straw and grain yields from one treatment to another and from one soil to another. The marked increase in yields on all soils by the application of K_2O is particularly notable. The most significant increases in yields as a result of fertilizer application were obtained on Ste. Barbe silty loam where the initial fertility (particularly P_2O_5) was very low. On other soils with higher basic fertility significant increases in grain yields over the control were seldom obtained.

Of particular interest are the quality (per cent hull) data. Regardless of soil type the highest quality oats were obtained from plots receiving the complete fertilizer. The percent hull was relatively high in all plots on the low fertility Ste. Barbe soil, and fertilizer applications were no more effective in improving quality here than on the more fertile clay and loam soils. The best quality grain was obtained from the Sherbrooke sandy loam soil, and the application of fertilizers improved quality very little. In general per cent hull tended to be reduced by the application of P_2O_5 and K_2O, but this was not consistently correlated with the amounts of P_2O_5 applied. These data indicate the necessity of further basic studies concerning the influence of fertility elements on oat quality.

Further study is being given to the influence of various fertilizers on the individual componenets of yield.

Table 1. Data from Fertilizer Experiments with Garry Oats Conducted by Macdonald College in 1958

Fertilizer Treatment	Straw Yield - lbs. per Acre			
	St. Laurent Clay	Greensboro Loam	Ste. Barbe Silty Loam	Sherbrooke Sandy Loam
Control	4115	2387	1635	2096
N-20 *	4763	2793	1388	3265
P_2O_5-50	4071	2189	2431	2568
P_2O_5-100	4000	1997	2914	2151
N-20 + P_2O_5-50	4225	3105	3226	2749
N-20 + P_2O_5-100	4516	2628	3907	3243
N-20 + P_2O_5-100 + K_2O-50	4757	4258	4587	4445
L.S.D.	-	-	-	-

Fertilizer Treatment	Grain Yield - Bu. per Acre			
	St. Laurent Clay	Greensboro Loam	Ste. Barbe Silty Loam	Sherbrooke Sandy Loam
Control	83.0	38.0	19.7	45.4
N-20 *	86.6	31.5	24.5	62.2
P_2O_5-50	91.0	40.8	48.6	62.3
P_2O_5-100	85.1	41.6	54.3	56.9
N-20 + P_2O_5-50	88.8	41.7	57.0	61.2
N-20 + P_2O_5-100	94.6	41.0	63.8	71.4
N-20 + P_2O_5-100 + K_2O-50	109.3	82.1	81.0	87.5
L.S.D.	10.9	5.2	18.0	18.8

Fertilizer Treatment	Per cent Hull			
	St. Laurent Clay	Greensboro Loam	Ste. Barbe Silty Loam	Sherbrooke Sandy Loam
Control	27.8	29.5	30.6	26.3
N-20 *	27.0	29.3	31.1	26.5
P_2O_5-50	26.4	27.6	30.5	25.8
P_2O_5-100	27.6	27.6	30.6	25.8
N-20 + P_2O_5-50	26.1	27.9	28.6	25.9
N-20 + P_2O_5-100	26.4	27.4	29.2	26.1
N-20 + P_2O_5-100 + K_2O-50	25.2	26.7	28.1	25.5

*Numbers following the fertilizer elements indicate rate of application in pounds per acre.

Charlottetown, P.E.I.,

by J. D. E. Sterling

An attempt to produce a field-type infestation of Septoria avenae (Frank) was made in the greenhouse at Charlottetown during the winter of 1957-58. Infected oat stubble from the 1957 crop was placed among seedlings of three oat varieties which showed differential field reaction to the organism. Steam from the heating system was almost continuously released into the greenhouse compartment and approximately one month later, ascospores identified as Septoria avenae were produced on the stubble. Typical leaf lesions then developed. Fruiting bodies in these lesions later produced typical Septoria avenae pycnidiospores and, at heading time, "blackstem" symptoms appeared indicating that the complete cycle of the disease had been completed. "Blackstem" ratings of the varieties were quite similar to those obtained under field conditions.

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JAPAN

Hokkaido Agricultural Experiment Station

by K. Gotoh and K. Kumagai

In Japan, more than 90% of oats are grown in Hokkaido. The first problem in the oats breeding is the combination of lodging resistance and high yield, and disease resistance, especially crown rust resistance, comes next. Further, well furnished varieties with the good quality and earliness are desired.

The yield trials with foreign varieties have been under way. According to the data, Abegwelt S1 and Exeter from Canada, and Engelbrecht harre and Primus harre II from Sweden were the high yielders among the examined varieties.

Further, the response of 30 varieties including North American and European varieties to the delayed sowing has been tested. These varieties were sown 7 times every one month, starting from late April. As the results of delayed sowing, some varieties failed to emerge ears in a given date of sowing. Based on the type of response, whole varieties were classified into four groups. Detailed studies are under way.

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IV. CONTRIBUTIONS FROM THE UNITED STATES: USDA AND STATES

ARIZONA

Oats in Arizona

by A. D. Day (Tucson) 1/

In 1958, Arizona farmers grew 23,000 acres of oats, an 8% decrease below the 25,000 acres grown in 1957. Thirty-nine percent of the 1958 oat crop was harvested for grain and 61% was used for winter pasture, green chopped feed, and hay.

The 1958 production of oat grain in Arizona was 15,840,000 pounds, and the state average yield was 1,760 pounds per acre. The 1957 average yield was 1,920 pounds per acre.

The principal varieties of oats grown in Arizona in 1958 were Palestine, California Red, and Markton for grain production, and Markton for winter pasture, green shopped feed, and hay.

1/ Associate Agronomist, Department of Agronomy, Arizona Agricultural Experiment Station, Tucson, Arizona.

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ARKANSAS

R. L. Thurman and G. E. Templeton* (Fayetteville)

The 1958 crop year was a relatively poor one for oat grain production in Arkansas. Excessive moisture at seeding time reduced stands and hampered seeding operations to the extent that only 239,000 acres were planted for grain which is some 20,000 acres less than the 10 year average. Wet, cool conditions prevailed until about the middle of May followed by about a month of dry weather. The extremely dry conditions were again followed by wet weather which greatly impeded the harvesting operations. The end result of the unfavorable season was exemplified by the average yield of 29 bu/acre as opposed to the 10 year average of 32.8 bu/acre. Although the acreage of oats sown for grain production continues to decrease, the total acreage sown has increased over 100,000 acres over the 10 year average. The additional acreage is being used for hay, silage, grazing, green manure, etc.

The disease situation was dominated by crown rust, Helminthosporium, leaf spot, yellow dwarf, anthracnose, and Helminthosporium blight. Crown rust was quite severe in the southern part of the state where farmers have been trying to replace the red rust proof type varieties with oats of Victoria and Bond parentage. The epidemics

*The authors wish to express their gratitude to Dr. H. R. Rosen for assistance in preparation of this article.

of rust on these varieties confirm the prevalence of Race 213 and 216 in the state. The amount of crown rust on the Arkwin variety in the Northern part of the state was much greater than for previous years. Leaf spot as usual was generally prevalent and yellow dwarf was considered of primary importance in the Northern part of the state, particularly in the nursery here at Fayetteville. Anthracnose, though not always of importance, did show a build up in the state this year. Helminthosporium blight was found on susceptible varieties in the Northern half of the state to a greater extent than previously found in that area.

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CALIFORNIA

An "Evolutionary Breeding" Program with Oats

Coit A. Suneson[1/]

An expanded oat breeding program is getting under way in California. It was inspired by our experiences with composite crosses of barley and Agrotrieum. Its unique components are A. fatua and a new crossing technique using nullisomics. The wild-oat population here is large, widely dispersed, and has been "improving", for local adaptation, for 200 years. Earlier (Agron. Jour. 40: 374-375) it was shown that wild oats carried strains that were resistant to both stem and crown rust. This was even more evident in 1958 under the most widespread and severe rust since 1941. Only three small populations from A. fatua x A. byzantina have been observed, but they are providing some new useful characters. The initial recombination will be predominantly on nullisome or monosomic plants, without emasculation.

The segregating progenies will then be manipulated in a large composite population for the rapid elimination of weak plants, shattering, etc. Natural crossing will be an important continuing force in this program.

1/ Agronomist, Crop Research Division, Agricultural Research Service, U. S. Department of Agriculture. Davis.

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COLORADO

by T. E. Haus (Ft. Collins)

The National Seed Storage Laboratory which is located on the campus of Colorado State University at Fort Collins, was dedicated December 5, 1958. Assistant Secretary Peterson was the featured speaker.

Although the laboratory has not yet been officially accepted by the Federal Government, it is in condition to begin immediate operation. Installation of the walk-in germinators remains to be completed, but six daylight germinators are in operation. The latter will provide sufficient space for the first germination tests.

The Director of the Laboratory, Edwin James, has met with the chairmen of the several Crop Group Committees who are now formulating standards applicable to the storing of seeds of their respective crop groups. These standards will be assembled for distribution in the near future, after which time the laboratory will be in a position to accept seed for storage.

A new Agronomy Farm was acquired during the year. This new experimental area includes approximately 200 acres five miles south and east of Fort Collins. Approximately 130 acres of the area have been bench levelled and plans are now being drawn for an underground irrigation system for the experimental area.

A new plant science building and greenhouses are in an advanced stage of construction and will be ready for occupancy by late this fall.

Mr. Floyd Frazier, a graduate of Oklahoma State University, joined the station staff this year. He is in charge of the cereal work at the U. S. Central Great Plains Field Station at Akron, Colorado.

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FLORIDA

by W. H. Chapman, H. H. Luke, Paul Pfahler (Quincy, Gainesville)

Season 1957-1958

Favorable moisture conditions allowed early planting of forage and clipping plots. Although temperatures were much colder than average, all entries had become hardened and no cold damage resulted. This was true of the most tender entries such as Saia and lines of Avenae strigosa. Moisture was adequate and forage and grain yields were excellent. For the first season since 1942, diseases were of minor importance.

Nursery Testing for Crown Rust Resistance

The active world collection consisting of 3,318 entries, International Rust Nursery, and experimental lines from several states were inoculated in nursery plantings with crown rust races 203, 216, 264, and 290. Approximately 10 hexaploid entries were resistant to both races 264 and 290, which attack the Landhafer variety. Also several experimental entries involving P. I. 174544 and D. L. M. 3 (C. I. 7172) were resistant in these tests. In addition several entries of A. strigosa were resistant. The Red Rustproof entries of the active World Collection were "late rusters" when inoculated with a composite collection of races in the nursery.

Ninety lines from irradiated Floriland were planted in specialized rust nurseries at Isabelo, Puerto Rico, and at Gainesville and Quincy, Florida. The Puerto Rico and Gainesville nurseries were inoculated with race 264, and the Quincy nursery with 203, 216, 264, and 290. Approximately 21 of the irradiated lines were resistant at Puerto Rico and Gainesville, but none showed resistance at Quincy. Rust collections from irradiated lines of Floriland grown at Quincy proved to be race 290. Resistance to crown rust races 264 and 290 was found in irradiated material under

widely different field conditions.

Combined Resistance to Certain Landhafer Races of Crown Rust

Until 1953, Landhafer and Santa Fe varieties were highly resistant to all known North American races of crown rust. Therefore, many of the rust resistant varieties of oats carry the Santa Fe or Landhafer types of resistance. In 1957 an epiphytotic of races 264 and 290 that attack these two varieties occurred in Florida. Apparently these races have become well established in the United States and as a result, a search for resistance to these races was initiated in 1957. The objective of this investigation was to develop oat varieties resistant to the prevalent crown rust races of the Southeastern United States as well as to the potentially dangerous Landhafer attacking races.

During the spring of 1958 a large number of selections and varieties were screened for resistance to the Landhafer races under field conditions in Florida and Puerto Rico. In these tests several selections from the cross D. L. M. 3, P. I. 197278 (C. I. 7172) x (H-J x Bond-Rainbow x Santa Fe, Minn. 0-200-10) x Southland) were highly resistant in Florida where races 203, 216, 264, and 290 were present but were susceptible in Puerto Rico where race 264 was the only race present. Since spring temperatures in Florida were abnormally cool, it was thought that this difference might be due to a breakdown of resistance at the higher temperatures in Puerto Rico. On the other hand, certain selections could have escaped infection in the Florida nurseries. Approximately 190 selections from the above mentioned cross were tested under greenhouse conditions for reaction to races 203, 216, 264, and 290. The reaction of certain of the more promising selections are presented in the following table:

Reaction[1] of Certain Selections from C. I. 7172 x (0-200-10 x Southland) to Crown Rust Races 203, 216, 264, and 290 Under Greenhouse Conditions.

1958 Aberdeen Row Number	Crown Rust Race 203	216	264	290
205	1	1	4	-
271	1	1	I	I
272	1	1	I	I
276	1	1	I	I
283	1	1	I	0-1
405	1	1	-	0-1N
406	1	1	-	0-1N
407	1	1	-	0-1N
408	1	1	-	0-1N
409	1	1	-	

(1) Reaction - numerals designate conventional infection types. N represents a type of necrosis. I designates immune reaction or no sign of infection.

These data indicate that several selections are resistant to all races to which they have been tested and carry combined resistance to prevalent crown rust races as well as to the potentially dangerous Landhafer races.

The parental material used in the above cross is susceptible to race 290 under greenhouse conditions. Nevertheless, two distinct resistant reactions to this race were observed. One was an immune reaction i.e., no sign of infection could be detected after inoculations were attempted on three occasions. At present, no satisfactory explanation of this reaction is available. However, the data suggest that this infection type may represent a new type of reaction to both Landhafer races in hexaploid oats. The other "off type" reaction was a 0-1 chlorotic fleck with slight necrosis. This reaction is somewhat similar to that exhibited by Victoria when inoculated with race 290. Therefore, selections exhibiting the necrotic fleck may be the result of an outcross with a selection carrying the Victoria type of crown rust resistance.

Personnel

If February 1958 Dr. A. T. Wallace was promoted from Associate Agronomist with the oat project to Geneticist, Head of Plant Science Unit. Dr. Paul Pfahler has replaced Dr. Wallace on the oat project and is working with basic problems relative to small grain improvement.

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GEORGIA

by U. R. Gore and L. L. Farrar (Experiment)

The acreage of oats harvested for grain in 1958 declined to 276,000 acres. A high yield of 33 bushels for the state average was obtained. A considerable acreage of oats is grown for grazing and not harvested.

Due to the cold winter of 1957-58 crown rust was not a factor in oat production. A low temperature of 5° on February 17, 1958 caused some killing of oat stands at Experiment.

A new greenhouse and growth chamber is being constructed at Experiment to house the oat breeding work. (Gore).

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Yellow-leaf of Oats in Georgia

Yellow-leaf of oats, in Georgia, is due to an aphid transmissable virus. The yellow striping of leaves and yellowing of entire, and central portions, of leaves have been obtained in Victorgrain oats following aphid feeding, the aphids having previously fed on affected Victorgrain plants. Similarly, symptoms have been obtained on Blackhulless barley plants (from Victorgrain) and transferred from these to Voctorgrain. All plants were grown in steam sterilized, unwashed sand except

the original yellow-leaf affected plants brought in from the field. Plants were fertilized with instant Vigaro. When plants were brought in the laboratory and placed in moist chambers, only common contaminating fungi such as species of Alternaria, Botrytis, Penicillium and Aspergillus could be found on roots, crowns and leaves after two weeks. (Farrar).

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by A. R. Brown (Athens)

Oat acreage harvested for grain in 1958 was 276,000 acres with an average yield of 33.0 bushels per acre. This drop of 118,000 acres from 1957 was caused by the fact that several acres were abandoned due to winterkilling. The harvested grain was bright in color and high in test weight, ranging between 32 and 35 pounds per bushel. Approximately 900,000 acres of oats and oat mixtures were planted in the fall of 1957, and over 70 per cent of this acreage was grazed; therefore, oats is still the most popular winter grazing crop despite the buildup of rye acreage during the past three years.

The 1958-59 USDA Central Area Winter Oat Nursery at Athens was planted in dust on October 31, 1958, and did not emerge until December 1, 1958, due to lack of moisture. Low temperatures in December and January causes considerable winterkilling among the less winterhardy selections.

The sowing of the 1958-59 oat crop was delayed over the entire state, and many farmers did not sow their intended acreage. No estimate of the number of acres sown to oats in 1958 can be made at this time.

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S. A. Parham, H. F. Harrison and D. D. Morey (Tifton)

Dry weather since late July, 1958, has reduced grain planting in the Georgia Coastal Plain region. Little grazing has been possible except in small dairy pastures which have been irrigated. Aphids have been noted in many plantings but had not seriously damaged young grain by late December.

The only natural crown rust collected at the Dairy farm by Howard Harrison did not key out to be race 264 or 290. We cannot say that we have found these virulent races up to late December in this area.

New Varieties

Radar 1 and Radar 2 oats were released for the Georgia Coastal Plain area in September, 1958. These varieties were developed chiefly through the efforts of the Georgia Coastal Plain Experiment Station; Coker's Pedigreed Seed Company and the Crops Research Division of the United States Department of Agriculture. Other research workers in Georgia, Florida and South Carolina are credited with portions of the research in Georgia Agricultural Experiment Stations Mimeograph N.S.60, "Radar Oats: Two Dual-Purpose Varieties for South Georgia", by Darrell D. Morey, September, 1958.

Radar oats originated from the cross Victorgrain 48-93 x /(Bond-Rainbow x Hijira-Joanette) x Landhafer/. The cross was made by Sam J. Hadden, Coker's Pedigreed Seed Company, Hartsville, South Carolina. The Bond-Rainbow x Hajira-Joanette x Landhafer parent came from the Minnesota breeding program and contributed mainly crown and stem rust resistance to this cross.

Radar 1 grows slightly shorter than Radar 2. It produces more grain and less forage than Radar 2 in Georgia trials. Radar 1 has smaller kernels which are golden yellow in color. Radar 2 has better test weight and larger kernels. These oats are new and of necessity have been selected and tested at a rapid pace since 1954. Consequently, the Radar varieties are not absolutely pure for plant and seed color and some other agronomic characteristics. Radar oats are medium in height and have strong straw. They are resistant to prevalent races of crown rust (not resistant to the new races 264 and 290) and are resistant to races 6, 7, 7A and 8 of stem rust. They are highly resistant to H. victoriae, M and M, and to all except one race of Southern oat smut. Yields of forage and grain have been good in trials to date. These oat varieties are semi-upright in growth habit, are entirely hardy where recommended and are intended to be used for both grazing and grain production.

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IDAHO

Harland Stevens and Frank C. Petr (Aberdeen)

Unlike the greater part of the region, the oat crop grown on the higher altitude dry land was very much above normal and irrigated yields were also above average. Even though oat stem rust was observed in a few fields in most of the nursery tests in the southern Idaho area, no reduction of yield or quality resulted from this.

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ILLINOIS

by C. M. Brown and R. M. Endo

Oats produced a state average yield of 55 bushels per acre in 1958. This is only 1 bushel short of the record high in 1955 and 13 bushels larger than average. A favorable growing season with little disease damage was partly responsible for the high yields in 1958.

The 4 leading oat varieties and the percentage acreage of each in Illinois for 1958 were as follows: Clintland, 36; Nemaha, 25; Newton, 16; and Clinton, 7. It is interesting to note that Clinton dropped from 35 percent in 1957 to only 7 percent in 1958. The severe attack of leaf rust on this variety in 1957 was mostly responsible for this large decrease. Most of the Clinton acreage was replaced by the stiff-strawed, rust resistant varieties, Clintland and Newton, as they increased from 18 and 3 percent in 1957 to 36 and 16 percent in 1958, respectively. Minhafer, a relatively new rust resistant high yielding variety from Minnesota, which was certified for the first time in 1958, will very likely show a large increase in acreage in 1959.

Oat Disease

Little or no damage by crown or stem rust was observed in any part of Illinois in 1958. This is in contrast to 1957 when crown rust caused extensive damage to the entire Illinois oat crop. Some crown rust came in late and was quite heavy on volunteer oats but the invasion was much too late to damage the main oat crop. Landhafer attacking races of crown rust were prevalent in volunteer fields of Clintland and other varieties possessing the Landhafer source of crown rust resistance. Race 290 appeared to be the most prevalent of the Landhafer attacking races.

Yellow dwarf appeared throughout the state in 1958. Some oat fields showed numerous grey spots ranging in size from a few feet in diameter to as large as 15 or 20 feet. Several of the out state small plot/yield tests were also hit hard by yellow dwarf. In one test several individual plots were damaged so severely that they had to be eliminated from the experiment. However, the total damage of the commercial oat crop was probably not very great.

An unusual leaf spot condition appeared in many oat fields in Central and Northern Illinois during May of 1958. The affected plants showed fairly large, dead, elongated brownish areas on the leaves. The entire leaf blade occasionally showed dead areas, but more frequently only a portion of the leaf blade was affected, usually the mid-portion and tips of the leaves. At the time this condition occurred, it was believed to be caused by the same "non-parasitic leaf spot" that has been described by Hooker at Wisconsin. He found this condition to be brought on by a sudden change in the weather from cool and moist to warm and dry windy weather. The occurrence of similar weather conditions in May in Northern and North-Central Illinois was followed by the widespread appearance of the leaf spot condition in Illinois. However, some additional observations made in the field and limited data from preliminary greenhouse experiments indicate that the condition may have been related in part to manganese deficiency or unavailability. Some additional work to determine the relationship of this leaf spot condition to the availability of manganese is in progress.

An unusually large amount of scab has been observed on oat kernels that were grown in parts of Northern Illinois in 1958. Ten or more samples of oats that swine refused to eat were sent in to the College of Agriculture. Each sample was examined by one or more of the plant pathologists at the University of Illinois and were found to have a high percentage of scabbed kernels. Some of the samples contained as much as 20 percent scab. This is thought to be quite unusual in oats and was apparently associated with the very wet summer in Illinois. All except one of the samples of oats that was found to have considerable scab were of the variety Newton. This may indicate that Newton is more susceptible to the disease or that the variety happened to be at a stage of maturity most conducive to scab development at a critical time.

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Personnel note: Dr. R. M. Endo left the University of Illinois in December of 1958 to accept a position in Plant Pathology of Ornamental Crops at the University of California, Los Angeles, California. It is anticipated that the position formerly held by Doctor Endo will be filled in the near future.

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INDIANA

by J. F. Schafer, F. L. Patterson, R. M. Caldwell, L. E. Compton - U.S.D.A., W. D. Sewell, D. E. Zimmer (Breeding, Pathology, Genetics), R. R. Mulvey, H. F. Hodges, C. F. Douglas (Varietal Testing), and K. E. Beeson (Extension) -- Purdue University (Lafayette)

The 1958 Season

The 1958 season was favorable for oat production in Indiana except for the southern portion where wet weather delayed planting to a date extremely unfavorable for spring oats in this region. In the rest of the state a dry late winter and early spring allowed moderately early planting and a good start of the crop in cool bright weather. Extremely cool, excessively wet weather in June and July was more helpful than harmful except in low areas where flooding occurred.

The Disease Situation

The 1958 season was notable for a lack of serious disease problems. In spite of the wet season rusts were negligible due to lack of inoculum. This was in great contrast to 1957, also a wet season, which was noted for the most severe crown rust epidemic in some years. In spite of no significant rust infection in 1958 it appears that Landhafer attacking races are an established part of the crown rust flora on the basis of the infection of volunteer oats in the fall. Isolations of the "290 group" of these have been made.

1958 Indiana Oat Production
(Data obtained from Purdue Dept. of Agricultural Statistics)

The harvested oat acreage in Indiana again dropped in 1958, to below 1 million acres, the lowest acreage of oats in Indiana since 1886. The state oat acreage had been reasonably constant since 1934 until 1957 and 1958. The high average yield in 1958, however, resulted in production 32% over that of 1957. The estimated state average yield of 51 bushels per acre ties the record high yield of 1955 and is 6 bushels above that of any other year. This lower oat acreage with compensatory higher yield appears to approach a more desirable situation in Indiana agriculture. The acreage, yields, and production for the last 5 years are as follows:

	Acreage Harvested (000)	Acre Yield Bu/A	Production (000) Bu.
1954	1,252	42.5	53,210
1955	1,302	51.0	66,402
1956	1,250	45.0	56,250
1957	1,025	34.0	34,850
1958	902	51.0	46,002

Oat Varieties Grown in Indiana, 1958

In 1958 the Purdue Dept. of Agricultural Statistics continued the annual small grain varietal survey which began in 1957.

	Per Cent of State Oat Acreage	
	1957	1958
Clintland	44.9	49.3
Clinton 59	26.8	20.0
Newton	8.4	15.8
Bentland	4.9	4.8
Missouri 0-205	1.0	0.4
Dubois (winter)	5.2	3.0
Other and Unknown	8.8	6.7

Oat Varieties Certified in Indiana, 1958

The 1958 Indiana acreage of certified seed oats was down from the volume of recent years, possibly due to the absence of a newly released variety recommended for the major oat area of the state. A total of 7,611 acres of oats was inspected for certification by the Indiana Crop Improvement Association.

	Foundation acres	Registered acres	Certified acres
Clintland	48	1,433	1,163
Newton	35	2,038	541
Minhafer	70	301	567
Putnam	10	807	
Bentland	10	178	171
Dubois (winter)	17	141	71
Clinton 59			

Overstate Varietal Performance Tests

Two sister selections of Newton, C.I. 7179 and C.I. 7268, which have also been in the North Central Uniform Nursery, continue to have the best overall yield performance of the experimental and named entries in drill-plot tests at 6 locations in Indiana. In view, however, of their close similarity to Newton, already released, and lack of straw strength equal to that of more recent experimental material, there are no current plans for any early release of these selections.

The Clinton types, Clinton 59, Clintland, and Clintland 60, were also among the top performing varieties as was Putnam. The 3 Clinton varieties had the best straw stiffness record of all entries in these tests. The outstanding performance of Putnam, a very early variety, in all parts of the state would indicate a possible expansion of its area of recommendation from southern Indiana only to the whole state in another year.

Performance of all named varieties is reported in Purdue Bulletin 670.

Oat Varieties Recommended in Indiana for 1959

Purdue Bulletin 670 also includes the Experiment Station recommendations to farmers of oat varieties to be seeded in Indiana in 1959. Clintland, Newton, and Minhafer are recommended for the northern 3/4 of the state. Putnam is recommended for the southern ½ of Indiana and wherever else an early oat is desired. Bentland is recommended wherever a tall oat is desired. Beedee is considered acceptable in the state, and the recommended varieties are also considered acceptable in areas where not recommended. Dubois winter oats continue to be recommended for the southern 1/4 of Indiana.

Release of Clintland 60

The new variety Clintland 60 has been approved for release to Indiana Certified Seed producers for multiplication of registered seed in 1959. This variety is essentially a reproduction of Clintland with the "Hajira" type stem rust resistance added by a backcrossing and stem rust testing procedure. It is briefly described in Purdue Mimeo ID-32 (January, 1959) and has been grown in North Central Uniform Nursery in 1957 and 1958. About 3000 bushels of Foundation seed are being distributed to Indiana growers. Breeder's seed was previously shared with Illinois, Wisconsin, Minnesota, South Dakota, Nebraska, Iowa, and Michigan.

Breeding for Straw Strength

Experimental derivatives of the Welsh oat, Milford P.I. 193101, continue to show excellent standing ability under conditions of high fertility as reported in the 1956 Newsletter. A number of older selections from this breeding were included in preliminary performance tests in 1958. Some of these were in the yield and test weight range of Clintland while being superior in straw stiffness. The best appearing lines are currently being incorporated in further crosses. In the 1958 nursery 56 different hybrids involving the Milford parentage were grown. As soon as a suitable selection is identified, it will be entered in the North Central Uniform Nursery.

Rust Resistance Backcross Breeding

The named and experimental varieties, Putnam, Clintland, Purdue 422A1-59-1-6 (C.I. 6933), and Ottawa 3928-5-8 (C.I. 5962) are all being improved in rust resistance by a backcrossing procedure. The Landhafer crown rust resistance and Hajira and linked Richland-White Tartar (from Minnesota 313) stem rust resistances have been added to Putnam. The Hajira and linked stem rust resistances have been added to Clintland. The Landhafer and Hajira resistances have been added to C.I. 6933, and the Landhafer resistance to C.I. 5962. A cross and 6 backcrosses have been completed in each case, but subsequent purification and increase has not yet been accomplished. These additions will give each of these varieties the Landhafer crown rust resistance and protection against all stem rust except race 13A and in 2 cases 8A.

Forage and Grain Yield Trials with Spring Oats

Seven varieties were compared for forage yield at 3 stages of harvest, preboot, flowering, and dough, and also for grain yield. The varieties were Mo 0-205,

Bentland, Clintland, Putnam, Ottawa 3928-5-8 (C.I. 5962), Purude 422A1-59-1-6 (C.I. 6933), and Newton. Forage yields for silage (calculated at 25% dry matter less 10% loss) were excellent, ranging from 16.6 to 22.7 T/A at the dough stage. The preboot harvest averaged about 34%, and the flowering stage harvest about 53% of that at the dough stage. The gain in dry matter was very rapid for 9 days following flowering in an experiment where stage of harvest was more critically examined for 2 varieties.

Grain yields in the same experiment ranged from 108 to 131 bushels per acre. Grain and forage yields were not closely related. Putnam, lowest in forage yield, was highest in grain yield. Bentland was excellent in forage yield but low in grain yield.

Male Sterile Oats

Male sterile oat plants have been obtained in sister lines of Clintland 60. Under greenhouse conditions anthers fail to complete development on male sterile plants. Experiments are underway to analyze the genetic basis for male sterility and to determine whether it is effective in diverse germ plasm backgrounds.

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IOWA

by K. J. Frey, J. A. Browning, M. D. Simons, K. Sadanage, F. P. Gardner, J. G. Wheat (Ames)

The 1958 growing season was very favorable for oats in Iowa. Disease damage was nearly non-existant (totaling an estimated 4.6% for the state) and the average oat yeild was 47.0 bushels per acre, a record for recent times. The acreage of oats harvested for grain in Iowa has been slipping somewhat in the last few years. In 1958 the acreage was only 4.8 million or about 10 percent below the 10-year average.

There has developed an interest in using oats for silage in Iowa. As a consequence a study on oat silage has been conducted during the past three seasons. In 1958 the agronomic phases of the study were supplemented with a limited animal test. Silage was made from Clintland variety in five stages of growth: (1) boot (both wilted and unwilted), (2) heading, (3) milk, (4) early dough and (5) late dough stage. All silages were chopped approximately 3/4 to 1 inch in length and stored in small experimental silos holding approximately 800 pounds of silage. The silos were opened on November 24 and the silage placed in feeding bunks for free access to dairy cattle. The cattle were allowed to become hungry before admission. In duplicate tests involving different dairy cows the animals strongly preferred and rapidly cleaned up the silages made in the early and late dough stages. Repeated guarding the cattle from the silages and permitting them to be readmitted to the feeder bunks resulted in the cattle attempting to feed out of the bunks containing the silages cut in the two dough stages. Silages cut at the earlier stages, particularly at the boot and heading tended to be slimy and give off a foul odor. This probably resulted from the high moisture content of the oat forage when placed in the silo, thus resulting in a cold silage. Organic acid protein, carotene and other determinations of the silages are under investigation.

It appears that one of the most pressing problems in oat variety development is obtaining resistance to the newer races of crown (290, 264) and stem (8A, 13A) rust. The Iowa Station has available for limited distribution the following materials which may carry resistance to the newer crown and stem rust races:

Cross No.	Cross parentage	Generation	Possibly resistant to:
C 698	Bonham x (Cherokee x C.I. 2923)	F_2	All crown rust races except Saia group
C 699	Bonham^2 x P.I. 174545	F_2	All crown rust races
C 700	Clintland^2 x C.I. 2923	F_2	All crown rust races
C 701	Clintland^2 x P.I. 174545	F_2	All crown rust races
C 702	Clintland^2 x C.I. 4636	F_2	All crown rust races
C 314	Clintland x P.I. 174544	F_6	All crown rust races
C 375	Clinton x P.I. 174544	F_6	All crown rust races except 216 complex
C 497	Clintland x C.I. 2710	F_4	All stem rust races except 8A
C 496	Cherokee x C.I. 2413	F_4	All stem rust races except 8A
C 498	Cherokee x C.I. 3031	F_4	All stem rust races except 8A
C 526	C.I. 2710 x Burnett	F_4	All stem rust races except 8A
C 553	Burnett x C.I. 3030	F_4	All stem rust races except 8A
C 554	Burnett x C.I. 3031	F_4	All stem rust races except 8A

Several years ago P.I. 174544 was crossed with Clinton with the dual objectives of studying inheritance of the field resistance of P.I. 174544 and investigating the feasibility of transferring this resistance into new varieties of oats. Since that time P.I. 174544 has been crossed with a number of other varieties and inheritance of resistance has been studied in numerous segregating populations. The results have

not always been clear-cut or consistent from test to test, but the majority of the evidence indicates that resistance is probably conditioned by one major gene and several minor or modifying genes. Yield trials designed to measure the effect of crown rust showed that F_5 lines could be obtained from P.I. 174544 x Clinton that were as resistant as was P.I. 174544. These resistant lines showed considerable diversity in plant type, maturity, etc., indicating that the genes conditioning resistance from P.I. 174544 were probably not closely linked with genes which affected agronomic characters adversely.

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KANSAS

by E. G. Heyne (Manhattan)

Oat production always has been up and down in Kansas but in 1958 it was the lowest production in the state since 1881. The harvested acreage was only 516,000. Only in 13 of the last 75 years has there been less than one million acres harvested. Part of the greatly reduced acreage was accounted for by wet, cold conditions at seeding time. Most farmers have learned by experience that seeding after April 1 generally gives a very poor oat crop. No serious disease problems or lodging occurred in 1958.

Active breeding in spring oats has been greatly reduced but more emphasis has been placed on winter oats, however, only to the extent of carrying crosses in bulk. The winter of 1957-58 was not severe so the bulks that had been grown for several years survived about 90 percent. Others were winter killed to the extent of 50 per cent or more. Individual selections will not be made until several more severe losses occur. The longest any bulk hybrids have been carried is six years.

Minhafer was recommended for commercial production in Kansas in 1959. This variety has shown the best straw strength in Kansas for the past three years. For example, in 12 comparisons where lodging occurred, Minhafer was rated as 30 percent lodged and Mo. 0-205, 50 percent. Other recommended oat varieties for Kansas are Nemaha, Andrew, Mo. 0-205 and Kanota.

Others cooperating on the oat breeding and testing program in Kansas are C. O. Johnston and Lewis Browder on oat rusts, E. D. Hansing on oat smuts, and James Wilson (Hays) and Robert Ellsworth on breeding and testing.

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KENTUCKY

Verne C. Finkner and Randolph Richards (Lexington)

1958 Season. - 1958 was a better than average season for winter oats in Kentucky. The winter was rather severe but the ground had snow cover during much of the coldest weather. Good differential winter killing was obtained at Lexington where only the hardier varieties survived.

State yield tests. - Thirty-six winter varieties were tested at Lexington and Princeton and 25 of these were also tested at Hopkinsville and Murray. The outstanding named varieties were Forkedeer and Dubois. Our recommended varieties are Forkedeer, Atlantic, Dubois and Bronco. The outstanding experimental varieties were Ky. C.I. 7130, C.I. 7135, C.I. 7297 and C.I. 7298.

Date x Rate x Variety tests. - Forkedeer, Atlantic, Bronco and Dubois were seeded at Lexington at 1, 2 and 4 bu/A on Sept. 25, Oct. 7, Oct. 19 and Nov. 8. The last two seeding dates were completely winterkilled. The average yield of all varieties at the first seeding date was 69 bu/A and at the second seeding date 32 bu/A. The great effect of planting date emphasizes the need for hardier oats.

Breeding work. - The search for additional winterhardiness is being carried on through the use of the bulk hybrid method using hardy x hardy crosses and reselection within the world oat collections and certain other varieties. Neither method appears at this time to be giving us what we really need; a big gain in winterhardiness. More emphasis are now being placed on trying to utilize the best degree of winterhardiness we now have by getting it into acceptable commercial varieties. This is being attempted primarily by the back cross method. The results are not yet far enough along to critically evaluate but do appear promising.

Kentucky Ballard Selections. - Since a considerable number of breeders have been interested in the Kentucky selections called Ballard Sel. 45-34 and Ballard Sel. 45-65, I wish to call their attention to some mistakes which have been made concerning these selections. First the selection number and the C.I. number has not always been correctly listed. The correct C.I. numbers and selection numbers are:

C.I. 6905 = Ballard 45-34

C.I. 6980 = Ballard 45-65

There also has been a mistake concerning the origin of these oats. C.I. 6905 Ballard 45-34 was from a head selection from a local variety of oats called Ballard grown near Lebanon, Kentucky. Hence the name Ballard. However, C.I. 6980 Ballard 45-65 <u>was not</u> from this source but rather was a head selection from C.I. 2499 Fulghum Winter Type.

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MAINE

by Clinton R. Blackmon (Orono)

The average oat yield in Maine for 1958 was 45.0 bushels per acre. Rainfall was high and the soil was wet during the heading and maturing stages. This contributed greatly to the lodging and disease problems. For the first time in several years stem rust was widespread in the northern Maine oat growing district.

Fifty-four high yielding strains from the World Oat Collection have been hybridized with Garry, Clinton 59, Clarion and Bronco oats in an attempt to improve the yield and other agronomic qualities of oats. Some of these hybrids are in the F_3. A concentrated effort is being made to obtain fundamental information on the relative value of and efficiency of methods of early generation selection. Selections of hulless oats are being hybridized to improve the yield and straw strength over present varieties.

A preliminary screening of the World Oat Collection will be completed in 1959. Further evaluation of selections will take two or three more years. Yield and straw strength are major objectives in Maine.

A study is underway to determine the sources of spring infection and the vectors of red leaf disease of oats (barley yellow dwarf).

New selections of interest are: CI 7402, PI 540 and PI 590.

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MASSACHUSETTS

by I. K. Bespalov, Field Seed Research,
Eastern States Farmers' Exchange, Inc., West Springfield, Massachusetts

The small grains program at the Eastern States' Crop Research Center at Feeding Hills is centered around oat improvement. Particular effort is being made in winter oats to obtain new varieties with greater winter-hardiness.

A total of 28 different hybrid combinations of winter oats were grown in 1958 as selections or bulk hybrids. Thirty selected lines were tested in yield trials with three of these included for the first time in the USDA Winter-hardiness Nursery. The data from plantings of this Nursery, an average of 30 stations with 33 entries, indicated that all three lines are superior in winter-hardiness to Wintok, generally considered our most winter-hardy variety. These and three additional promising lines are now included in the 1958-59 Winter-Hardiness Nursery. One line, CI 7301, (Hairy Culberson x New York Selection) x Early Wintok, will be tested in the 1959 Uniform Nursery for further studies of the important agronomic characteristics.

Weather conditions at Feeding Hills in 1958 were favorable for both spring and winter oats. The yields and quality of the grain were high. The highest yielding

winter oat varieties were CI 7224 and Dubois, giving 75.3 and 67.5 bushels per acre, respectively. The highest yielding spring oat varieties were CI 7402, CI 7213, and Garry, which yielded 86.9, 78.1, and 76.9 bushels per acre, respectively.

Although the average yield obtained with winter oats was lower than spring oats, quality (test weight and percent of groat) was much higher. The differences were much larger than observed in comparisons made in the previous years. LeConte, Lee and Ballard measured 41.5, 41.0, and 39.0 pounds per bushel. The highest in percent of groat were Wintok, Ballard, Leconte, and Lee, with 81.0, 78.0, 78.0, and 77.8 percent, respectively.

The test weight and percent of groat of spring oats were considerably lower. Burnett and Beedee were highest with test weights of 34.5 and 34.0 pounds, respectively. Burnett and the Canadian varieties, Shield and Ga. 52, were highest in percent of groats, these giving readings of 75.0% each.

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MICHIGAN

by J. E. Grafius and R. L. Kiesling

The 1958 Season

The 1958 small grain growing season in Michigan was characterized by low temperature and low rainfall. Ample subsoil moisture and low temperatures prevented drought symptoms. In addition there was an almost complete absence of foliar disease and, in general, very little lodging. As a result the oat yields were exceptionally high.

An attempt was made for first time in Michigan, to devise a procedure for varietal recommendation based on the knowledge of expected genotype-environment interaction rather than short time, average yield performance. Good agreement between observed and expected performance was obtained. This was published as a Farm Crops, Botany and Plant Pathology leaflet and distributed to County Agents, farmers, and seedsmen.

An unusual disease of oats, powdery mildew, was observed on both winter and spring oats at East Lansing. This outbreak, caused little damage and was associated with the extremely cold season.

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MINNESOTA

by W. M. Myers, F. Koo, M. B. Moore, and B. J. Roberts (St. Paul)

Breeding

I. The selection /Landhafer x (Mindo x Hijira-Joanette)/ x Clinton II-50-12 (C.I. 6935) has continuously proved to be excellent in yield in Minnesota. It has exceeded all varieties including Garry and Rodney in yield trials at 8 locations throughout the state in 1956-58, but has only significantly outyielded Andrew, Ajax, Branch, Sauk, Minland, Minhafer and Burnett. This selection is intermediate in maturity between the early varieties, Andrew and Minhafer, and midseason varieties, Branch and Sauk. Its straw strength, on an average, is about equal to that of Sauk but better than Ajax and Branch. The seed is about the size of that of Andrew. It has low bushel weight and somewhat high hull percentage. This selection has also been tested in the North Central States Uniform Yield Nurseries in 1954-58. II-50-12 is resistant to the prevalent races of crown rust in the region but susceptible to the races 264, 276, and the 290's which have been prevalent in the southeastern states and have occurred in small amount in the north central states.

At the Minnesota Experiment Station conference on varietal recommendation last fall, approval was given for naming and release of this variety in 1959.

II. In a group of selections tested in the rod rows, several with a combination of ABCD genes for stem rust resitance and Landhafer gene for crown rust resistance have shown superiority in yield and grain qualities. They all have been later in maturity than Minhafer. Other selections, such as II-52-3 (C.I. 7399), II-50-119 (C.I. 7199), and II-50-136 (C.I. 7271) concurrently tested in the N. C. States Yield Nurseries have continuously performed well in yield in the state.

III. In the wake of the pressing importance of breeding for rust resistance to new races, crosses and backcrosses have been made between high yielding varieties and varieties of different ploidy levels that possess either resistance to stem rust race 13A or seedling and adult plant resistance to crown rust races 264, 276, and 290's. F_3 lines of certain crosses and the F_1's of several 3rd backcrosses will be grown next summer and their reaction to the common races of both rusts in the field and to certain specific races in the greenhouse will be studied.

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MISSISSIPPI

by Donald H. Bowman and Paul G. Rothman
(Delta Branch Experiment Station, Stoneville)

For the second straight year the oat crop in the Mississippi Delta was far below normal. Excessive rainfall in the fall of 1957 and early winter of 1958 either prevented seeding or resulted in poor stands. The incidence of crown rust was lower than in 1957 and did not cause extensive damage. Acreage for the 1959 oat crop is somewhat below normal with much of the acreage seeded in late November and early

December. Growth has been retarded by below normal temperatures.

Intensive screening of Landhafer and Santa Fe derivatives in the nursery indicated that the Landhafer races of crown rust have not appeared in this area. At the present time an effort is being made to incorporate into as many promising new selections as possible, resistance to these particular races of crown rust.

The fourth generation following x-raying was under observation this year in the Delair irradiation program. The progeny of a single rust resistant selection found in 1957 was completely free of crown rust in the presence of an artificially induced epiphytotic of crown rust races 202, and 216. The plants were free from stem rust throughout most of the growing season while a moderately susceptible to a moderately resistant response was recorded late in the season. Races 2, 7 and 8 of stem rust were released in the nursery. Backcrossing of short semi-sterile selections is currently being carried out. Sterility was substantially reduced in the first generation backcross.

The oat breeding work has been given added impetus with the construction of an artificially lighted and temperature controlled growth chamber. Hybrid populations can be grown quickly and throughout the entire year. Variations in maturity, from 2 to 4 months, exists between lines, depending on the particular parentages.

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MISSOURI

by J. M. Poehlman, Dale Sechler, Charles Hayward and Marvin D. Whitehead (Columbia), Carl Hayward (Pierce City), and Arnold Matson (Gideon).

Unfavorable weather at planting time delayed seeding and resulted in the smallest oat acreage in Missouri since 1871 and the smallest harvest since 1934. In spite of the late planting date over most of the state the 1958 oat crop averaged 32 bushels per acre, one bushel more than in 1956 and in 1957 but 9 bushels below the record 1955 average. The nursery at Columbia was heavily infected with red leaf virus or a very similar virus. Symptoms fit those of red leaf except for a confusing abundance of yellow leaves. Colors commonly encountered were yellow, yellow orange, salmon, light brown and light to dark red. Crown rust caused only minor damage to late maturing fields and only trace amounts of stem rust were observed. One field of Mo. 0-205 was found which contained 1 to 2 percent of smut. Purity of the variety and races of smut in the field are being checked. Much of the oats harvested was weather damaged as harvest was delayed by rain in many areas. Test weights tended to be low but were better than in 1957 when crown rust was more abundant.

Oat strain C.I. 6625, Columbia x Marion, was named Macon and seed distributed to growers for production of certified seed in 1959. The superior qualities of Macon are earliness, yield comparable to Mo. 0-205 in Missouri tests, superior seed quality-light grey color and heavy test weight. Macon has better resistance than 0-205 to race 216 of crown rust, the A gene for stem rust, resistance, and is resistant to smut. C.I. 7272, Columbia-Marion x Victoria - Hajira-Banner-Victory-Hajira-Ajax, has been approved for increase in 1959. C.I. 7272 has yielded as well

as Macon and 0-205 in Missouri and has stiffer straw; short, plump, heavy kernels with high groat percentage; moderate crown rust resistance; and the A B C genes for stem resistance.

Mo. 0-205, Andrew, and Minhafer are recommended varieties of spring oats in Missouri in addition to the new Macon variety.

Winter oats are receiving more attention in our breeding program. Bulk hybrids are grown and early selections evaluated at Columbia where winter injury is normally quite severe. Yield tests are conducted at Sikeston in southeast, Missouri and at Pierce City in southwest Missouri. Commercial production of winter oats is limited to these two areas and adjacent Ozark uplands. Some lines which appear to be superior in hardiness to existing varieties have been selected from bulk hybrids sent to us by Mr. Coffman but these lines are mostly inferior agronomically. Winter oats at Columbia in the fall of 1958 were heavily infected with crown rust which has been identified by Dr. Simons as race 216. Currently Dubois, Forkedeer, and Bronco are the recommended varieties of winter oats in the areas where winter oats are grown in Missouri.

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NEBRASKA

by John W. Schmidt and A. F. Dreier (Lincoln)

Oat acreage in Nebraska declined slightly in 1958 after a sharp drop in 1957. However, better than average yields kept the harvested production close to the 10-year average.

On the basis of state-wide tests, Burnett was the top variety with an average yield of 74 bushels per acre, followed by Mo. 0-205 with 72, Andrew with 68, Minhafer with 67, and Nehawka (C. I. 7194) with 66. Over a period of years Mo. 0-205 and Andrew have been outstanding for their wide adaptation and consistent performance. There were more acres of Andrew certified in Nebraska in 1958 than of any other variety.

The Burnett variety will be recommended for production in northeastern and east-central Nebraska in 1959.

A new variety of oats, Nehawka, developed cooperatively by the Nebraska Agricultural Experiment Station and the Crops Research Division, ARS, USDA, was released for production in Nebraska in 1959. This oat, C. I. 7194, has been tested in the Uniform Spring Sown Red Oat Nursery and the North Central States Uniform Nursery as Cherokee Reselection, Nebr. 52753. It was selected from the Cherokee variety in 1950 and has been yield-tested since 1953. It is an oat of the Nemaha-Cherokee type so popular in Nebraska but it has consistently and significantly outyielded these varieties. It is slightly shorter and earlier than these varieties, but similar to them in straw strength and test weight. Nehawka is resistant to race 7 of stem rust but susceptible to race 8 (the reverse of Nemaha) and has some crown rust tolerance. It is lighter blue-green in foliage color and has a more

open panicle than Nemaha. The outer glume color is lighter than that of Nemaha while the hull tip does not break off as readily as it does in Nemaha. The height variation typical of Bond derivatives is, also, present in Nehawka. Five hundred forty-six bushels of foundation seed were available for spring planting in 1959.

Dr. D. P. McGill, already a staff member at the University of Nebraska, is taking over the oat work at Lincoln, replacing John Schmidt who will devote full time to wheat research.

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NEW HAMPSHIRE

by Leroy J. Higgins (Durham)

There is an indication that New Hampshire may grow more oats for grain, since there is a greater demand for straw for bedding purposes. In spite of the increased lumber operations in the immediate past, there is a shortage of sawdust and shavings for bedding on dairy farms.

Oats continue to be the leading small grain crop in the State, since the crop is used extensively as a nurse-companion crop for seeding down, for grazing and for annual hay alone, or in mixtures in the up-to-date pasture-hay system used by the dairy farmers. With the introduction of disease resistant varieties with a good return from oat production it has encouraged farmers to use oats.

The leading varieties available and sold as seed oats are Garry, Rodney, Ajax and Clarion. Garry and Rodney seem to be replacing the other varieties.

In the Station's Cooperative Northeastern Nursery Oat Trials for 1958, the above varieties started off with good stand and with indications of continued good yields. One day a severe hail and wind storm shattered the ripening grain and badly lodged the stand as well as stripping and nearly ruining the corn in the same field. The average yields as a result were 2.5 tons of forage and 48.7 bushels of grain per acre, as compared to the 1957 yields of 4.2 tons and 72.5 bushels respectively.

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NEW JERSEY

by Steve Lund and John L. Gerwig (New Brunswick)

Although the oat acreage in New Jersey decreased 19% from last year, total production was about the same in 1958.

Much of our oats are now being utilized as silage in support of our dairy industry. Trials over the last two years have borne out the economic advantage of this system. Silage yields of several varieties of spring oats grown in various parts of New Jersey are given below:

Pounds of Silage at 70% Moisture Produced by Spring Sown Oats in New Jersey

Variety	1957[1]	1958[2]	Average
Clinton	10,245	15,938	13,092
Clintland	10,558	15,500	13,029
Newton	11,011	15,130	13,072
Beedee	11,358	15,899	13,629
Garry	10,687	15,767	13,227
Ajax	9,483	16,618	13,051
Rodney	11,369	19,558	15,464
Minhafer	---	15,138	---

[1]Six locations in New Jersey.

[2]Two locations in New Jersey.

These results were obtained in a very dry season in 1957 and a high rainfall season in 1958.

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NEW YORK

by N. F. Jensen, G. C. Kent, E. J. Kinbacher, W. F. Rochow,
A. A. Johnson, E. Jones (Ithaca)

Production

Records of the New York Crop Reporting Board show that 615,000 acres of oats were harvested in 1958 with a total production of 31,980,000 bushels. The average acre yield was 52.0 bushels.

Changes in the Oat Project

The Arizona increase this winter of a new oat selection marks both the end and the beginning of an era. Three years ago significant changes in the oat breeding project were made to incorporate field and greenhouse testing to crown and stem rust races. The pick up of information on rust reaction on breeding material in the nurseries has been rapid and our hopes are that the Arizona increase will be the first in a series of variety releases designed to put a more stable foundation under oat production in New York.

For a great many years oat production on New York farms has lacked a status of stability. The reasons for this are many: some of a general nature; others unique to the Northeast. We would characterize our principal problems as: 1) A 1-variety economy. Since the early 1940's acreage cycles from 0 to 80-90% have paralleled the introduction of the varieties Vicland-Clinton-Garry. 2) Reliance on varieties

produced elsewhere. Fortune has been kind to us in that such excellent varieties have been available when needed. Prudence suggests that we may not always be so fortunate. 3) Crown and stem rust. The Northeast plus eastern Canada with its heavily forested areas provides alternate hosts for both crown and stem rusts, thus serves as a breeding area from which new races originate and older ones perpetuate themselves. Coupled with the seasonal air movement of spores north and eastward these conditions act to create frequent epiphytotics of rust in New York. While Cornell has introduced several oat varieties, Craig appears to be the only one with significant rust resistance (crown) and its useful life was restricted by general susceptibility to stem rust (Mohawk, while named and introduced by Cornell, was bred and developed by Iowa-USDA).

The importance of stem and crown rust protection in oat varieties for New York can be deduced from the following rust race picture obtained from numbers of collections made in the State and identified at St. Paul (stem rust) and Ames (crown rust):

		1954	1955	1956	1957	4 yr. %
Stem rust race	2	1	-	1	-	3.6
	6	-	2	2	5	16
	7	17	12	2	6	66
	7A	2	-	-	-	3.6
	8	1	1	-	-	3.6
	12	-	-	-	3	5.4
	13	-	-	-	1	1.8

In 1956 eight races of crown rust were found in 13 collections identified.

This serves to highlight the emphasis currently being given to breeding and testing for rust resistance. The long-time -- and continuing -- selection program for high yield, lodging resistance, smut resistance and other desirable agronomic characters, has not been enough to provide varieties which would give reasonably stable production. The objective of resistance to the two rusts is needed to round out the program.

The tests for rust reaction are under the direction of Dr. G. C. Kent and Mr. G. Gregory of the Plant Pathology Department. Field testing the past 2 crop seasons has been accomplished by planting a row of a susceptible oat down the center of the range alleys at right angles to the rod row plots. The susceptible spreader row is inoculated, alternately by alleys with a race of stem rust and a race of crown rust, thus making it possible to obtain stem rust and crown rust notes by reading both ends of the rod row plots. In this nursery we have been using race 7A of stem rust and race 202 of crown rust. A separate nursery of short rows of the same oats is maintained on a different isolated field and inoculated with race 6 of stem rust. Since resistance to race 6 also means resistance to races, 1,2,3,5,7,12,4,6, 8,10,11, and 13 (B-C gene), and resistance to race 7A also means resistance to races 1,2,3,5,7,7A, and 12 (A gene) it is obvious that the use of these 2 tester races provides much information.

The efficiency of these tests can be illustrated by a nursery of 233 entries grown in 1958. Of 139 selections retained, 85 had resistance to stem rust races 6 and 7A and to crown rust race 202; 51 had resistance to 2 of the 3 races; and 3

were resistant to 1 race only.

Race 216 of crown rust is to be added to the tester races for 1959. At this writing 1200 of approximately 5000 F_2 plants from crosses involving race 264 resistant parentage have been inoculated and examined in the greenhouse. Races not prevalent in the area must naturally be handled with caution.

A tentative time schedule based on this program is about as follows: The present Arizona increase to be the first variety in a series, this to be followed in 1960 by a second and in 1961 by a third variety. The series may run to 4-6 varieties -- and this is important -- of different breeding. The program is designed to break away from the one-variety rut and to give farmers greater protection against rust. It should also do another important thing in the minds of farmers -- give them a choice of variety. Many farmers are disappointed with only 1 or 2 recommended varieties in the State.

"Variance Component Analysis for a Series of Oat Yield Trials in New York"

This is the title of a M.S. thesis by Mr. S. B. White, Jr. who completed his degree requirements in 1958. Dr. C. C. Lowe and Dr. D. S. Robson were members of his Special Graduate Committee. The raw material for the study came from the oat project. The following excerpt is from Mr. White's summary:

"Yield data from 97 oat variety trials conducted during 1947-56 were summarized for the purpose of estimating some variance components affecting oat yield. Twenty-nine of New York's 50 counties were represented at least once by these data.

"The components of variance which were considered to be of interest together with their average estimates are given below:

Variety	=	43.11
Location	=	109.76
Year	=	199.77
Replication	=	38.04
Variety x Location	=	1.69
Variety x Year	=	23.36
Location x Year	=	286.55
Variety x Location x Year	=	25.74
Error Component	=	63.30"

The extremely small component of variance for the interaction Variety x Location is interesting. Through the use of these variance components Mr. White also constructed tables by which one can find the most efficient combination of years, locations and replications.

Varieties

Average yields from 12 regional (State) nurseries show Garry continuing in the top spot. Yields of a few varieties were: Garry 66.0, 618a1-1-2-12 58.4, Craig 53.6, Burnett 52.5, Clintland 60 49.3, and Mohawk 48.4.

Increase of New Oat Selection

A ten acre winter increase in Arizona of Cornell Sel. 618a1-1-2-12 is now underway. This selection is from the cross of Goldwin x C.I. 4192 (Victoria-Rainbow). Sel. 618a1-1-12 is a yellow oat, early midseason, medium tall, resistant to smut and to stem rust races 1,2,3,5,7,7A and 12. Its straw strength is good and it was chosen over higher yielding sister selections on this basis. An important reason for increase of this oat is its higher resistance (than Garry) to black stem disease.

How to Win Seeds and Influence Oat Crossing*

A few years ago percentage of seed set (no. seeds/florets pollinated x 100) for a full season's crossing operations averaged 14%. With care and diligent effort this was raised to a high of 22%. The comparable figure for wheat in production run operation was slightly above 40%. Two years ago a slight change in technique resulted in the production of 81 seed from274 pollinations, or very close to 30%, over a 4-day period. Refinement of this technique in the 1957-58 crossing season (greenhouse) resulted in a production of 507 hybrid seeds from 1316 flowers worked, or an average for the 23-day period of 38.5%. Consistency of this technique is illustrated by the following series of "seed set/flowers worked" figures for consecutive days: 10/29, 1/26, 47/79, 0/9, 33/123, 9/100, 32/41, 10/38, 22/29, 85/121, 17/41, 51/136, 8/27, 48/99, 11/90, 65/141, 4/35, 29/50, 25/102, 4/43, 2/59. A great many things affect seed set and the reasons for low seed sets on certain days are known, however, recognizing this, it is believed that a seed set of approximately 35% can be reproduced at will for a season's run.

The change in technique developed from a simple observation of a difference between wheat and oats. Pollinations of wheat are made early in the morning for it is a characteristic of wheat to "flower" or shed its pollen so in response to light and heat. Because of this our crossing programs for all the small grains were largely forenoon operations. If one will observe oats, however, it will quickly be noted that the pattern of flowering is much later, in fact, several hours later. The increase in seed set followed a change to afternoon pollinations. Depending on the type of day (sunny-earlier, dull-later), pollination now begins no earlier than 11 a.m. and usually after noon. Emasculations may be made at any time but best seed set results have come from pollination after 2 days.

These observations are based on mid-winter greenhouse hybridizing. While we do very little field crossing the relationship appears to hold equally well, with the exception that natural flowering usually occurs earlier in the day outside.

Nysel Winter Oats

Since C.I. 5364 has frequently been used as a hardy parent in hybrids it has been suggested that, for convenience sake, it be given a name. Mr. F. A. Coffman has suggested the name Nysel and if no objection is found this informal notice can constitute the christening ceremony. It should be understood that no commercial production is involved.

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*With apologies to Dale Carnegie.

By way of description (See Vol. 2, 1951) Nysel is the progeny of 1 of 3 plants which survived the winter of 1944-45 at Ithaca. They were found at heading time among weeds in the area where the USDA Winter Oat Hardiness nursery had been grown. Prior to the discover of these 3 plants it had been assumed that winter kill had been 100%. Stakes had heaved and now locations had been obliterated so it was not possible to even hazard a guess as to identification. The appearance and performance of Nysel is different from the type of the entries in this nursery and we assume that it is probably a hardy segregant from a line of oats not yet genetically stabilized.

Nysel is grayish black, very hardy and high yielding, tall, very late, extremely weak strawed, and susceptible to many prevalent races of rust.

Winter Oat Hybrid Progenies

The winter of 1958-1959 to date has been the most favorable for several years past in creating selective pressure for the elimination of non-hardy types. There have been 3 prolonged periods of low and fluctuating temperatures in the absence of protective snow cover. Assuming high, but not complete, per cent kill bulk seed of at least some of the following crosses from the 1959 crop will be offered to interested breeders for line selections in their area. First call for seed will be reserved for cooperating members of NE-23.

Cornell Series	5603	F3	Nysel x Ballard C.I. 6980
"	5605	F3	Nysel x Dubois
"	5531	F3	Garry 5-Craig x C.I. 6905
"	5407	F5	Goldwin-Clinton x Nysel
"	5259	F6	Mohawk x Nysel
"	5413	F5	Garry x Nysel
"	5239	F6	C.I. 5961 x Nysel
"	5282	F6	(Goldwin x Va.-Rainbow) x Nysel
"	5417	F5	Rodney x Nysel
"	5428	F5	Alamo x Nysel
"	5434	F5	(XB119-1 x Rosen's 674) x Nysel
"	5438	F5	Craig sister-Ajax x Nysel
"	5439	F5	Nysel x Mo. 0-205
"	5525	F4	C.I. 6901 x C.I. 6666
"	5526	F4	C.I. 6901 x Nysel
"	5529	F4	C.I. 6666 x Nysel
"	5530	F4	C.I. 6905 x Nysel
"	5601	F4	Nysel x C.I. 6982
"	5602	F4	C.I. 6980 x Dubois
"	5604	F4	C.I. 6980 x C.I. 6666-Nysel
"	5606	F4	Dubois x C.I. 6982
"	5607	F4	Dubois x C.I. 6666-Nysel

The amount of selection done by the plant breeder in these hybrid bulk progenies varies from lot to lot.

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NORTH CAROLINA

by G. K. Middleton, T. T. Hebert and W. H. Davis

Production

North Carolina has had two bad oat years. In 1956-57 "yellowing", "red leaf", and other diseases reduced yields considerably while in 1957-58 the crop suffered from cold injury more than in any recent year.

Total acreage planted in the fall of 1956 was 743,000 of which 448,000 was harvested for grain, the remainder being used for grazing, hay or cover crop - with some being abandoned due to disease. The average yield was only 30.5 Bu./A. A reduced acreage of 580,000 was seeded in the fall of 1957, of which 354,000 was harvested. The resulting grain yield was 31.0 Bu./A. Average yield for the three years 1954, 1955 and 1956 was 36.3

Varieties with resistance to the above mentioned diseases, as well as to crown rust and mosaic, and with greater cold resistance than the more popular varieties now widely used, are needed to stabilize production.

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OHIO

by Dale A. Ray (Columbus)

Oat Breeding and Testing

1958 Season and Production in Ohio

The small acreage seeded to winter oats, predominately Dubois, suffered heavy winter-killing in Ohio. The additional hazard of wet weather in June and July delayed harvest in many areas until severe lodging and high moisture in the grain resulted in considerable abandonment of winter oat fields or poor yields of low quality grain.

Spring oats were planted ahead of the usual schedule. The 1,090,000 acres seeded in 1958 produced a new record yield for Ohio of 52 bushels per acre and amounted to an increase of 34 percent above the production in 1957. These records were set in spite of yield reductions in central Ohio due to excessive rainfall from June to August and considerable delay in harvest.

Crown rust infection was not observed until late in the season and then did not influence the performance of susceptible varieties as in 1957. Collections indicated a higher proportion of crown rust races (or race) attacking oat varieties with Landhafer parentage than in previous years although varieties of Victoria and Bond parentage showed the highest infection. More Septoria avenae and red leaf were observed than in earlier years but stem rust and smut infection was unusually light.

Seed production

As an indication of the relative availability and popularity of oat varieties, the acreages passing certification standards in Ohio for 1958 are as follows:

Spring Oats

Variety	Acres passed	Percent
Clintland	12,416	78.0
Clinton 59	938	5.9
Clarion	878	5.5
Rodney	820	5.2
Ajax	5	.03
Other varieties	864	5.4
Total	15,921	

Winter Oats

Variety	Acres passed
Dubois	6

Varietal recommendations

Clintland, Clinton 59, Clarion, Ajax and Rodney are recommended for pdocution in all areas of Ohio, with the late-maturing varieties, Rodney and Ajax, performing better in the northern half of the state than in the southern counties.

Dubois winter oats is considered acceptable for southern Ohio only.

Variety and selection testing

New studies initiated in 1958 on oats included variety comparisons for silage yield, protein content and response to clipping treatments. Early and advanced generation selections were compared with standard varieties in preliminary rod-row tests at Wooster and Columbus. Drill-sown spring and winter variety tests were harvested with farm combines at five locations in Ohio, and rod-row oat yield and small-plot winterhardiness nurseries were grown at two locations. Several selections of surviving plants from hardy winter oat crosses were made. No new releases are anticipated in the immediate future from the current breeding materials.

Publications

Performance trials of spring oat varieties in Ohio including 1958 results. Ohio Agric. Expmt. Sta., Agron. Dept. Mimeo. Series 146. January, 1959.

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OKLAHOMA

by B. C. Curtis, A. M. Schlehuber, R. M. Oswalt,
H. C. Young and O. D. Smith (Stillwater)

Production and Varieties

In 1958 a total of 716,000 acres of oats were harvested with an estimated production of 21,480,000 bushels. Yield per acre was estimated at 30.0 bushels, 10.5 bushels higher than the 10-year (1947-1956) average.

Practically all the oats presently grown in Oklahoma are winter varieties which, when fall seeded, have shown a definite yield advantage over spring varieties. The transition from the growing of spring varieties to that of winter varieties has occurred during the last 15 years. This change was greatly accelerated after discovering that certain of the winter varieties perform as well or better than spring varieties when early spring planted (January or February). However, spring varieties do perform better than winter varieties from plantings made after March 1.

Breeding and testing of spring oats by the Oklahoma Experiment Station has been discontinued. Spring oat improvement work has been de-emphasized during the past several years; however, it was not until the fall of 1958 that the final decision was made to discontinue this work.

It has been tentatively decided to leave only the best 1 or 2 spring varieties on the recommended list until there appears to be no further farmer interest in spring oats.

All available records indicate that Early Clinton, C.I. 7192, is superior to any presently recommended variety in Oklahoma. In addition to being a good yielder, this strain has 3 outstanding characteristics: high test weight, excellent straw strength and early maturity. It also is resistant to some of the prevalent races of crown rust. C.I. 7192 has not been released; however, approximately 70 bushels of breeders seed will be grown under contract for the production of foundation seed in 1959. The decision regarding its release as a variety will be made following the 1959 harvest.

Oklahoma State-wide Winter Oat Tests - 1958

Yield and test weight data are shown in the table below from tests conducted in 14 counties at 16 locations in western Oklahoma and 6 counties at 7 locations in eastern Oklahoma in 1957-58. These tests represent the major oat growing areas of the state. Each variety is compared with Forkedeer for the same tests in each area.

Average test yields ranged from 43.8 bushels to 93.6 bushels per acre in western Oklahoma, with test weight averages ranging from 29.7 to 36.3 pounds. The range in yield for tests in eastern Oklahoma was from 20.7 bushels to 93.2 bushels with the test weight per bushel ranging from 21.3 to 32.7 pounds.

Arkwin and Mustang were grown only in the southern half of the western area and yielded 15 and 3 percent below Cimarron, respectively, in that area. Mustang

exceeded Cimarron by approximately 5 percent in the eastern area. Arkwin ranged from 2 to 16 percent below the other varieties in yield in both areas, but was equal to or slightly higher in weight per bushel.

C.I. No.	Type and Varieties	No. of Tests	Yield Bu./A	Test Weight	Percent of Forkedeer Yield	Percent of Forkedeer Test Weight
	Western Oklahoma - 14 Counties					
	Fulwin Derivatives					
6571	Bronco	16	67.8	32.1	91	97
4660	Mustang	7	78.0	31.4	104	97
	Winter Fulghum Sel.					
3170	Forkedeer	16	74.2	33.2	100	100
	Hardy Winter Types					
5106	Cimarron	16	79.1	31.5	107	95
3424	Wintok	16	71.4	34.7	96	105
	Miscellaneous Winter Type					
5850	Arkwin	7	70.6	33.3	94	102
	Eastern Oklahoma - 6 Counties					
	Fulwin Derivatives					
6571	Bronco	7	67.8	28.0	101	97
4660	Mustang	7	70.9	27.4	105	95
	Winter Fulghum Sel.					
3170	Forkedeer	7	67.4	28.8	100	100
	Hardy Winter Types					
5106	Cimarron	7	67.2	27.8	100	97
3424	Wintok	7	58.0	29.0	86	101
	Miscellaneous Winter Type					
5850	Arkwin	7	57.6	30.2	86	105

Diseases

Crown rust -- Completion of the crown rust survey of the 1957 crop involving 151 isolates showed the following races present together with the percent of each in the population: 274, 47%; 216, 23%; 201, 15%; 202, 4%; 279, 4%; 213, 2%; and 203, 210, 217, 237, 285 at 1% each. It seems significant that of this number of isolations from all over the state of Oklahoma none of the races capable of attacking Landhafer were found. So far approximately 50 isolations have been made from the 1958 crop

and the race population seems to be following the same trend. No races capable of attacking Landhafer have been found.

A few pustules were found on Landhafer in the field late in the season of 1957, but no viable urediospores were obtained from these pustules. Crown rust was very light in 1958 and appeared late. Very little rust was found on any of the spring sown oats and no rust at all was found on Landhafer.

New disease -- In the Oat Newsletter for 1953 a disease of the oat variety 0-205 was reported that was then attributed to the fungus Olpidium brassicae (Asterocystis radicis). Symptoms of the same type were observed again in the 1958 season. In 1953, the month of April was rather dry and the disease symptoms disappeared during that dry spell and damage to the crop was negligible. In 1958, however, the season continued quite moist and cool into mid-May. The damage to spring sown oats was severe, and again, the roots were found to be thoroughly infected with the hypnospores of Olpidium brassicae. By far the most severely damaged varieties were Appler or Red Rustproof and derivatives containing this germ plasm. More comprehensive studies of this organism and its infection of oats are planned.

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PENNSYLVANIA

by R. P. Pfeifer (University Park)

Studies of growth rates of winter oats were completed. Some semi-hardy oat lines grow much faster at 40°F than the most winter hardy lines we now have. Growth rate at low temperature was not correlated with winter hardiness. This should be a desirable character in winter oats and cannot be obtained other than crossing specific lines with the most hardy lines.

Kline's cold hardiness work in winter oats has been prepared for publication and has now passed the reviewing committee.

It was observed that soil compaction at planting time limited hardiness of oats. Vernalization in the dark promoted elongation of the plants so that the first node came above the ground in warm soil. No adventitious roots were established and the plants died. Wheat and barley do not react in this manner.

C.I. 7236 a winter oat was distributed for regional testing from this station in the fall of 1958.

Numerous spring oat lines are being studied for straw strength and yield. These lines are head row selections from several hybrids involving diverse parentage.

New Addition: Dr. Harold G. Marshall joined our faculty in January and is a member of the Oat Section, A.R.S., U.S.D.A. Dr. Marshall is working with winter oats.

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SOUTH CAROLINA

by R. W. Earhard (Clemson)

The "Processing" of Oat Seed and Seed-borne Diseases

From the 1146 oat seed lots collected during the "drill box" survey at planting time in 1956 we have developed the following data on effect of processing on the pathological status (as it pertains to the amount of seed-borne diseases) of these seed lots.

1. Degree of processing prior to planting:

Processing Category	Seed Lots	
	Number	Percent
I. Field Run	493	43.0%
II. Cleaned, but not treated	137	11.9
III. Treated, but not cleaned	32	2.9
IV. Cleaned and treated	484	42.2
Totals	1146	100.0%

2. Seed processing did not materially affect the percent of the seed which emerged from 3/4 inch of greenhouse soil:

I. Field run seed - 79.7%
IV. Cleaned and treated - 82.8%

3. The amount of seed-borne diseases being carried by these seed as measured by the indexing of ten-day-old seedlings indicated that each step in the processing of oat seeds reduced the amount of these diseases being carried with the seed.

Processing Category	Disease Index
I. Field Run	21.9
II. Cleaned, but not treated	19.3
III. Treated, but not cleaned	11.6
IV. Cleaned and treated	4.9

4. The "quality" of oat seeds was increased by 15% as measured by the percent of healthy seedlings obtained by "complete" processing (Class IV seed).

Processing Category	Percent Healthy Seedlings
I. Field Run	62.1%
II. Cleaned, but not treated	69.7
III. Treated, but not cleaned	59.3
IV. Cleaned and treated	78.5%

In summary: Processing improves the "pathological status" of oat seeds. However, this improvement is measured in increased percentages of healthy seedlings and lowered amounts of diseased seedlings - not by increased numbers of seedlings.

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by S. J. Hadden, J. A. Keaton, and H. F. Harrison (Hartsville)

Season 1957-58

Fall seeding of oats was seriously hampered and delayed by the unusually wet November of 1957, and the following winter was one of the most severe on record. Stands were generally reduced by spotted killing, and the oat crop furnished very little winter grazing. However, diseases were not serious, and a fairly satisfactory grain crop was produced.

Moregrain Oats Released

Moregrain, C.I. 7229 (Coker 56-38), a new variety selected from the cross (Arlington-Delair x Trispernia) x (Bond-Fulghum x Victorgrain) was distributed by the Coker's Pedigreed Seed Company in the fall of 1958 as a combination forage and grain type.

Moregrain is a moderately cold hardy variety of semi-winter growth habit. In comparison with Victorgrain, Moregrain heads about 5 days earlier, and is 3 to 4 inches shorter. The kernels are similar to those of Victorgrain but are slightly shorter and darker red, and have averaged 3 pounds higher in test-weight. Grain and forage yields of Moregrain have compared favorably with those of the older standard varieties.

Moregrain is resistant to Victoria blight and to 2 of the 3 known southern smut races, but is susceptible to 1 race of loose smut and to stem rust. It is resistant to mildew, soil-borne mosaic, and to the common crown rust races (race 216 group), but is susceptible to the newer races 264, 276, etc.

*****

TENNESSEE

by N. I. Hancock (Knoxville)

Early maturity is an important character in winter oats as well as in the other small grains especially for the northern bordering states of the cotton belt. The farmers in this area are following the practice of seeding legumes, lespedezas and clovers, in their winter small grains during the spring months. Obviously, these legumes grow better after grain crop has been removed. But in our breeding nursery the character of early maturity in oats has not been associated very much with winter hardy, stiff strawed, or high yielding types. Low correlations of these characters not exceeding .550 have been obtained the past several years. Apparently the genes for early maturity are not carried on the same chromosome of parental material from

early strains of variable sources in sativa and byzantina species. Four different sources of nearly equal maturity when crossed on LeConte gave highly variable maturities in the F_1 generation. Only three fairly desirable early strains have come from these combinations. Recently all four sources were combined first and crossed with LeConte. There was not as much variability in F_1 generation as in the first procedure. Strains from this combination need further testing for evaluation. One might predict more intelligently the behavior of the character, early maturity, if its genes were known to be located on a particular chromosome or on particular chromosomes in various combinations.

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TEXAS

by I. M. Atkins and M. C. Futrell (College Station)

Oat acreage, yield per acre and total production in Texas in 1958 were among the highest on record. An estimated 2,323,000 acres were seeded from which 1,361,000 acres were harvested. This acreage produced an estimated 43,552,000 bushels or 32.0 bushels per acre. The remaining acreage was used exclusively for winter pasture and other forage uses. Returns to growers who use oats exclusively for winter pasture were the best in 10 years in spite of damage by rust in some parts of South Texas. A survey made of varieties grown shows that 34.2 percent is sown to Mustang, 29.0 percent to New Nortex, 7.5 percent to Victorgrain and 5.1 percent to Alamo. Eleven other varieties make up the remainder of the acreage.

Diseases significantly influenced yields in several areas causing damage to winter pasture as well as to grain production. It was estimated that crown rust caused a 5.2 percent loss and Helminthosporium (largely victoriae) caused a 3.1 percent loss. Total loss from diseases was estimated at 5,138,293 bushels or 10.6 percent of the crop. The race 213-216 complex now predominates and greatly reduces the value of the Victoria derivatives in the State. Traces of the Landhafer attacking races were found in 1958.

The study of progeny from irradiated Alamo oats was continued although, with the change in prevalence of races, this material generally has less practical value. From two 1957 families some 10 lines were found to be resistant to race 216 and to Helminthosporium blight. These may have practical value and they have been crossed with Landhafer to determine whether or not they are related. Many interesting segregates for plant type were observed in this material.

Promising material from a corss of (Fulwin-Lee-Victoria, 3826 x Red Rustproof Backcross C,I. 4062, Texas Sel. 145-44-43) x (Bond-Rainbow-Hajira-Joanette x Landhafer, Minn. II-47-4) has been expanded into an extensive "short oat" breeding program. Some strains from this cross have unusual straw strength, short statue, resistance to several diseases and outstanding grain quality. Yield trials at three levels of fertility are planned for 1959.

Research problemsof graduate students now in progress include a thorough study of forage characteristics of varieties, means of measuring forage yielding ability, value for silage and hay and the influence of grazing or clipping on grain yields. Another study is one of the relationship of size, shape and density of seed on test weight and the yielding potential of these various sizes and shapes of seed. A study of characteristics and pathogenicity of Helminthosporium culture collections of oats from over the State has been started.

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by Harvey L. Chada and James H. Gardenhire (Denton)

The world oat collection has been screened for greenbug resistance in the controlled environment insectary at the Denton Substation of the Texas Agricultural Experiment Station, and 77 varieties were found to have considerable resistance. Previously little greenbug resistance had been observed in oats. These 77 varieties were subsequently subjected to more critical tests for resistance. The most resistant varieties observed are: C.I. 183992 (Yugoslavia), C. I. 186270 (Argentina), C.I. 183990 (Yugoslovia), C.I. 186609 (Brazil), C.I. 2898 (Canada), C.I. 183991 (Yugoslavia), C.I. 190585 (Argentina), C.I. 5945 (Minnesota), C.I. 177788 (Turkey), and C.I. 6443 (Idaho). Five crosses involving several of the above resistant varieties and adapted varieties and strains have been made, and the F_1 generations and being grown in the greenhouse.

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WISCONSIN

Wisconsin State Yields and Variety Performance
by H. L. Shands (Madison)

The unusually favorable season and high yielding varieties are partly responsible for the all-time record high state-wide yield of 58.0 bushels of oats per acre in 1958. Rainfall was lower than usual in many locations in Wisconsin and temperatures were lower than normal in June and July. Oats headed somewhat sooner than average, but ripened a little later than average, giving a comparatively long filling period. There was much less lodging than in most years. Bushel weights were unusually high, indicating good grain quality.

Nearly all currently grown oat varieties did well in 1958. Very probably Beedee, a well adapted variety, will lead acreage in 1959. Sauk and Branch, though good performers, will probably decrease in 1959. In a varietal acreage survey made by the Wisconsin Crop Reporting Service, Sauk was found to be the leading variety for the second year. Beedee increased greatly in acreage, whereas Branch had decreased. The percentage of acreage grown in each variety is listed below.

Variety	Percent of seeded acreage			
	1955	1956	1957	1958
Sauk	5	16	24	20
Beedee	--	1	4	17
Branch	26	21	22	14
Clintland	3	13	11	12
Ajax	11	11	8	8
Rodney	--	4	6	6
Garry	--	--	3	4
Clinton	18	9	7	4
Fayette	--	--	2	5
Nemaha	7	7	3	3
Bonda	16	9	5	3
All other	14	9	5	4
Total	100	100	100	100

Wisconsin certified seed of Garry, Burnett and Minhafer will be available to farmers for the first time for sowing in 1959.

In spite of crown rust infection in 1957, a new yield record of 52.5 bushels per acre was established only to be exceeded in 1958. Crown rust that was severe in the southern part of Wisconsin in 1957, attacked varieties of the "Victoria" origin which includes Branch, Burnett, Garry, Newton, Rodney, Sauk and others. Late in that season, a Landhafer-attacking race (290 and possibly 264) occurred naturally in Wisconsin. Again in 1958, summer-planted (very late) Clintland was severely attacked by naturally-occurring crown rust. This indicates that the Landhafer-attacking race or races are distributed in Wisconsin and may become prevalent enough some year to damage such varieties as Clintland and Minhafer.

Variety Performance

By courtesy of the Seed Certification Service, comparative yields of several oat varieties, grown for certified seed in Wisconsin for several years, were available. Nine varieties were grown for certification in 1958. Not as many paired comparisons will be given as in the past years because there is reasonable doubt as to the accuracy of the reports and also there is some doubt as to the usefulness of the data. The number of growers reporting yields of varieties ranged from 16 to 115. Clintland had the highest yield for 38 reports, being 4.6 bushels higher than Minhafer. Yet, when paired by the same growers, they had almost identical yields. In the paired comparisons, Garry exceeded all other varieties, but with the least advantage over Beedee. For non-paired comparisons, all varieties gained in yield over 1957 except Ajax, which dropped 8.1 bushels. Fayette registered only .3 bushel gain. Beedee seems to be enjoying the popularity at the moment while Sauk will probably start losing acres. Some of the information just reported is given in Table 1 on the next page.

Table 1. Seed growers' reports of yields of oat varieties in Wisconsin, 1957. Reports from Seed Certification Service.

Varieties Paired	Number Comparisons	Yield in Bu. per A.	Varieties Paired	Number Comparisons	Yield in Bu. per A.
Ajax		50.2	Burnett		62.0
Minhafer	11	48.0	Clintland	31	64.7
Ajax		50.7	Burnett		61.8
Sauk	10	51.2	Minhafer	68	61.3
Beedee		61.8	Clintland		63.8
Burnett	62	59.7	Garry	20	66.8
Beedee		64.7	ALL FIELDS		NON-PAIRED
Clintland	35	66.0			
			Ajax	16	50.4
Beedee		62.7	Beedee	115	64.6
Garry	41	64.2	Branch	28	55.9
			Burnett	104	61.4
Beedee		62.0	Clintland	38	66.1
Minhafer	62	61.9	Fayette	46	56.9
			Garry	63	63.5
Beedee		60.5	Minhafer	103	60.5
Sauk	40	58.4	Sauk	46	58.1

GOODFIELD OATS

The Wisconsin Experiment Station expects to distribute a new variety of oats to growers of certified seed. The new variety, C.I. 7266, from the cross Clintland x (Garry x Hawkeye-Victoria), is called Goodfield, the name suggesting its adaptation to highly fertile soils where lodging has been a problem. A limited quantity of seed will be distributed to growers of certified seed of Clintland and Fayette oats for 1959 planting, and a wider distribution will be made for 1960 planting. The variety was bred cooperatively by workers at the University of Wisconsin and the United States Department of Agriculture with support by the Quaker Oats Company.

Goodfield has short and stiff straw. Yields have been low on medium and low fertility soils, but are satisfactory on fertile soils. Bushel weight is high. Hull color is a dull yellow that tends to weather and turn brownish at the base.

Goodfield is resistant to all prevalent races of stem rust and crown rust, including race 290 which attacks varieties with Landhafer resistance. However, there are rare races that will attack it.

Some of the Wisconsin workers who have helped in the development of Goodfield, though not necessarily listed in order of contribution, are: Z. M. Arawinko,

P. E. Pawlisch, R. A. Forsberg, L. G. Cruger, L. N. Barker, M. L. Kaufmann, E. A. Brickbauer, D. C. Arny and A. L. Hooker. Branch station men materially assisted in the testing of Goodfield.

Selections of current interest are: X456-4, C.I. 7107; X643-9, C.I. 7269; X643-10, C.I. 7377; and X643-53, C.I. 7379.

Quintuple Cross

The quintuple cross involving 31 varieties and selections was completed in the summer of 1958. An advanced portion of F_1 plants were grown in the field in 1958. A second portion was harvested in the greenhouse in December, 1958. A third and fourth portions are being produced in the greenhouse and Puerto Rico, respectively.

The F_1 populations of the two quadruple crosses were produced in 1958.

Personnel Items. Graduate assistants in the small grain breeding work are: R. A. Forsberg, P. E. Pawlisch, L. G. Cruger, L. N. Barker, and T. T. Lee. D. C. Hess became an assistant in September, 1958. P. E. Pawlisch has completed work on grain quality and is concentrating on writing his thesis. R. A. Forsberg is continuing work on amphiploids and interspecific Avena hybrids.

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Oats with Some Tolerance to Yellow Dwarf Virus

by D. C. Arny (Madison)

Several entries from the World Collection have shown some tolerance to yellow dwarf under our conditions. A list of these follows:

C. I. No.	Name	Source
1012	Old's White Kherson	Wis.
1050	Iowa 103	Wis.
1364	Fraziers Red Rust Proof	
1436	Fulghum	Ga.
1963	R.R.P.	Wash.
4664	C.I. 3717 x Sib. of C.I. 4316	Mo.
6668	Clinton-Boone-Cartier	Indiana
6954	Saia	
7010	Saia Reselect.	
PI 175526	Simo	Finland
180942	Rotenburger Schwarz	Germany
186606	Saia	Brazil

In several of these the tolerance is only moderate, and with different virus strains and conditions undoubtedly will prove susceptible. CI 1050 is probably the same as Albion, CI 729, which Endo has used as a source of tolerance.

Mr. Gert Orlob has continued to work on the relation of aphids to the spread of the virus and also on the physiology and biochemistry of virus infected plants.

Effects of rust on oat yields

Protective sprays (Manzate) were applied weekly from the time rust first appeared. Leaf rust was spread by means of aeciospores from buckthorn. Some stem rust came in late. Yields of sprayed plots and reductions in yield and kernel weight due to the rust are given in the table below. In the unsprayed plots Clintland 60 yielded 105 bu., Clintland 91, and Clinton 88.

Variety	Yield			Kernel weight % reduction
	Bu.[a/]	Reduction Bu.	Reduction Per cent	
Branch	132	14	11	12
Rodney	117	5	4	5
Sauk	129	22	17	7
Beedee	119	9	7	8
Clarion	114	15	13	11
Clintland 60	100	-5	-5	-2
Clinton	111	23	21	14
Minhafer	98	-1	-1	2
Clintland	105	14	13	-1
Fayette	92	1	1	4
LSD 5%	-	16	-	-

[a/] Yield of Manzate sprayed plots.

V. NEW VARIETIES*

*(Including tentative selections)

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*****

VII. MAILING LIST

Aleksa Popovic, Institute for Agriculture, Kragujevac, Yugoslavia
L. N. Allen, Federal Seed Laboratory, 212 Old Post Office Bldg., Montgomery 4, Ala.
R. E. Anderson, Plant Breeding Dept., Cornell Univ., Ithaca, N.Y.
Z. M. Arawinko, Agronomy Dept., Univ. of Wis., Madison 6, Wisconsin
Deane C. Arny, Dept. of Plant Path., Univ. of Wisconsin, Madison 6, Wisconsin
I. M. Atkins, Agronomy Dept., A and M Col. of Texas, College Station, Texas
R. E. Atkins, Agronomy Dept., Iowa State College, Ames, Iowa
E. E. Bantarri, Dept. Plant Path., Univ. of Minnesota, St. Paul, Minn.
K. E. Beeson, Agric. Exten. Service, Purdue Univ., Lafayette, Indiana
Ivan Bespalov, 26 Central Street, West Springfield, Massachusetts
Wayne Bever, (USDA) Dept. of Plant Path., Univ. of Ill., Urbana, Illinois
C. R. Blackmon, Agronomy Dept., Univ. of Maine, Orono, Maine
S. V. Bokde, Agronomy Dept., Univ. of Wisconsin, Madison 6, Wisconsin
O. T. Bonnett, Agronomy Dept., Univ. of Illinois, Urbana, Illinois
Carl Borgeson, Dept. Agronomy and Plant Genetics, Univ. of Minn., St. Paul 1, Minn.
D. H. Bowman, Delta Branch Exper. Sta., Stoneville, Mississippi
R. H. Bradley, Seed Cooperatives, Plant Sci. Bldg., Ithaca, New York
W. H. Bragonier, Iowa State College, Ames, Iowa
V. C. Brink, Dept. of Agron., The Univ. of British Columbia, Vancouver 8, Canada
L. Browder, Botany & Plant Pathology, Kansas State College, Manhattan, Kansas
A. R. Brown, Dept. of Agron., Univ. of Georgia, Athens, Georgia
C. M. Brown, Agronomy Dept., Univ. of Illinois, Urbana, Illinois
Norman Brown, Agric. Exper. Station, Sikeston, Missouri
J. Artie Browning, Plant Path. Dept., Iowa State College, Ames, Iowa
C. S. Bryner, Agronomy Dept., Pennsylvania State Univ., Univ. Park, Pennsylvania
J. H. Byrd, USDA Federal Seed Laboratory, 212 Old Post Office Bldg., Montgomery 4, Alabama
W. P. Byrd, Agron. Dept., Clemson Agric. College, Clemson, South Carolina
R. M. Caldwell, Dept. of Bot. and Plant Path., Purdue Univ., Lafayette, Indiana
Canadian Seed Growers Assoc., Inc., Box 548, Ottawa, Canada
R. Cappellini, Dept. of Plant Path., Rugers Univ., New Brunswick, New Jersey
H. L. Chada, Texas Agr. Exp. Substation, Denton, Texas
L. O. Chang, Plant Breeding Dept., Cornell Univ., Ithaca, New York
T. T. Chang, Dept. Agronomy and Plant Genetics, Univ. of Minn., St. Paul 1, Minn.
W. H. Chapman, North Florida Exper. Sta., Quincy, Florida
R. M. Chatters, Dept. of Bot. and Plant Path., Oklahoma State Univ., Stillwater, Okla.
B. L. Chona, Div. of Mycology and Plant Path., Indian Agric., Res. Institute, New Delhi 12, INDIA
J. J. Christensen, Cooperative Rust Lab., Univ. of Minn., St. Paul 1, Minnesota
B. E. Clark, Div. of Seed Investigations, N.Y.S. Agric. Exper. Sta., Geneva, N.Y.
F. A. Coffman, Section of Cereal Crops and Diseases, Plant Industry Station, Beltsville, Maryland
R. R. Coker's Pedigreed Seed Co., Hartsville, South Carolina
L. E. Compton, Dept. of Bot. and Plant Path., Purdue Univ., Lafayette, Indiana
T. J. Conlon, Dickinson Exper. Sta., Dickinson, North Dakota
B. F. Coon, Zoology and Entomology, Pennsylvania State Univ., University Park, Pa.
R. V. Cotter, Cooperative Rust, Univ. of Minn., St. Paul 1, Minn.
W. F. Crosier, Dept. of Seed Investigations, N.Y.S. Agric. Exper. Sta., Geneva, N.Y.
L. I. Croy, Agronomy Dept., Oklahoma State Univ., Stillwater, Oklahoma
L. G. Cruger, Agronomy Dept., Univ. of Wisconsin, Madison, Wisconsin
B. C. Curtis, Agronomy Dept., Oklahoma State Univ., Stillwater, Oklahoma

R. G. Dahms, Head, Cereal and Forage Insects Section, USDA Plant Industry Sta. Beltsville, Md.
R. D. Davies, Wantage Res. Lab., Grove Airfield, Nr. Wantage, Berkshire, ENGLAND
W. H. Davis, Field Crops. Dept., North Carolina State College, Raleigh, North Carolina
Arden D. Day, Agronomy Dept., Univ. of Arizona, Tucson, Arizona
R. A. Derick, Cereal Crops Div., Central Exper. Farm, Ottawa, Ontario, CANADA
R. S. Dickey, Plant Path. Dept., Cornell Univ., Ithaca, N.Y.
V. A. Dirks, Agronomy Dept., South Dakota State College, Brookings, So. Dakota
C. F. Douglas, Dept. of Agronomy, Purdue Iniv., Lafayette, Indiana
A. F. Dreier, Agronomy Dept., Univ. of Neb., Lincoln 1, Nebraska
R. W. Earhart, Dept. of Bot. and Bacteriology, Clemson Agric. Col., Clemson, S.C.
D. C. Ebeltoft, Agronomy Dept., North Dakota Agricultural College, Fargo, N.D.
Editor, Agronomy Journal, 2702 Monroe Street, Madison 5, Wisconsin
Editor, What's New in Crops and Soils, 2702 Monroe Street, Madison 5, Wisconsin
C. W. Ellett, Dept. Bot. and Plant Path., Ohio State Univ., Columbus 10, Ohio
R. Ellsworth, Agronomy Dept., Kansas State College, Manhattan, Kansas
R. M. Endo, Dept. of Agronomy, Univ. of Ill., Urbana, Illinois
E. B. Eskew, Dept. of Agronomy, Clemson Agric. College, Clemson, South Carolina
L. L. Farrar, Dept. Plant Path., Georgia Exper. Station, Experiment, Georgia
V. C. Finkner, Agronomy Dept., Univ. of Kentucky, Lenxington, Kentucky
D. G. Fletcher, Exec. Sec., Rust Prevention Assoc., 820 Midland Bank Bldg., Minneapolis 1, Minnesota
W. H. Foote, Dept. of Farm Crops, Oregon State Col., Corvallis, Oregon
W. L. Fowler, Kansas Crop Improvement Assoc., Kansas State Col., Manhattan, Kansas
K. J. Frey, Dept. of Agronomy, Iowa State College, Ames, Iowa
M. C. Futrell, Agronomy Dept., A and M College of Texas, College Station, Texas
J. H. Gardenhire, Rt. 1, Box 547, Texas Agric. Exper. Substation 6, Denton, Texas
F. P. Gardner, Agronomy Dept., Iowa State College, Ames, Iowa
F. Gauthier, Experimental Farm, Ste. Anne de la Procatiere, Quebec, CANADA
D. W. George, Pendleton Branch Exper. Station, Pendleton, Oregon
J. Gerwig, Farm Crops Dept., N.J. Agr. Exper. Sta., New Brunswick, N.J.
U. R. Gore, Agronomy Dept., Georgia Agric. Exper. Station, Experiment, Georgia
Kanji Gotoh, Tokachi Branch Sta., Hokkaido Agr. Exp. Sta., Obihiro, Hokkaido, Japan
J. E. Grafius, Dept. of Farm Crops, Michigan State Univ., East Lansing, Mich.
G. J. Green, Plant Path. Lab., Box 322, Univ. of Manitoba, Winnipeg, Man., CANADA
W. L. Griffeth, Agronomy Dept., Cornell Univ., Ithaca, N.Y.
D. J. Griffiths, Welsh Plant Breeding Station, Plas Gogerddan, Aberystwyth, WALES
R. Grindeland, Agronomy Dept., Iowa State College, Ames, Iowa
A. A. Guitard, Exper. Farm, Beaverlodge, Alberta, CANADA
S. J. Hadden, Coker's Pedigreed Seed Co., Hartsville, South Carolina
N. I. Hancock, Agronomy Dept., Univ. of Tenn., Knoxville, Tennessee
E. D. Hansing, Dept. of Bot. and Plant Path., Kansas State Col., Manhattan, Kansas
H. Harrison, Coastal Plain Exper. Sta., Tifton, Georgia
H. F. Harrison, Coker's Pedigreed Seed Co., Hartsville, South Carolina
C. Hart, Plant Breeding Dept., Cornell Univ., Ithaca, N.Y.
T. E. Haus, Dept. of Agronomy, A. and M. College, Fort Collins, Colorado
E. B. Hayden, Rust Prevention Assn., 820 Midland Bank Bldg., Minneapolis 1, Minn.
Carl Hayward, Pierce City, Missouri
Charles Hayward, Field Crops Dept., Univ. of Missouri, Columbia, Missouri
T. T. Hebert, North Carolina State College, Raleigh, North Carolina
E. G. Heyne, Agronomy Dept., Kansas State Col., Manhattan, Kansas
L. J. Higgins, Agronomy Dept., Univ. of New Hampshire, Durham, New Hampshire
D. L. Hill, Dairy Dept., Purdue Univ., Lafayette, Indiana
H. F. Hodges, Agronomy Dept., Purdue Univ., Lafayette, Indiana

C. S. Holton, Plant Path. Dept., Washington State College, Pullman, Washington
A. L. Hooker, Plant Path. Dept., Univ. of Wis., Madison, Wisconsin
D. N. Huntley, Dept. of Field Husbandry, Ontario Agric. Col., Guelph, Ontario, CANADA
M. D. Jellum, Agronomy Dept., Univ. of Illinois, Urbana, Illinois
N. F. Jensen, Dept. of Plant Breeding, Cornell Univ., Ithaca, N.Y.
A. A. Johnson, Dept. of Plant Breeding, Cornell Univ., Ithaca, N.Y.
I. J. Johnson, Agronomy Dept., Iowa State College, Ames, Iowa
T. Johnson, Dominion Lab. of Plant Path., Winnipeg, Manitoba, Canada
V. A. Johnson, Agronomy Dept., Univ. of Nebraska, Lincoln, Nebraska
C. O. Johnston, Dept. of Plant Path., Kansas State Col., Manhattan, Kansas
T. H. Johnston, Rice Branch Exper. Station, P.O. Box 287, Stuttgart, Arkansas
E. D. Jones, Plant Path. Dept., Cornell Univ., Ithaca, N.Y.
Buford Jones, Supervisor, State Seed Lab., Capitol Bldg., Oklahoma City, Oklahoma
K. Jones, Plant Breeding Dept., Cornell Univ., Ithaca, N.Y.
H. K. Hayes, Dept. Agronomy and Plant Genetics, Univ. of Minn., St. Paul 1, Minn.
J. A. Keaton, Coker's Pedigreed Co., Hartsville, South Carolina
G. C. Kent, Dept. of Plant Path., Cornell Univ., Ithaca, N.Y.
R. L. Kiesling, Bot. and Plant Path. Dept., Michigan State Univ., E. Lansing, Mich.
E. J. Kinbacher, Dept. of Plant Breeding, Cornell Univ., Ithaca, N.Y.
K. H. Klages, Agronomy Dept., Univ. of Idaho, Moscow, Idaho
H. R. Klinck, Agronomy Dept., Macdonald College, Quebec, CANADA
R. Kleese, Agronomy Dept., Iowa State College, Ames, Iowa
C. F. Konzak, Agronomy Dept., W.S.C., Pullman, Washington
Francis K. S. Koo, Dept. of Agronomy and Plant Genetics, Univ. of Minn., St. Paul 1, Minnesota
K. Kumagai, Forage Breeding Lab., Natl. Hokkaido Agr. Exp. Sta., Tsukisappu, Hokkaido, JAPAN
A. G. Kusch, Experimental Farm, Scott, Sask., CANADA
C. Krull, Agronomy Dept., Iowa State College, Ames, Iowa
C. A. Lamb, Agronomy Dept., Ohio Agric. Exper. Station, Wooster, Ohio
L. Leininger, Agron. Dept., Iowa State College, Ames, Iowa
W. H. Leonard, Dept. of Agronomy, Colorado A and M College, Fort Collins, Colorado
J. A. Levique, USDA Federal Seed Lab., 212 Old Post Office Bldg., Montgomery 4, Ala.
Librarian, Welsh Plant Breeding Station, Univ. College of Wales, Aberystwyth, WALES
H. H. Love, Plant Breeding Dept., Cornell Univ., Ithaca, N.Y.
H. H. Luke, Agric. Exper. Station, Gainesville, Florida
S. Lund, Farm Crops Dept., N.J. Agric. Exper. Station, New Brunswick, New Jersey
E. S. Luttrell, Agronomy Dept., Georgia Agric. Exper. Sta., Experiment, Georgia
F. A. Martz, Dairy Dept., Purdue Univ., Lafayette, Indiana
A. Matson, Gideon, Missouri
A. D. McFadden, Experimental Farm, Lacombe, Alberta, CANADA
R. I. H. McKenzie, Experimental Farm, Indian Head, Sask., CANADA
H. H. McKinney, Section of Cereal Crops and Diseases, Plant Industry Sta., U.S. Dept. of Agric., Beltsville, Maryland
F. W. McLaughlin, N.C. Crop Improvement Assoc., Inc., State College Station, Raleigh, North Carolina
G.K. Middleton, Field Crops Dept., North Carolina State College, Raleigh, North Carolina
J. W. Midyette, Jr., Commonwealth of Virginia, 1112 State Office Bldg., Richmond 19, Virginia
F. L. Miller, Agronomy Dept., Kansas State College, Manhattan, Kansas
M. D. Miller, Extension Agronomist, Univ. of California, Davis, California

M. B. Moore, Dept. of Plant Pathology, Univ. of Minn., St. Paul 1, Minnesota
D. D. Morey, Coastal Plain Exper. Station, Tifton, Georgia
R. R. Mulvey, Dept. of Agronomy, Purdue Univ., Lafayette, Indiana
H. C. Murphy, Agronomy Dept., Iowa State College, Ames, Iowa
R. B. Musgrave, Agronomy Dept., Cornell Univ., Ithaca, N.Y.
W. M. Myers, Dept. of Agronomy and Plant Genetics, Univ. of Minn., St. Paul 1, Minnesota
J. W. Neely, Coker's Pedigreed Seed Co., Hartsville, South Carolina
J. E. Newman, Agronomy Dept., Purdue Univ., Lafayette, Indiana
L. W. Nittler, Dept. Seed Investigations, N.Y.S. Agr. Exp. Sta., Geneva, N.Y.
C. H. Noller, Dairy Dept., Purdue Univ., Lafayette, Indiana
A. Norden, Agronomy Dept., Iowa State College, Ames, Iowa
N.Y.S. Col. of Agric. Library, Cornell Univ., Ithaca, N.Y.
J. F. McGill, Coastal Plain Exper. Sta., Tifton, Georgia
J. G. O'Mara, Bot. and Plant Path. Dept., Iowa State College, Ames, Iowa
Thomas O'Sullivan, Dept. of Agriculture, Dublin, IRELAND
R. M. Oswalt, Dept. of Agronomy, Oklahoma State Univ., Stillwater, Oklahoma
S. A. Parham, Coastal Plain Exper. Station, Tifton, Georgia
F. L. Patterson, Agronomy Dept., Purdue Univ., Lafayette, Indiana
J. R. Pelletier, Experimental Farm, Ste. Anne de la Pocatiere, Quebec, CANADA
J. W. Pendleton, Agronomy Dept., Univ. of Illinois, Urbana, Illinois
F. C. Petr, Branch Exper. Station, Aberdeen, Idaho
B. Peturson, Plant Pathology Lab., Box 322, Univ. of Manitoba, Winnipeg, Manitoba, CANADA
P. Pfahler, Agr. Exper. Sta., Gainesville, Florida
R. Pfeifer, Agron. Dept., Pennsylvania State Univ., University Park, Pennsylvania
W. H. Pierre, Agron. Dept., Iowa State College, Ames, Iowa
Plant Breeding Library, Cornell University, Ithaca, New York
J. M. Poehlman, Dept. of Field Crops, Univ. of Missouri, Columbia, Missouri
W. K. Pope, Agronomy Dept., Univ. of Idaho, Moscow, Idaho
D. A. Ray, Dept. Agron., Ohio State Univ., Columbus, Ohio
E. Reinbergs, Field Husbandry, O.A.C., Guelph, Ontario, CANADA
R. Richards, Agronomy Dept., Univ. of Kentucky, Lexington, Kentucky
C. W. Roane, Agronomy Dept., Virginia Agric. Exper. Station, Blacksburg, Virginia
B. J. Roberts, Dept. of Plant Path., Univ. of Minnesota, St. Paul 1, Minnesota
D. A. Roberts, Dept. Plant Path., Cornell Univ., Ithaca, N.Y.
T. C. Roberts, Kansas Crop Improvement Assn., Manhattan, Kansas
D. W. Robertson, Agronomy Dept., Colorado A and M College, Fort Collins, Colorado
W. F. Rochow, Dept. of Plant Path., Cornell Univ., Ithaca, N.Y.
H. A. Rodenhiser, Crops Research Div., Plant Industry Station, Beltsville, Maryland
P. Rogers, Agron. Dept., Iowa State College, Ames, Iowa
C. R. Rhode, Pendleton Branch Exper. Station, P.O. Box 816, Pendleton, Oregon
H. R. Rosen, Plant Path. Dept., Univ. of Arkansas, Fayetteville, Arkansas
W. M. Ross, Cereal Crops, Fort Hays Exper. Station, Hays, Kansas
P. G. Rothman, Delta Exper. Sta., Stoneville, Mississippi
K. Sadanaga, Dept. of Genetics, Iowa State College, Ames, Iowa
J. E. Sass, Dept. of Bot. and Plant Path., Iowa State College, Ames, Iowa
J. F. Schafer, Bot. and Plant Path. Dept., Purdue Univ., Lafayette, Indiana
R. D. Schein, Plant Pathology Dept., Pennsylvania State Univ., University Park, Pa.
A. M. Schleuhuber, Agronomy Dept., Oklahoma State Univ., Stillwater, Oklahoma
J. W. Schmidt, Dept. of Agronomy, Univ. of Nebraska, Lincoln 1, Nebraska
Dale Sechler, Field Crops Dept., Univ. of Missouri, Columbia, Missouri

W. D. Sewell, Dept. Bot. and Plant Path., Purdue Univ., Lafayette, Indiana
H. L. Shands, Dept. of Agronomy, Univ. of Wis., Madison 6, Wisconsin
L. H. Shebeski, Dept. of Field Husbandry, Univ. of Saskatchewan, Saskatoon, Saskatchewan, CANADA
M. D. Simons, Bot. Hall, Iowa State College, Ames, Iowa
E. L. Smith, Agronomy Dept., Oklahoma State Univ., Stillwater, Oklahoma
O. D. Smith, Agronomy Dept., Okla. State Univ., Stillwater, Oklahoma
T. R. Stanton, 4305 Sheridan Street, Univ. Park, Hyattsville, Maryland
T. M. Starling, Agronomy Dept., Virginia Agric. Exper. Station, Blacksburg, Va.
J.D.E. Sterling, Experimental Farm, Charlottetown, P.E.I., CANADA
Harland Stevens, Branch Exper. Station, Aberdeen, Idaho
D. M. Stewart, Cooperative Rust Laboratory, Univ. of Minn., St. Paul 1, Minnesota
J. W. Stiles, Director of Research, G.L.F., Inc., Ithaca, N.Y.
T. E. Stoa, Dept. of Agronomy, North Dakota Agric. College, Fargo, North Dakota
C. A. Suneson, Agronomy Dept., Univ. of Calif., Davis, California
M. Tabata, Dept. of Agronomy and Plant Genetics, Univ. of Minn., St. Paul 1, Minn.
D. K. Taylor, Experimental Farm, Agassiz, B.C., CANADA
L. H. Taylor, Dept. of Agronomy, Virginia Polytechnic Institute, Blacksburg, Va.
G. E. Templeton, Dept. of Agronomy, Univ. of Arkansas, Fayetteville, Arkansas
R. L. Thurman, Dept. of Agronomy, Univ. of Arkansas, Fayetteville, Arkansas
L. J. Tyler, Dept. of Plant Path., Cornell Univ., Ithaca, New York
U.S.D.A. Library, Washington 25, D.C.
R. S. Vasudeva, Div., Mycology and Plant Path., Indian Agric. Res. Institute, New Delhi, INDIA
I. Wahl, Faculty of Agriculture, P.O.B. 12, Rehovot, ISRAEL
A. T. Wallace, Agric. Exper. Station, Gainesville, Florida
E. K. Walrath, Eastern States Farmers' Exchange, West Springfield, Massachusetts
D. J. Ward, Cereal Introductions, U.S.D.A., A.R.S., Crops Research Div., Plant Industry Station, Beltsville, Maryland
E. C. Waters, Agric. Exper. Sta., Geneva, New York
I. A. Watson, Dept. of Genetics & Plant Breeding, Univ. of Sydney, Sydney, AUSTRALIA
D. E. Weibel, Agric. Exper. Station, Denton, Texas
H. L. Weir, Seed Lab., Arkansas State Plant Bd., Capitol Ave. & Center, Little Rock, Arkansas
J. N. Welsh, Cereal Breeding Lab., Box 322, Univ. of Manitoba, Manitoba, CANADA
D. E. Western, The Quaker Oats Company, Chicago 54, Illinois
J. G. Wheat, Agronomy Dept., Iowa State College, Ames, Iowa
Marvin Whitehead, Dept. of Field Crops, Univ. of Missouri, Columbia, Missouri
S. C. Wiggans, Horticulture Dept., Okla. State Univ., Stillwater, Oklahoma
J. Wilson, Ft. Hays Experiment Station, Hays, Kansas
L.S. Wood, Agronomy Dept., South Dakota State College, Brookings, South Dakota
R. W. Woodward, Agronomy Dept., Utah State College, Logan, Utah
H. C. Young, Agronomy Dept., Oklahoma State Univ., Stillwater, Oklahoma
W. S. Young, Plant Breeding Dept., Cornell Univ., Ithaca, New York
F. J. Zillinsky, Cereal Crops Division, Central Exper. Farm, Ottawa, Ontario, CANADA
D. E. Zimmer, Dept. Bot. & Plant Path., Purdue Univ., Lafayette, Indiana