Neal Jensen

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OAT NEWSLETTER

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April 1, 1964

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Neal F. Jensen, Editor

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ANNOUNCEMENTS

Back issue wanted - A copy of Vol. 10 (1959) is wanted to round out a complete set. If you know of a surplus copy please send to N. F. Jensen.

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

Available back issues - Back issues of the 1960, 1961 and 1962 Newsletters (plus a few copies of certain earlier editions) are available on request.

Plant Breeding Series - Dr. Poehlman has contributed a detailed account of the system in use at Missouri for this issue. Who will volunteer a write-up for the 1964 issue?

Variety descriptions - It would be helpful if you name or announce a new variety if, in addition to your account in the State report text, you would submit a single paragraph of description which could be included under the "New Varieties" section.

Oat bulletin being reprinted - Dr. O. T. Bonnett, University of Illinois, writes that the following bulletin, which has been out of print, is being reprinted and will shortly be available:

Bonnett, O. T. Developmental Morphology of the Vegetative and Floral Shoots of Maize. University of Illinois, Agr. Exp. Sta. Bul. 568.

PLEASE DO NOT CITE THE OAT NEWSLETTER IN PUBLISHED BIBLIOGRAPHIES

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

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

Certain agencies require approval of material before it is published. Their approval of material which goes into the Newsletter is a different evaluation from approval for publishing. A recent letter thinks that abuse of this informal relationship by secondary citation could well choke off the submission of information.

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

I hope this does not become controversial. I mean that I am trying here to reflect what I believe to be the oat workers' desire, that the Newsletter be a conversation among oat workers; when it is cited elsewhere the conversation becomes public. Perhaps the "Not for publication" status of the Newsletter should be strengthened.

The above remarks should not be construed to mean in any way an attempt to suppress information; the initiative for publicizing or not publicizing a piece of information remains with the contributor. He should not, however, after submitting the information in good faith, lose this initiative to any casual reader of the Newsletter.

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I. CONFERENCE AND REGIONAL NOTES

None was received although certain of the special reports are from material presented at the North Central Oat Workers Conference and NCR-15 Committee Meetings at Urbana, Illinois, January 16-17, 1964.

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II. SPECIAL REPORTS

*** The 1963 Oat Crop ***

by H. C. Murphy, USDA

A record high yield and near high test weight oat crop was harvested in the United States in 1963 from the smallest acreage since 1883. Unusually high average yields of 50 bushels per acre, or above, were obtained in the high oat-producing states of Minnesota (51), New York (53), Pennsylvania (55), Wisconsin (55.5), Illinois (57), Indiana (62), and Ohio (65). The average yield of 45.1 bushels per acre in the United States in 1963 was the highest on record. Five of the highest average U.S. oat yields have been recorded during the past six years, as follows:

Year	Yield	All time rank	Remarks
1963	45.1	1	
1962	45.0	2	
1961	42.1	5	
1960	43.3	4	
1959	37.6	-	BYDV
1958	44.8	3	

A record yield probably would also have been established in 1959 had the crop not sustained heavy losses caused by the barley yellow dwarf virus (BYDV). The 1959 epidemic of BYDV is described in detail in the Plant Disease Reporter, Supplement 262, 1959.

In contrast to increasing yields the harvested oat acreage in the United States has been steadily decreasing in recent years. The highest acreage on record was 45,539,000 in 1921. Since a fairly recent high acreage of 42,291,000 in 1954, the acreage has steadily decreased to 21,757,000 in 1963. Oat production in the United States was 980,910,000 bushels in 1963. This is the first year since 1939 that production has been below one billion bushels.

Despite heavy damage from BYDV, crown rust, *Helminthosporium avenae*, and other oat diseases in localized areas, total oat disease losses were relatively minor in 1963. On the other hand, the losses from winterkilling of winter oats were the worst in 100 years. As indicated in the report from Texas, an estimated 45 percent of their 2,208,000 acres of winter oats were destroyed by low temperatures and stands were reduced on most of the remaining acreage. The average yield per acre of oats in Texas in 1963 was only 20.5 bushels per acre. Heavy losses from winterkilling were also experienced throughout the winter oat growing region from the Deep South to the northernmost limits. Approximately 70 percent of the 1963 U.S. oat acreage was grown in the North Central Region with 88 percent of this acreage being harvested for grain. In contrast only 29 and 42 percent of the planted acreages in the South Central and South Atlantic regions, respectively, was harvested for grain in 1963 compared with 36 and 51 percent in the also unfavorable 1962 season.

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*** The distribution of physiologic races of oat stem rust in the United States in 1963 ***

by D. M. Stewart, R. U. Cotter, and B. J. Roberts (USDA, St. Paul)

From 283 collections of oat stem rust in 21 states, 332 isolates were identified in the Cooperative Rust Laboratory at St. Paul, Minnesota. Based on preliminary results, race 6F accounted for 73 percent of the identifications; 6AF, 11 percent; 7A, 4 percent; and the remaining 12 percent included 11 other races and subraces (Table 1).

Virulence for the BC and F genes predominated in the 1963 stem-rust population. Approximately 95 percent of the isolates identified had virulence for either the genes BC, or F, or both (Table 2).

Race 6F was widely distributed from Texas to North Dakota and eastward to New York. It was found in 19 out of 21 states sampled in 1963. This race attacks oat varieties with genes A, D, E, and F.

Race 6AF, which attacks all known commercial oat varieties in the United States, was isolated 36 times in collections from the states of Iowa, Minnesota, Missouri, New York, Pennsylvania, Texas, and Wisconsin, whereas, in 1962 this race was found only twice, once each from Minnesota and Wisconsin.

The Rodney (BC) attacking race 7A was found 15 times in 1963 in Iowa, Michigan, Minnesota, Missouri, Nebraska, North Dakota and Texas.

From barberry in Virginia, race 6F was identified twice and races 2, 5, and 6AF once each. In rust spreads from barberry in Pennsylvania, race 4A was identified 13 times; 13A, 5 times, 6A and 6F, 4 times each; and 4 and 6AF, once each.

Table 1. Physiologic races of *Puccinia graminis* var. *avenae* identified in the United States in 1963.

Preliminary

Race	Percentage of isolates
6F	73
6AF	11
7A	4
6	2
7AF	2
8A	2
7	1
5	1
6A	1
1,2,4A,10,&13A	3
	100

Table 2. Occurrence of virulence for the BC and F genes in the 1963 stem-rust population.

State	Gene or genes
Georgia	F
Illinois	F
Indiana	F
Iowa	F, BC&F, BC
Kansas	F
Kentucky	F, BC
Michigan	F, BC
Minnesota	F, BC&F, BC
Missouri	F, BC&F, BC
Nebraska	F, BC
New York	F, BC&F, BC
North Dakota	F, BC&F, BC
Ohio	F, BC&F
Oklahoma	F
Pennsylvania	F, BC&F, BC
South Dakota	F
Texas	F, BC&F, BC
West Virginia	F
Wisconsin	F, BC&F

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*** Procedures in Small Grain Breeding at Missouri ***

by J. M. Poehlman, Professor of Field Crops
University of Missouri, Columbia

Dr. Jensen's article in the 1962 Oats Newsletter prompts me to describe how we have streamlined our procedures in handling the small grain breeding nurseries at the Missouri station. These changes have been accomplished by the addition of a full-time technician to the small grain projects who is handy with machinery, and subsequent mechanization of operations where possible. They have been forced upon us by a shrinking budget resulting from new income failing to meet increasing costs and even loss of income from some sources. By streamlining and mechanizing procedures and operations, the working size of our nursery has essentially been doubled over the past five years with no increase in the labor force.

Scope of Operations and Staff:

We have been working with five crops, winter barley, winter wheat, winter oats, spring oats, and rice. In 1962-'63 we grew a total of 15,000 nursery rows on all crops and 350 drill plots. This was handled with two staff members (myself and Dr. Charles Hayward) both of whom devote approximately one-half time to teaching and other duties, one graduate student, one technician, two part-time student helpers during the winter, and 3 to 5 student or high school workers during the summer. Two additional graduate students conducted thesis problems.

Crossing and Selecting Procedures:

Crossing - In our program crosses are normally made in the greenhouse during the winter to free our time for heading notes, smut counts, and other note taking operations which occur during the period when crossing would be done in the field.

F_1 - The F_1 plants are grown in space plantings in the field. We average about 10 to 20 carefully selected crosses per year in each crop.

F_2 to F_6 Bulks - The F_2 to F_6 generations are grown as bulk plantings in the field. These are planted with a grain drill, harvested with a binder, and threshed on a Vogel thresher. The plot size is usually 3-rows x 90 feet, or 8 rows x 90 feet depending on generation, amount of seed available to plant, anticipated need for seed the next year, and amount of space available. No selection is made from the bulks grown in drill plots. The bulks are grown only for seed increase to advance the generation of the cross. This procedure permits carrying a maximum number of crosses with very little labor. Bulks may be discarded at any generation if they appear inferior or if the objective of the cross is outmoded. Some winter oat crosses, in which there has been considerable winter killing in most years have been carried to the F_{12} to F_{14} generation and are still being maintained.

Space Plantings, F_3 to F_6 - Selections are made from space planted plots of the crosses and not from the thick seeded bulk plots. This permits careful evaluation of the plant from the standpoint of height, tillering, straw stiffness and disease resistance whereas in a bulk seeding selection is more or less random. Space plantings are made using four John Deere Flex beet planters mounted on a tractor draw bar. Blank corn planter plates are notched according to size and shape of the crop seed to be planted, and the seeds are then carefully screened to a uniform size. Two men can plant 75 spaced plots (approximately 1,000 seeds each) in an eight hour day with sufficient accuracy in spacing for the purpose required. While we have been planting space plantings in 12-inch rows and cultivating by hand, we plan to widen these to permit tractor cultivation. After plants have been selected the plots are chopped or combined off.

I should like to emphasize that the space plantings are duplicates of the advanced generation bulk plantings with the bulk plantings harvested for seed and the space plantings used for selection of superior plants only. In oats, the space plantings are flanked with rust spreaders to permit selection for rust resistance.

The space planted nursery replaces the head row-head hill nursery previously grown. It is labor saving because planting and cultivation is mechanized; there is no note taking or record keeping involved; only one or two trips are made through the plot to select plants for harvest.

Increase Rows - Seed harvested from the spaced plants are used to plant 10-foot increase rows. Sometimes seed is divided and increase rows may be planted at two locations. Usually a few (25-50) plants from a particular cross will be selected from space planted plots about the F_3 or F_4 generation which gets lines from a cross into increase rows in the F_4 or F_5. If these lines as a group look good the following year, a larger number will then be selected from the space plantings; if they look poor, few will be selected or the entire cross discarded. Only superior rows are harvested.

Yield Tests - Seed harvested from increase rows go to yield tests at Columbia, regardless of generation of the seed, and after the first season to outstate tests. Yield tests and increase rows are planted with the cone-type, tractor mounted nursery seeder previously described in the Agronomy Journal (Vol. 54:364). Three men can plant approximately 2,000 rows in an 8-hour day with this seeder, with far greater accuracy in depth of seeding, covering, and spacing than with any other planter we have used.

Drill Plots - Single drill plots are grown for observation and seed increase. These are planted with a grain drill, cut with a binder, and threshed on a Vogel thresher. Standard varieties and advanced strains are planted in the drill plots. The number of drill plots may vary from 30 to 80 depending upon the crop. Sufficient seed is harvested to plant yield tests, another drill plot, and to go to uniform nurseries if desired.

System summarized

To summarize our procedure is as follows:

1st year	- make cross
2nd year	- grow F_1 in spaced planting
3rd year	- grow bulk of F_2 generation
4th to 7th year	- grow bulk of F_3 to F_6 generations for seed increase only - grow space planted plots for plant selection only, make plant selections
5th to 8th year	- (depending upon generation in which plant selection was made) grow increase rows
6th to 9th year	- put strain in yield test
7th, 8th, or 9th year	- grow yield test and single drill plot
8th, 9th, or 10th year	- put superior strain in uniform nurseries.

The advantages are these:

a. Labor saving - Procedure mechanized wherever possible, note taking and record keeping minimized until strain reaches increase row.

b. Flexibility - Crosses can be selected at any generation beginning with F_3.
Crosses can be dropped in any generation.
Evaluation can be made by observing cross, by observing spaced plants from a cross, and by observing a group of selections growing in rows.

c. The single drill plots are excellent for observation of strains and provide a good quantity of seed for planting the next generation with less danger of mixing than seed harvested from nursery rows. Labor involved in growing and harvesting is small.

Mechanized Operations

a. All planting (drill plots, nursery rows, space plantings) is with power equipment. Precision is superior to hand equipment.
b. Tiller is used to clean out alleys and square up ranges after planting. We find the Ariens Trans-amatic a very sturdy and dependable machine for this and similar work.
c. Sickle bar and rotary mowers are used to keep down weeds in alleys and around blocks and to cut back edges of plots prior to harvest. We have sickle bars of different lengths for Jari mower which will adapt it to various width alleys. Yield tests are planted in 12-foot rows which are cut back to 10-foot prior to harvest with a rotary mower, either hand or tractor mounted. The chopped material is deposited over the alley and eliminates hauling away. Rust spreader rows which may interfere with harvest operations are chopped out before harvest. Drill plots discarded before harvest may be chopped out to reduce labor required for harvesting and threshing. Plots not harvested and guard rows are chopped off after harvest.
d. Harvesters are used for solid row seedings. The Texas type, reel harvester designed by Atkins is used for 2-row plots and a Jari harvester attachment for single-row plots. Drill plots are cut with a binder.
e. A Vogel thresher is used for both nursery and drill plots.
f. A New Holland drier has been adapted to dry bundle and grain materials when high humidity would otherwise prevent threshing. (Agron. Journ., Vol. 55)

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*** Puerto Rico Oat Rust Nurseries, 1963-64 ***

by H. C. Murphy, D. V. McVey, and Marie Prechtl, USDA

The Puerto Rico oat rust nurseries are designed primarily for testing with dangerous rust races that should not be used for testing in nurseries on the North American mainland. Entries are accepted from research institutions throughout North America when parentages indicate a source of resistance to the specific rust races being used. The number of entries accepted from any one institution may be limited depending upon the space available.

Virulent race 264 of crown rust and subraces of 6 and 13 of stem rust continue to represent a serious threat to the U. S. and Canadian oat crops. Race 264 has been widely distributed in recent years but has not become as prevalent as expected. There has been an explosive increase in the United States in recent years of race 6 of stem rust and its virulent subraces. Therefore, it seems highly desirable to search for additional sources of resistance among exotic material and to select for combined resistance to these dangerous races in early generation hybrids in an isolated location such as Puerto Rico.

The locations, number of entries, and races of rust for each of the Puerto Rico oat rust nurseries grown in 1963-64 are as follows:

Location	Race	No. of entries	Rust
Isabela	264	4,830	Crown
Lajas	6AF	2,640	Stem
Ponce	6A&13A	3,025	Stem

M. D. Simons supplied the inoculum of crown rust race 264 for inoculating the Isabela nursery. B. J. Roberts supplied the inoculum of 6A, 13A, and 6AF for the stem rust nurseries at Lajas and Ponce. Supplying adequate, viable, and pure inoculum is a major contribution and vital to the success of the Puerto Rico oat rust nursery program.

Facilities for testing potential parental and early generation lines of oats with dangerous races of rust have been made available by the Federal Experiment Station, Crops Research Division, ARS, USDA, Mayaguez, Puerto Rico, and by Agricultural Experiment Stations of the University of Puerto Rico at Isabela, Lajas, and Fortuna, near Ponce. Donald V. McVey, pathologist, Federal Experiment Station, Mayaguez, is responsible for the Puerto Rico phases of the program. The over-all wheat and oat rust testing program is coordinated by Louis P. Reitz, Crops Research Division, Beltsville, Maryland. The oat nurseries are coordinated by H. C. Murphy. All seed is assembled and data summarized and distributed by Marie Prechtl and J. C. Craddock at Beltsville.

The number of United States and Canadian cooperators submitting entries, states or provinces participating, and rows of oats grown in each nursery, for the past six seasons, has been as follows:

	1958-59	1959-60	1960-61	1961-62	1962-63	1963-64
Cooperators	18	25	24	21	17	19
States and provinces	12	16	15	18	14	18
Approximate number of rows						
Crown rust race 216	600	--	--	--	--	--
Crown rust race 264	4,800	5,700	5,002	4,774	3,719	4,830
Crown rust race 290	1,200	5,000	--	--	3,552	--
Crown rust race 294	--	--	4,899	--	--	--
Crown rust race 321	--	--	--	2,964	--	--
Stem rust subrace 6A	--	--	--	2,238	--	--
Stem rust subrace 13A	540	1,900	547	--	--	--
Stem rust subraces 6A+13A	--	--	--	--	1,398	3,025
Stem rust subrace of 6AF	--	--	--	--	411	2,640
Total	7,140	12,600	10,448	9,976	9,080	10,495

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*** Oats for Winter Grazing ***

by J. P. Craigmiles, J. P. Newton, D. G. Cummins, and L. V. Crowder (Georgia)

In Georgia for the past 5 years an average of 500,000 acres was planted to temporary winter pastures. In addition to this acreage, 70 per cent of all small grain grown for grain was grazed at least once prior to cutting the seed crop. The combination of oats, ryegrass, and crimson clover is the most frequently grown winter grazing crop in the southeastern United States.

Studies conducted over a 9-year period at Experiment, Ga., on the effect of supplemental water and the rate and time of applying nitrogen on the forage production and protein content of an oat, ryegrass, and crimson clover mixture indicate that total forage production is not increased significantly by splitting the application of nitrogen rather than applying all at seeding on either the irrigated or nonirrigated plots. The average of the irrigated and nonirrigated yields was 6,319 pounds when all the nitrogen was applied at seeding. Splitting the nitrogen so that half was applied at seeding and half in the fall produced 6,102 pounds; applying one-third at seeding, one-third in the fall, and one-third in the spring produced 6,318 pounds of dry matter per acre. Five hundred pounds of 0-12-12 were applied prior to seeding. The lack of significance among times of applying nitrogen has economic implications since all the nitrogen can be applied at fall oat planting when nitrogen cost is at a minimum. The application cost of top dressing can be eliminated, and the fertilizer distribution can be programmed more easily by the dealer.

Supplemental water is highly desirable during critical droughty periods. A 55 per cent increase in forage production was obtained by mid-December. The over-all increase in forage production for the season totaled 22%. Generally, winter grazing does not economically justify an elaborate irrigation system unless it is profitably utilized the remainder of the year on cash crops. When irrigation is used, more nitrogen can be economically applied; however, irrigation increased winter killing in oats. Normally up to 150 pounds of nitrogen can be applied without appreciable winter killing in irrigated areas and 180 pounds where irrigation is not used. When 64 pounds of nitrogen were applied at the time of sowing, the crude protein content of the forage was 24 per cent during the fall and early winter, 18 per cent in the winter, and 15 per cent in the spring. In the combination of oats, ryegrass, and crimson clover it was found that forage harvested in November was 95 per cent oats, from December to February, 50 per cent oats and 50 per cent ryegrass. After March oats made little contribution. Where 16 pounds or less of nitrogen were applied the forage was 5 per cent oats, 70 per cent crimson clover, and 25 per cent ryegrass in April and May. Higher rates of nitrogen eliminated crimson clover.

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*** Presence and Control of Seed-Borne Fungi ***

by W. F. Crosier
(Cornell University) Geneva, New York

For this biennial report on the health condition of oats a few seed lots of the 1961, 1962, and 1963 crops were examined critically for both fungi and expressions of phytotoxicity (chemical injury). Since the stains caused by *Septoria avenae* are difficultly recognizable on dry seeds, the presence of the stains and of fungi was recorded for germinating seeds. The expressions of chemical injury, quite naturally, were restricted to the seedlings.

It should be remembered that the life span of *Septoria avenae* on the paleas and lemmas of oat seeds is very short whereas the symptoms or discolorations persist and became black when wet. The living fungi -- Alternaria tenuis, Epicoccum spp. and Fusarium roseum -- resident both internally and externally to the paleas and lemmas usually remain alive for several years.

Since the copious growths of Alternaria tenuis usually obscure the stains of Septoria avenae the latter may be unrecognizable unless the seeds have been treated. In Table 1 the values in the extreme right column are minimal and simply indicate that a few stains were extremely prominent.

The data indicate that Septoria avenae was either more prevalent in New York State than elsewhere or at least that percentwise seed discoloration occurred in more New York fields. The data in Table 2, however, indicate that New York produced the greater percentage of Septoria-free or nearly free (1 to 5 percent of seeds discolored) seed lots.

It should be understood that every seed lot sold in 1962 and 1963 had been chemically treated and Alternia tenuis was alive on only a few seeds. Neither Epicoccum spp. nor Fusarium roseum was observed on any seed or seedling.

In a group of 577 oat lots being prepared for seedstocks, a red-dyed mercurial was observed on 258, while a dry mercurial was demonstrated on 67 samples. Mercury poisoning was evident in 79 of the red-dyed and in 4 of the dust-treated seedstocks. The number of treated and untreated lots, respectively that produced fungi were: Alternaria tenuis, 13 and 249; Epicoccum spp., 2 and 129; and Fusarium roseum, 5 and 9. Stains from Septoria avenae were evident on 306 of the 325 treated lots.

Another group of 306 combine-run oat lots were germinated and the numbers of developing fungi recorded. Only 11 lots were free of Alternia tenuis, less than 25% of the seeds were contaminated in 14 lots, 26-50% of the seeds in 31 lots, 51-95% in 38 lots, and at least 95% of the seeds carried this fungus in 217 of the 306 lots. The orange mycelia of Epicoccum neglectum were evident on only 1 or 2% of the seeds in 126 lots and on 3-5% of the seeds in 32 lots.

The highly pathogenic scab fungus, Fusarium roseum, was observed in 14 lots. There was no indication of varietal resistance or escape.

A portion of the combine-run lots which were, of course, received untreated were dusted with a mercurial so that the Septoria stains would be evident. At least 1% of the seeds in every lot was discolored. The maximum discoloration was 48%. The

Table 1. Chemical Injury and Common Fungi Observed in Germinating Samples of Oats Being Processed for Planting in New York State

Variety of seed, and source*	Percentage of treated lots with: These percents of chemical injury				Percentage of treated lots with: Evident stains of Septoria	Percentage of non-treated lots in which fungi or stains were present: Alternaria tenuis	Epicoccum spp.	Fusarium roseum	Septoria avenae
	0	1/2	1	1+					
						1961 Crop			
Garry*	77	8	5	10	98	100	63	4	24
"	63	7	5	25	100	100	0	0	0
Niagara*	100	0	0	0	100	100	--	50	50
Oneida*	89	4	2	5	100	100	61	7	9
"	77	11	0	12	100	--	--	--	--
Rodney*	69	6	6	19	100	100	71	8	15
"	90	10	0	0	75	--	--	--	--
Others*	73	13	0	14	100	100	31	3	19
"	95	5	0	0	75	90	67	0	0
						1962 Crop			
Garry*	87	11	1	1	100	100	39	0	12
"	72	17	3	8	94	96	42	4	0
Niagara*	67	33	0	0	83	100	0	0	0
Oneida*	62	29	5	4	73	100	36	6	16
"	89	11	0	0	58	--	--	--	--
Rodney*	60	20	13	7	93	100	50	8	0
"	33	33	11	23	100	--	--	--	--
Russell*	84	16	0	0	78	93	56	3	--
Others*	100	0	0	0	86	100	73	0	0
"	87	9	0	4	79	100	48	4	--
						1963 Crop			
Garry	93	7	0	0	86	100	72	13	--
"	93	7	0	0	94	--	--	--	--
Niagara	89	11	0	0	100	100	71	14	--
"	84	16	0	0	77	--	--	--	--
Oneida	100	0	0	0	82	100	90	0	--
"	100	0	0	0	50	--	--	--	--
Rodney	100	0	0	0	33	100	25	0	--
Russell	100	0	0	0	100	100	100	0	--
Others	100	0	0	0	100	--	--	--	--
"	50	50	0	0	75	--	--	--	--

* The upper lines represent seed lots grown in or near New York State. The lower lines, if present, represent seed lots from other states.

Table 2. Chemical Injury and Common Fungi Observed in Germinating Samples of Oats Sold in New York State

Variety of seed, and source*	Percentage of seed lots in each classification									
	These percents of chemically injured seedlings					These percents of seeds with Septoria stains				Alternaria tenuis vegetating on seeds
	0	1/4	1/2	1	2-4	0	1-5	6-25	26-75	
					Sold in 1962					
Garry*	83	4	8	0	5	18	32	45	5	18
"	84	0	8	8	0	6	50	42	2	0
Oneida*	98	2	0	0	0	27	44	29	0	0
"	84	8	8	0	0	17	50	33	0	0
Rodney*	96	4	0	0	0	0	0	50	50	0
"	53	14	5	15	13	19	29	47	5	0
Russell	64	0	18	0	18	0	28	72	0	0
Others*	80	20	0	0	0	40	40	20	0	5
"	87	4	5	0	4	9	56	35	0	4
					Sold in 1963					
Garry*	65	24	0	6	5	18	59	12	11	0
"	79	9	9	0	3	15	42	34	9	3
Oneida*	96	4	0	0	0	25	75	0	0	0
"	67	0	33	0	0	0	0	100	0	0
Rodney*	5	45	50	0	0	50	50	0	0	0
"	73	5	11	5	6	25	62	6	7	0
Russell*	89	0	11	0	0	0	44	23	33	11
"	91	0	0	5	4	10	56	29	5	9
Others*	95	5	0	0	0	0	98	2	0	0
"	77	23	0	0	0	11	44	34	11	0

* Produced in New York State

average percentages of *Septoria*-stained seeds per sample were: Ajaz, 12; Garry, 11; Oneida, 7; Rodney, 6; and others, 5.

To determine if fungi were carried internally in oats, 100-seed lots were surface-sterilized in sodium hypochlorite and plated on agar. The percentages of seed lots for each fungus isolated are: *Alternaria tenuis*, 100; *Chactomium elatum*, 3; *Epicoccum neglectum*, 62; *Fusarium poae*, 42; *Fusarium roseum*, 24; *Helminthosporium biseptatum*, 22; *Hormodendron* spp., 46; *Nigrospora oryzae*, 55; *Papularia sphaerosperma*, 4; *Stemphylium botryosum*, 15; and others, 7. The species of *Fusarium*, *Helminthosporium*, *Nigrospora* and *Papularia* are moderately to strongly pathogenic.

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*** USDA Small Grain Collections ***

by J. C. Craddock
USDA, Beltsville, Maryland

During 1963 the *Avena* collection was increased by 604 entries. Oats were obtained from nine countries, 18 states and the USDA, Beltsville. Cereal Investigation (C.I.) numbers were assigned to 103 varieties of domestic origin, 10 from Canada and one *Avena sterilis* from Israel. Plant Introduction (P.I.) numbers were assigned by the New Crops Research Branch, CRD, to the 336 samples of *Avena sativa* and 154 samples of oats other than *Avena sativa* obtained from foreign countries.

A portion of the collection previously identified as the "inactive oat collection" was grown at Aberdeen, Idaho. Seed was harvested from these 2100 oats and is now available for distribution. These oats are principally sib lines from the USDA oat breeding project. These are the sibs of lines that were either released as varieties, or given serious consideration for release.

Copies of Report (CR-85-62), "Abbreviation of Oat Varietal Names", are available upon request. Abbreviations for varieties named during 1963 are as follows:

C.I. No.	Name	Abbreviation
7473	Ortley	Orl
7639	Clintland 64	Cld 64
7670	Ausable	Asb
7684	Coachman	Chm
7811	Orbit	Obt

The oat collection is being screened at Clemson, South Carolina for entries resistant to soilborne mosaic. This nursery should be available for observation during the Southern Small Grain Workers' Conference this spring.

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*** Chemical Weed Control in Oats ***

by M. B. Moore (Minnesota)

For several years annual weeds have been controlled more or less successfully in the oat disease nurseries at St. Paul by a single spray of diuron (Karmex) at 4/5 lb/A applied when the oats plants were in the 3-5 leaf stage. This practice was adopted following the successful use of the material by Buckholtz and Arawinko in Wisconsin.1/ However, with no late cultivation or hand weeding the later emerging crabgrass and witchgrass have become increasingly troublesome, apparently germinating after the diuron has lost some of its effectiveness. Consultation with herbicide specialists* on the St. Paul Campus singled out Dacthal (dimethyl ester of tetrachloroterephthalic acid) as a promising material to test experimentally either alone or in some combination or sequence with diuron to control both early and late emerging weeds. Dacthal is said to have pre-emergence selective action against a number of troublesome annual weeds including crabgrass, witchgrass green and yellow foxtails, stinkgrass, purslane and lambsquarters, but is tolerated by a broad range of crop plants.2/ Information was not available on the tolerance of cereal grains but wild oats are listed as tolerant and it was hoped that tame oats might be also. Dacthal has little post-emergence effect on most crops or weeds, and thus might be applied after the cereal crop is up but before most weeds have emerged.

To test the possible usefulness of Dacthal for weed control in small plot work with cereals several tests were made with oats in the greenhouse and with oats, barley, and wheat in the field. Tests have been made in only one season and results should not be taken as conclusive.

Pre-emergence applications of 8, 16, 32 lbs/A (8 lbs is the recommended rate) to oats in the greenhouse resulted in 5, 8 and 21 percent stunted plants when made at planting time, and in 0, 1, and 3 percent stunted plants when delayed until just prior to emergence. Plants not stunted in the seedling stage grew normally thereafter. Applications in 1- or 2-leaf stages caused no injury at any of the three rates. Control of crabgrass and witchgrass was complete in all tests.

In the field pre-emergence applications of 8, 16, 32 lbs/A were made to oats, wheat and barley 2 and 7 days after planting, and post-emergence applications were made at the same rates at the 1-leaf and 3 to 5-leaf stages. The only stunting observed was of a very few seedlings at the two higher rates in the 2 day application. With two exceptions post-emergence applications at any stage or rate caused no apparent injury. Regardless of dosage or time of

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1/ 1956 Natl. Oat News Letter 7:80-81. 1957.

2/ Research Bull., Rev. Feb 1963. Diamond Alkali Chemical Co., Agric. Chems. T. R. Evans Research Center., P.O. Box 348, Painesville, Ohio.

* R. E. Nylund, R. N. Andersen, R. Behrens.

application no apparent injury developed beyond the seedling stage.

A general application of 10 lb/A to oats in which about one-half of the first leaf had emerged caused numerous small necrotic leaf spots on the varieties Saia and Canadian. However the injury remained localized on the plants and they grew normally thereafter. This field area included the uniform oats smut nursery of 46 varieties. All of these with the exception of Saia were unaffected by the spray.

The degree of weed control in all of the field tests was estimated. The early pre-emergence applications resulted in the best control and effectiveness declined progressively with increasing delay of application. Nevertheless, it appeared that control of susceptible weeds which had not already emerged at the time of application was nearly complete.

Further investigations with Dacthal seem warranted. Early or delayed pre-emergence applications were the most effective for weed control but also the most likely to injure the crop plants. A fine seed bed might insure complete coverage and protection of the crop seed. Moderately deep planting could do the same thing. Amount of rainfall could affect penetration of the chemical into the soil. Observations of the effects of top watering suggest that penetration into the soil is slow.

At the present state of knowledge an early post-emergence application would seem to be safest. This could be followed with an application of diuron at the 3 to 5-leaf stage to clean up escapes and tolerant species.

Dacthal and diuron were combined in one test and applied at 3 to 5 leaf stage with no greater injury to oats than that caused by diuron alone. But weed control was less effective than with the earlier applications of Dacthal alone or of Dacthal applied at an early stage and followed by diuron at the 3 to 5-leaf stage.

Dacthal also has been applied in combination with Maneb and nicotine sulfate to oats without injury.

For wheat and barley Dacthal seems safe whereas diuron is not.

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*** Spanish "Gold" ***

by Franklin A. Coffman, USDA

The history of our present day cereal varieties is of wide interest. Often such information is helpful in interpreting the results from present day inheritance studies. In this connection it is of interest to those working with winter oats that the primary source of such in America has been the old, heterogeneous variety variously known as "Texas Red," "Red Rustproof," "Red Texas," and by other names.

Several stories as to the introduction of this oat into the United States exist. One story appeared in an old commercial seed catalogue published in Pennsylvania in 1889. This story indicated that the variety started in south Georgia from volunteer plants found growing on an old camp site following the war (1861-1864). This story was given some little publicity.

More recently, however, U. R. Gore of Georgia, searching the published records of the Georgia State Agriculture Society for 1876 (pp. 129-130), reported to this writer that those records revealed that it had been reported by a Mr. Merriam of South Carolina that his oats came from Mexico in 1848 or 1849. Apparently Merriam obtained his oats from a neighbor who claimed they would not rust. These were called "Red Mexican-rust-proof" oats, and according to Merriam, they were brought to South Carolina from Mexico by a soldier (of the Mexican War) in 1848 or 1849.

The late G. W. Hendry of California University made extensive collections and carefully studied seeds he obtained from adobe bricks taken from the ruins of old Spanish Missions built by the Catholic Church in Mexico and southwestern United States. Among sources of Hendry's specimens were the ruins of San Vincente Ferrer, San Vincente, B. C., Mexico, built in 1780, and San Jose de Guadalupe and Rancho Vallijo built in California in 1797 and 1834, respectively.

Some 40 years ago Hendry sent specimen oat kernels, he had obtained from those old bricks, to this writer for examination and, if possible, for varietal identification. Some of these kernels were observed to be of the old "Red Rustproof type." This observation was not surprising since it is well known that oats of that general type have been grown in Spain and in the Mediterranean region for centuries. Seed of oats of this general type were observed by this writer in the Mediterranean region in the autumn of 1963.

As a consequence, the discoveries made by Hendry and the story reported by Gore are considered sufficient reason for believing that the "Red Rustproof" oats of this country were introduced into the United States from Mexico and earlier into Mexico from Spain, or at least the Mediterranean area. It seems clear that these oats were very likely brought to America by the clergy of the Catholic Church. Otherwise, those kernels would likely not have existed in the soil from which they made their adobe bricks for the building of their Missions, nearly two centuries ago.

It is now nearly 40 years since this writer made his first extended trip throughout southern United States. Numerous fields of "Red Rustproof" oats were observed at that time. Some of these fields were of improved strains such as Appler, Ferguson 71, etc., but on the general farms of the South most often the fields were of "unimproved Red Texas" or "Red Rustproof." At that time the latter fields were frequently almost a "hodgepodge" of different oat types. The most common type in these mixtures was that similar to Appler, but many tall, late-growing, vigorous plants as well as shorter and earlier types were seen. The predominant kernel color was red, but numerous gray-kerneled and a scattering of black as well as yellow-kerneled plants were observed. Consequently, the "Red Rustproof" oats as originally grown in the United States were actually a collection of different types. This explains why, although Red Rustproof is the source of numerous "typical Red Rustproof" types, it has also been the source of many selections that differ widely in morphologic characters.

In 1892, J. A. Fulghum, a farmer of Georgia, selected Fulghum from a field of Red Rustproof. In 1912, the late C. W. Warburton received from E. F. Cauthen of Alabama 5 ounces of Fulghum oats to which Warburton assigned C. I. 699. In 1920, the late T. R. Stanton reselected C. I. 699. Among his selections two have proved exceptionally valuable. These are Pentagon and its sister selection, C. I. 2500.

In 1930, N. I. Hancock of Tennessee observed that Pentagon was not entirely homozygous and selected from it the very hardy strains Fulwin, Tennex, and Forkedeer. Early in this century the late C. W. Warburton of the USDA selected the plump, yellow-kerneled, awnless oat he named Aurora from Red Rustproof. Aurora is included in the parental background of numerous present-day oats. The history of Ferguson Navarro, another oat that has proved of great importance in breeding varieties for the South, was supplied by the late A. M. Ferguson of Texas. It too was apparently a selection from Red Rustproof and was first grown in Navarro County, Texas. Burt, an extremely variable variety formerly grown to some extent from fall seeding but more often spring-sown, was according to Coffman et al. another oat selected from Red Rustproof. Burt is supposed to have made his selection in 1878 in Greene County, southern Alabama.

The most recently discovered known derivative of Red Rustproof is Ballard. The history of Ballard is apparently similar to that of Fulwin except that Ballard was selected from Pentagon in Kentucky by L. M. Josephson, tested widely in Kentucky by D. A. Reid, and later in Pennsylvania by C. S. Bryner. Its degree of hardiness and mosaic resistance was determined in cooperative nurseries grown for several years. Ballard is somewhat similar to those hardy Pentagon derivatives selected in Tennessee but is superior to them in many respects. Its kernels are gray. It is exceptionally hardy, highly tolerant to soil-borne mosaic, vigorous-growing, high-yielding, but has exceptionally weak straw. Ballard has been used extensively in crosses.

Two other oats supposedly selected from "Red Rustproof type oats" are California Red and Coast Black, grown primarily in California.

Present basic varietal types of semi-hardy to very hardy winter oats derived from known crosses are Wintok, Lee, Arlington, Mustang, Fulgrain, and Victorgrain. The histories of all are known and each includes in its parental background one or more of the Red Rustproof derivatives mentioned above. Another exceptionally hardy oat in America today is the New York variety Nysel. It was selected by H. H. Love and N. F. Jensen of Ithaca, New York, as one of a very few plants that survived a severe winter in the uniform winter hardiness nursery sown at Ithaca. In kernel color, as well as in plant characters, plus its high susceptibility to soil-borne mosaic, Nysel resembles, in several respects, the hybrid strains from the cross Colo x Wintok, recently named Colwin. Wintok resulted as a selection by the late C. B. Cross of Oklahoma from progeny of the cross Hairy Culberson x Fulghum C. I. 2500 made by W. D. Mankin then of the USDA. It is shown that C. I. 2500 was a sister of Pentagon.

Hence it would appear that all of these oats were derived directly or indirectly, in part at least, from "Red Rustproof." Other than Winter Turf this leaves the history of Culberson alone to be traced.

There are several reports of interest as to the origin of Culberson. A story heard by this writer when on a trip through the South nearly 40 years ago, was, that following an exceptionally severe winter, only a scattering few plants survived in a field that had been sown to "Red Rustproof" oats. These plants were saved "in bulk" by a man named Culberson, and the variety named Culberson was the result. Based on the above story this writer indicated Culberson "resulted from mass selection from "Red Rustproof." Later, the late T. R. Stanton mentioned this "bulk selection" theory in his Oat Classification Bulletin. Among other references in literature on the subject is one by Duggar and Cauthen of Alabama in 1913. They state of Culberson--"This appears to be a strain of Red oats. The strain is perhaps a little taller." In 1916, Childs of Georgia states, "Culberson oats are of several different types. Some strains are like the Red Rustproof group described. The strain grown at Athens (Georgia) has a spreading panicle, light, slender grains that are nearly white in color and without awns."

The variable condition of Culberson is also shown by the fact that Mooers of Tennessee in 1926 states, "The Culberson oat used was the short growing strain (Dwarf Culberson) obtained by selection at the Knoxville Station some twenty years ago." In 1908, Tech, which has black kernels, was selected from Culberson at Blacksburg, Virginia, by T. B. Hutcheson. Stanton of the USDA stated that he obtained Hairy Culberson as a reselection of the Culberson strain selected by C. W. Warburton in 1904. Thus, Culberson has given rise to a number of different types indicating that the story of its origin by mass selection from "Red Rustproof" is most likely correct. With the tracing of Culberson to "Red Rustproof" only Winter Turf remains in question.

The history of Winter Turf also known as Virginia Grey, Gray Winter, Oregon Gray, etc., is still unknown. The variety has been comparatively homozygous for decades. It is considerably later to mature than all the other well known winter oat types grown in this country. This of course tends to preclude natural crossing in Turf. Just how long the variety has been grown in America is not known but certainly it seems for decades even prior to 1900. Coffman, who traced the earliest references on oats sown in America, indicated that George Washington planted oats in the autumn of 1764 at Mt. Vernon in Virginia. Also that winter oats were apparently sown for the first time in Germany in 1757. The seed sown in Germany was supposedly received from England. It is known that oats of the Winter Turf type are still being grown in England. The seed sown in Germany in 1757 were described as "black." It is known that under some conditions Winter Turf, normally gray, may develop much more color than usual. Probably only an oat specialist would differentiate between dark gray and black oats. Just when and where Winter Turf was first grown in America remains unknown. Possibly the historical records in Virginia may yield some information on the subject. The idea that George Washington might have seeded Winter Turf oats at Mt. Vernon in 1764 will not be offered without further checking, but it would appear that Winter Turf, which may have been grown for at least a century or more in Virginia and nearby states, is the only important winter oat type in America that has not yet been traced directly or indirectly to that original "hodgepodge" of "Red Rustproof" that apparently came to this country from Spain by way of Mexico and/or the southwestern states.

Hence, it now seems clear that the Spanish Catholic Clergy modestly made a contribution to American agriculture that may well exceed in value most of, if not all, the mythical golden stores envisioned by those long-famed Spanish adventurers and explorers, many of whom so feverishly followed fantasies of fabulous affluence.

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*** Seed Treatments for Oats ***

by W. F. Crosier (Cornell University) Geneva, N. Y.

Although today's varieties of oats are highly resistant to the smuts, it is desirable to continue seed treatment practices and research. In general any chemical formulation that will control oat smuts in the older susceptible varieties will also reduce or control blights, seed discoloration, scab, and seed decay in any variety. For this reason chemical formulations designed for treatment of oat seeds are usually evaluated in terms of control of oat smuts caused by *Ustilago avenae* and *U. kolleri*.

All of the commercially available and several of the experimental formulations are tested annually at Geneva, New York. During the course of this testing as well as that of the Co-operative Seed Treatment Trials for Canada and United States it was observed that smut was easily controlled in certain lots but persisted in others. Artificially contaminated (smutted) lots, especially of the Wisconsin State's Pride variety, seemed to be unlike naturally infested lots in regard to protection of the spores and promycelia from mercury vapors. The abilities of 16 formulations, including 3 non-mercurials, at 2 dosage rates to reduce smuts were determined in 1963 for 3 susceptible varieties.

Seeds of Anthony, State's Pride, and Vanguard oats were soaked in spore suspensions, agitated briefly, then dried and treated with the formulations listed in Table 1. As expected, no chemical killed all of the artificially established spores in State's Pride, whereas several formulations at the manufacturers' recommended rates prevented smut in the Anthony and Vanguard varieties.

With two exceptions, no mercurial formulation was statistically inferior to the best one. One of the non-mercurials, Chemagro 4497, was better than the average of the mercurials. The other two non-mercurials, while excellent in the control of bunt of wheat, were clearly not oat smuticides. Chemagro 4497 is volatile and can reach the smut spores within the palea and lemma, whereas Bayer 47531 and TCNA develop no vapor pressure.

In New York, as well as in other states, mercurial formulations may be evaluated on the basis of smut control by vapors alone, i.e. the chemical is not applied directly to the seed, but is placed a short distance away.

The New York system consists of treating dead oat seeds at a 3X (triple) dosage rate and using them as the mercury source for the live, smut-infested seeds. In 1962 and again in 1963 two lots each of three varieties were placed in indirect, or fume action, treatment experiments. The methods of exposing the live seeds to the heavily-treated dead seeds were: (1) agitation, 1 volume of dead briefly agitated with 2 volumes of live seeds; (2) mixing, 1 volume of dead merely added to 2 volumes of live seeds; (3) layered, alternating layers (1 to 2 cm. thickness) of dead and live seeds; and (4) bagged, 1 volume of live seeds in a cloth bag enclosed by 1 volume of dead seeds.

As shown in Table 2 the mercurial formulations were effective in a vapor state. The vapors generated in a mass of treated oats were able to diffuse for a distance of at least 1 cm. in the "layered" seed and up to 3 cm. in the "bagged" seed.

The active ingredient of Gallotox is the slightly volatile phenyl mercury acetate. This formulation was somewhat less effective than the highly volatile compounds.

Seed Pathology Laboratory
January 10, 1964

Table 1. Control of oat smuts by direct application of seed-treating fungicides

Name or code designation of fungicide	Mean percent of smutted panicles						
	Anthony		State's Pride		Vanguard		
	1R*	2/3R	1R	2/3R	1R	2/3R	Average
Bayer 47531	1.1	7.2	17.	23.	12.	22.	14.
Ceresan M	0.1	0.2	1.8	3.8	0.1	1.7	1.3
Ceresan MDB	0.1	0.1	3.6	5.8	0.2	0.3	1.7
Ceresan L	0.2	2.1	2.6	7.6	0.3	3.8	2.8
Ceresan 1966	0.0	0.2	1.3	2.3	0.0	0.0	0.6
Chemagro 4497	0.0	0.3	3.2	3.3	0.0	0.0	1.1
Chipcote 25	0.1	1.2	3.7	6.5	0.1	0.6	2.0
Corona S, Conc.	0.1	0.8	4.1	16.	0.2	1.1	4.0
Corona S, Dilute	0.1	0.9	1.9	9.9	0.1	0.4	2.2
Corona TCNA	4.2	5.0	12.	13.	11.	15.	10.
Metasol MP	0.0	1.1	2.0	10.	0.0	1.2	2.4
Morton EP225	0.0	0.3	2.5	7.4	0.0	0.4	1.8
Panogen 15	0.0	0.6	1.0	9.4	0.0	0.7	1.9
Stauffer 242	0.0	0.2	6.4	9.9	0.0	0.3	4.8
Stauffer 271	0.0	2.3	9.4	19.	0.0	2.3	5.5
Stauffer 274	0.0	0.2	2.5	4.4	0.0	0.3	1.2
No Treatment	18.	19.	32.	31.	28.	27.	26.

* 1R and 2/3R indicates that the dosage rate was that recommended by the manufacturer and 2/3rds of that amount respectively.

Table 2. Control of oat smut by indirect, fume action, seed treatment

Name or code designation of fungicide	Mean percent of smutted panicles when treatment method was				
	Agitation	Mixing	Layering	Bagging	Average
Ceresan L	1.4	1.8	0.5	1.2	1.3
Ceresan M	0.3	1.3	0.2	0.2	0.5
Chipcote	0.7	0.9	0.7	1.4	0.9
Corona S	1.2	1.9	0.7	0.8	1.1
Gallotox	1.0	3.9	3.6	3.6	3.1
Metasol MP	0.5	0.9	0.4	0.2	0.5
Morton EP228	0.5	1.0	0.1	0.3	0.5
Ortho LM	0.9	1.1	0.3	1.0	0.8
Panogen	0.9	1.4	0.5	0.5	0.8
Stauffer MV	0.5	1.0	0.3	0.4	0.5
No treatment	11.	10.	9.2	9.7	10.

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*** Aneuploids for Commercial Hybrid Oats? ***

by H. N. Lafever and F. L. Patterson, Purdue University

The occurrence of a vigorous male-sterile nullisomic in Clintland 60 sib line suggested experiments on hybrid oats. The nullisomic was male sterile in some controlled environments (80° F) but was partially male fertile and produced 0-55% seed set at 60° F. The nullisomic set about 1% seed in bagged panicles in the field in 1959. The monosomic was nearly fully fertile. Quartet analyses of monosomics and observed segregation for fertile and sterile plants from selfed monosomics suggested that 20-chromosome gametes were functional in both pollen and egg. Selfed monosomics produced nullisomics, monosomics, and disomics in a ratio of 4.85:0.95:0.05 respectively.

Natural crossing in the field in 1959 to produce seed for yield trials in the F_1, used the nullisomic Clintland 60 sib as the female parent and resulted in about 12% seed set. The source of the nullisomic female parent was selfed monosomics. This gave about 83% nullisomics, 16% monosomics, and 1% disomics in the nullisomic stock row. Seed from crosses produced fertile monosomic plants except for some fertilized by 20-chromosome gametes from monosomic plants in the stock. These were sterile nullisomics which had to be contended with in estimating heterosis in the F_1 generation.

Five crosses were examined for heterosis in the F_1 and 6 in the F_2. Pollen parents were Ajax C.I. 4157, Andrew C.I. 4170, Fundy C.I. 7288, Minhafer C.I. 6913, M.O. 0-205 and for the F_2, Burnett C.I. 6537. In addition fertile Clintland 60 sib was also used as pollen parent to produce new monosomics for determining vigor of monosomics and for comparing yields of fertile plants in mixed fertile and sterile spaced plant yield trials with fertile disomics at the same spacing.

In yield trials of heterosis in the F_1 in space planted (4 inch) field trials, crosses were main plots. Each main plot contained 1 row each of: (a) F_1 monosomic of the cross, (b) F_1 monosomic Clintland 60 sib, (c) pollen parent, and (d) Clintland 60. The F_1 Clintland 60 sib monosomic was not significantly different from Clintland 60, thereby validating the experiment.

Only the F_1 of Clintland 60 sib X Fundy exceeded the better parent in yield to any extent. This increase was not significant. In no case was a yield component of F_1 significantly higher than the higher yielding parent. In only one case was a yield component of F_1 higher than that of the higher yielding parent.

Changes in one yield component were generally unrelated to changes in others. Only 4 of 33 correlations among yield components were significant.

In F_2 yield trials using selfed monosomics at normal seeding rates, a major problem of correcting yields for sterile (nullisomic) plants was involved. The theoretical percent of sterile plants was about 83% whereas the highest percent of sterile panicles counted was 52. Yields were 2 or 3 times greater than pollen parents when corrected for sterile plants but lower than the pollen parents when corrected for sterile panicles. Fertile plants in F_2 populations were more competitive than sterile but the yield increase was not in proportion to the increase in tillers.

The low natural cross-pollination, 12%, and little indication of hybrid vigor in these experiments appear to be the major problems to which additional research should be directed.

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*** Second Generation Amphiploids Between Crosses of Two Tetraploids and Common Oats ***

by H. L. Shands and R. A. Forsberg (Madison, Wisc.)

This is a continuation of observations on amphiploids first reported in Oat Newsletter XII, page 28, where the first generation (A_1) results were briefly described after the 1961 growing season. Two tetraploids with crown rust resistance were crossed with common oats and the pentaploids were treated with colchicine for doubling chromosomes by Dr. E. R. Sears. Chromosome counts have not been made in any of the generations.

Planting of the A_2 generation in 1962 was slightly later than the larger portion of the nursery. Three amphiploid populations were grown:

	Parents	
A_2 Population No.	Tetraploid	Hexaploid
1	A. barbata var. excoimbra (no. 20)	X969-5
2	C.I. 7232	X969-5
3	A. barbata var. excoimbra (no. 20)	Clinton

The first and third populations were derived from more than one pentaploid F_1 plant, while the second was derived from a single plant. Each A_2 population was grown in 7 or more 10' rows, giving approximately 80-200 plants per population.

Population 1.--Plant height in a sub-population varied within lines but more so among lines from different A_1 plants and ranged from 32 to 39 inches. Plant spikelet fertility varied from sterile to 42 per cent. Some plants had broad appearing kernels. While crown and stem rust were present, it was not possible to determine their reaction satisfactorily; but crown rust resistance seemed probable. The second sub-population had height similar to that of the first (33-43"). Spikelet fertility varied from 9 to 83 per cent. Stem rust graded from 4 to 45 per cent. A few plants appeared crown rust resistant, and they were late-maturing types.

Population 2.--The most outstanding feature of this population was short plant height of 22 to 29". Spikelet fertility varied from 9 to 82 per cent. Stem rust infection was lower than Population 1. A few plants had large kernels.

Population 3.--The third A_2 population (A. barbata x Clinton) had the tallest plants--35-48"--and a fertility average higher than others, ranging from 5 to 100 per cent. Crown rust resistance appeared to be associated with later maturing plants.

The third amphiploid generation was grown in 1963, an unfavorable season for plant and rust development. Plants were harvested and have been stored for later evaluation.

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*** Morphological Characters Associated with Lodging Resistance in Milford-type Oats ***

by F. L. Patterson, P. Bhamonchant, J. F. Schafer, R. M. Caldwell, and L. E. Compton, Purdue University

The Milford oat introduced from Wales has excellent straw strength and moderately dense panicles. In backcross progenies of 4 Milford-type parents with moderately dense panicles and 14 parents with open panicle type, 100 segregating to 97 non-segregating progenies were obtained, suggesting a single factor pair of major importance in determining panicle size. While there was considerable range in panicle size, the occurrence of moderately dense panicles distinguished segregating progenies.

The association of panicle type and panicle width, with straw strength was studied on spaced F_2 plants in 12 crosses. Panicle type was classified into 5 classes on size. Of the 6 parents involved in the 12 crosses 2 were open (class 1), 2 were moderately dense (class 5), 1 was class 3, and 1 was class 4. Straw strength was determined by the chain method. Panicle types 1 to 5 were obtained in F_2. The correlation between visually rated panicle type and straw strength was +0.645 in 1959 and +0.555 in 1960. These correlations were as high as those between measured panicle width and straw strength. Selection for panicle type in these materials should give good progress in improving straw strength.

Since panicle type *per se* was not contributing to straw strength, other morphological characters were studied which might have a direct effect on straw strength in segregating populations from crosses involving Milford-type oats. The relation between 11 characters and lodging resistance was studied in F_3 progenies of 100 random F_2 plants from the cross Ottawa 3928-5-8-2 X Purdue 543C1-16 spring oats. Lodging resistance was determined by a modified chain method not corrected for plant height. The correlation of height or elements of height (node number or length of different internodes) and lodging resistance were generally low. Culm diameter measurements were the most highly correlated with lodging resistance (+0.633 to +0.639).

The path-coefficient analysis technique was used to analyze the interrelationships of 4 variables and lodging resistance. These were plant height, diameter of second internode, length of third internode, and length of leaf sheath.

About 50% of the variation in straw strength was associated with these 4 variables and 50% to unknown variables.

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*** Stem Characteristics of a Segregate of Richland-Bond Crossed with Royal Scot Oats ***

by H. L. Shands and D. C. Hess (Madison, Wisc.)

In 1946 culms of certain oat selections were found lying in nursery alleys after moderately high winds. Culm breakage near the soil line revealed a near-solid condition. These observations were confirmed later. Culm bases were near-solid during early growth and early maturation. Culms have thicker walls and greater diameters than Kherson types. Though snap-back was somewhat low, lodging response was intermediate to resistance. The selection is X315-1, from the cross X215-4 (Richland-Bond sel.) x Royal Scot. It is susceptible to H. victoriae, having been transmitted by the Richland-Bond line. The second author is studying progenies of hybrid lines using X315-1 as a parent.

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*** Evidence of Complementary Genes for Crown Rust Resistance ***

by David E. Zimmer, John F. Schafer, and Fred L. Patterson (Purdue University)

Mutations for virulence to Ukraine oats in 2 monouredial clones of Puccinia coronata Cda. to which Ukraine was highly resistant were reported by Zimmer et al. (5). Green Russian produced an intermediate reaction to the Ukraine-avirulent clones and was fully susceptible to all Ukraine-virulent mutants.

A field population of Ukraine-avirulent P. coronata, following passage through the telial and aecial stages, segregated in a

26:12 ratio for avirulence and virulence to Ukraine, with 2 additional mesothetic segregants. All segregants virulent to Ukraine were also virulent to Green Russian, except for one mesothetic segregant. The Ukraine-avirulent progenies segregated in a 7:13:6 ratio for avirulence, intermediacy, and virulence to Green Russian.

These results indicate a common gene for virulence to Ukraine and Green Russian and a second independent gene for virulence to Green Russian. On the presumption of corresponding genes in the pathogen for avirulence and virulence and in the host for resistance and susceptibility, it is suggested that Ukraine and Green Russian possess a resistance gene in common. A second resistance gene is suggested for Green Russian corresponding to the second gene for virulence. As either virulence gene is effective alone, these resistance genes appear complementary. The fact that Ukraine is resistant to Green Russian-virulent segregant cultures suggests a second resistance gene also possessed by Ukraine. Because apparently single-gene mutant and single-gene segregant cultures attack Ukraine, its resistance is also suggested to be complementary.

It appears that Ukraine and Green Russian each has a set of complementary genes for resistance to *P. coronata*, that they possess one member in common, but that the resistance gene that is complementary to the common gene is different in the 2 varieties. The proposal of complementary genes for resistance of Ukraine is supported by studies of Weetman (4) but not by those of V. C. Finkner (2), R. E. Finkner *et al.* (1), and Sanderson (3), although reconciliation of the various results does not appear impossible.

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BIRDS, BIRDS, BIRDS

*** Controlling Bird Damage in Oat Plots ***

by R. C. McGinnis
Plant Science Dept., University of Manitoba
Winnipeg, Man.

In the summer of 1963, we grew a large number of lines of oat monosomics for increase in a plot 150' x 40'. We followed the procedure with a few modifications described by H. R. Klinck in "Cereal News" Vol. 7, (2):24-25, 1962, and obtained almost complete control. The method consists of setting 2" x 2" stakes about 6' long at intervals of 30 feet, around the outside of the plot. Black thread was strung at 6" intervals from stake to stake starting about 24" from the ground, to the top of the stakes. We found linen thread to be much more durable than cotton. One of the pathways was left open at one end of the plot to permit access.

It was interesting to watch a flock of sparrows or finches descend upon the plot. Swooping in for a landing they would suddenly be stopped by the threads (which are invisible), lose their balance and almost tumble to the ground. They would make cries of surprise or distress and leave the area as quickly as possible. Undoubtedly the impact also caused some physical discomfort as well.

Although the occasional birds did enter the plot without mishap, the amount of damage was negligible and we were pleasantly surprised at the excellent results.

The Canada Department of Agriculture Research Station, located on the campus, also followed this procedure and protected three plots successfully.

In all cases, of course, there was ample material outside the plots for the birds to feed on.

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*** Note on an Artificial Hawk for Frightening Birds ***

by W. H. Waddell, Crop Science Department
Ontario Agricultural College, Guelph, Ontario

Every year considerable bird damage is experienced in experimental grain plots in certain areas. Several methods of combating these losses have been employed, in most cases with little success.

At the Ontario Agricultural College, Guelph, "bangers" operated by acetelyne gas have been used to frighten sparrows. This method has been partially successful but is very unpopular with local residents. Cloth pennants and coloured tinsel strips strung on wires have been of some value. Cotton threads strung over small areas has given good results during the past four years at Guelph. The threads cannot be seen by the birds as they fly in. This method would be impracticable on large areas.

Visitors to Europe have reported a successful device which consisted of an artificial hawk supported by a balloon and anchored to the ground. In the summer of 1962 a similar device was tested in Guelph.

The hawk was constructed of cardboard strengthened with wires, and presented a very natural appearance while hovering over the plots. An 8-inch balloon1/ was inflated to a diameter of four feet with hydrogen supplied from a pressure tank. A 20-pound fishing line with ball-bearing swivels connected the hawk to the balloon and to the ground. Each section of the line was about 20 feet long.

Some expenditure of time and money was required since it was necessary to inflate a new balloon daily. However, for areas of from three to four acres, the hawk-balloon device for frightening birds was quite successful at Guelph.

1/ Meteorological balloon supplied by the Sterling Rubber Company, Limited, Guelph, Ontario.

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*** Note on Methods Employed at Welsh Plant Breeding Station to Prevent Bird Damage in Cereals ***

by J. D. Hayes (Aberystwyth)

In order to avoid damage by birds, especially sparrows, tits and finches, most of our F_1 hybrids and selected F_2 segregating populations are grown in the open in a large nursery permanently protected from birds by small-mesh wire netting.

During the last 3 seasons, in an attempt to combat bird damage in large field trials without netting protection, we have used a proprietary compound Morkit 80, which contains as its active constituent 80% anthroquinone, applied as a spray just before the spikelets have reached the milky-ripe stage. The effectiveness of this method depends on weather conditions just after spraying; if the weather has continued dry the results have been quite promising. This compound is apparently obnoxious to birds but non-poisonous, and is claimed to be harmless to animals and humans. It does not appear to have any adverse effect on grain production.

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*** Bird Damage ***

by G. M. Wright, New Zealand

Damage by sparrows to early-maturing lines of wheat and oats in the early dough stage is a major hazard in the breeding plots and yield trials at the Crop Research Division. Damage to wheat on farms in the province of Canterbury has been estimated to average 1/4 bushel per acre (Wright, G. M., 1958. N.Z. Wheat Review 7: 25-41).

Control in small plots has been achieved by the following methods:

(1) Electronic scarer (high-voltage wiring) surrounding breeding plots. This system from Wyoming was effective but has been discontinued pending changes to reduce radio-telephone interference.

(2) Cotton threads criss-crossed at head level.

(3) Fine rayon threads supplied by Chase Organics (G.B.) Ltd., Shepperton, Middlesex, England. The product, named Scaraweb, is

supplied in hanks which are teased out over the plot. Effective on small plots of oats, but not on sectors of drilled plots, and only effective on wheat if not tangled by wind.

(4) Permanent netting cages used for late-sown breeding plots.

(5) Temporary cages, 52' x 12'6", covered with 3/4" netting. Cotton netting is good for one season only, but we have on order a less expensive Japanese synthetic netting, Kuralon, which should last longer.

(6) Crossing bags on a few heads have a deterrent effect.

(7) Organophosphate insecticides have a repellent effect for a few days.

These methods are naturally more effective if alternative food supplies are provided.

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III. CONTRIBUTIONS FROM OTHER COUNTRIES

AUSTRALIA

*** A Tour of Oat Breeding Centres in the Northern Hemisphere ***

by P. M. Guerin, Agricultural Research Station, Glen Innes, New South Wales

Between late October and the 24th December, 1963, I had a short but extremely interesting tour, visiting oat breeders at the following Stations:

France	Versailles (S.& O.) and Rennes (Brittany).
Ireland	Department of Agriculture, Dublin.
	University College Dublin Farm at Glasnevin.
England	Cambridge Plant Breeding Institute.
Wales	Aberystwyth Plant Breeding Station.
Northern Ireland	Plant Breeding Station, Loughall, Armagh.
Scotland	Scottish Plant Breeding Station, Pentlandfield.
Sweden	Weibullsholm.
	Svalof.
Netherlands	Wageningen.

United States	U.S.D.A., Beltsville, Maryland. Cornell University. University of California, Davis.

To all the research workers, managers and breeders to whom I am so indebted for their hospitality and courtesy I will be corresponding in due course.

The following effort, which is open to correction, is an attempt to pin-point local problems in each of the three broad regions visited. For instance, lodging is a serious problem throughout the British Isles but I would expect to see the most severe lodging on heavy fertile limestone soils in central Ireland. The dry alkaline soils of western Scotland are a different proposition. Again, I should perhaps have written Middle Sweden for the crown and stem rust and inserted highland California under frost. If this lay-out can be improved upon and extended by other oat breeders, well and good. I think it is interesting to know what are the local problems in their order of priority for breeding effort and also to which region we can turn for material subjected to a particular selection pressure, e.g., frost at New York, Cambridge, or Versailles; late maturity in Ireland; earliness in California; grazing in damp winters at Aberystwyth or in frosty winters at Glen Innes; barley yellow dwarf in Sweden or anywhere else; rust in North America, Sweden or New South Wales. Many other oat or potential oat growing countries or regions remain to be visited and brought into an international endeavour if the oat crop is to be fully exploited. I must say also that visiting is much better than writing.

(1) <u>CONTINENTAL AREAS (Sweden, U.S.A., N.S.W.)</u>

Crown rust	Stem rust	Barley yellow dwarf
Sweden Washington New York Glen Innes	Sweden Washington New York Glen Innes	Sweden Washington New York California Glen Innes
Frost	**Root nematodes**	**Water-logging**
Washington New York Glen Innes	Sweden	Sweden (wet peat) Glen Innes (minor flooding)
Drought	**Shattering**	**Grazing**
Sweden Washington New York California Glen Innes	California (Western N.S.W.)	California Glen Innes

(2) OCEANIC AREAS (British Isles and Brittany of France)

Crown rust	Stem rust	Barley yellow dwarf
Brittany Wales	rare	rare

Frost	Stem eelworm	Alkaline soils
Brittany England Wales	England Scotland Wales	Scotland

Drought	Lodging	Grazing	Mildew
England	Ireland	Wales	Brittany British Isles

(3) SUBOCEANIC AREAS (France, Netherlands)

Drought	Root nematodes	Stem rust (moderate)
Versailles	Netherlands	Versailles

Frost (testing only)
Versailles
Wageningen

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CANADA

*** Yellow-leaf Condition on Oats in Southwestern Ontario in 1963 ***

by F. J. Zillinksy, Ottawa

A conspicuous leaf yellowing occurred on early seeded oats in southwestern Ontario in June, 1963. Reports of the condition were received between June 1 and June 6 from growers in at least 12 counties. The yellowing occurred in irregular patches varying from small groups of plants to extensive areas affecting most of the field. Most of the affected plants recovered. By June 24 the only visible signs of the condition were thin stands and shorter plants with brown withered lower leaves. Yield reductions were estimated from slight to 30 percent depending upon the degree of infection.

Barley yellow dwarf virus and halo blight were top suspects during investigations on the cause of the condition. Barley yellow dwarf was ruled out when it was found that the three most probable aphid species failed to transmit the disease, affected plants generally recovered and symptoms were not typical of BYDV on oats. At least three different bacterial isolates were obtained from affected plants having bacterial type lesions. Two isolates produced more or less typical halo blight symptoms when healthy seedlings were inoculated. The typical leaf yellowing was not obtained. In the affected patches all yellowed plants did not have halo blight symptoms nor was the halo blight restricted to the yellowed patches. Root symptoms of affected plants appeared normal. There did not appear to be an association between the yellow-leaf condition and the previous crop, cultural practices, topography, soil type, nematodes, fertilizers or herbical sprays.

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*** Rust Situation in Ontario 1963 ***

by F. J. Zillinsky

The Appleton and Merrickville rust nurseries appear to have been as severely infected as any in North America in spite of moving the nursery areas several miles from heavy infestations of barberry and buckthorn. Among the newly isolated races of stem rust is 6AF obtained from La Pocatiere and Merrickville. Barberry was involved in both isolations.

Naturally occurring stem rust in the 1963 Appleton nursery infected all but three of 78 strains from the world oat collection which were screened for resistance to the La Pocatiere isolate of 6AF under greenhouse conditions. The Merrickville isolate of 6AF was apparently more virulent and generally gave M.S. reactions on the same strains. C.I. 5844 and C.I. 6790 were found to be the most resistant to the La Pocatiere isolate.

A few diploid strains and their tetraploid derivatives are still resistant to all races of stem rust occurring naturally in Eastern Canada. No hexaploid derivatives from strigosa x sativa crosses having the strigosa type resistance have yet been isolated. Differences in degree of infection to naturally occurring inoculum in the adult plant stage have been observed in some progenies of such crosses.

New races of crown rust are appearing regularly. Most recently Saia attacking races have appeared in both Eastern and Western Canada. The greatest diversity of crown rust races occurs in buckthorn infested areas.

The Federal Government has recently approved a program for the eradication of barberry in which costs are shared between federal and provincial governments. The effect of barberry eradication on the prevalence and spread of stem rust, the prevalence of different races, and the occurrence of new races will be observed during the campaign.

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*** Contribution from Department of Agriculture, Research Station, Winnipeg, Manitoba ***

by G. J. Green, G. Fleischmann and R. I. H. McKenzie

Growing conditions for oats were generally very good in the Prairie Provinces in 1963. The total prairie production of 304 million bushels resulted from average yields of 38, 53 and 51 bushels per acre in Manitoba, Saskatchewan and Alberta respectively. Stem rust and particularly crown rust combined with heat damage reduced yields in south-eastern Manitoba and drought reduced yields drastically in the Peace River area of Alberta. Except for these two areas the oat crop was excellent.

Stem Rust

Traces of races 6A, 11A and 6AF of oat stem rust were found in Western Canada for the first time in 1963. Races 6A and 11A have been prevalent in Eastern Canada since 1957. Race 6AF is potentially the most dangerous race found in Canada because it can attack varieties carrying all the identified resistance genes. It was first collected in the field in Canada at Ottawa in 1962 and was reported in the United States in the same year. The first Canadian isolate of race 6AF was produced in 1961 in the greenhouse at Winnipeg on a barberry plant inoculated by means of teliospores collected in Eastern Canada in 1959. Consequently, its subsequent appearance in the field was not unexpected.

A search for sources of resistance to race 6AF was begun in 1961 with the culture produced in the greenhouse. Over 4500 varieties from the active section of the World Oat Collection were screened for resistance to this culture and the most promising ones were tested to 7 cultures of race 6AF, 6 of 6A, one each of 13A and 13AF, and several other races. Selections from C.I. Nos. 4529, 5844, 6558, 6792, 6828, 6849, 7110, and P.I. 258681 were resistant in the adult plant stage to the greenhouse culture of 6AF and in the seedling stage to 6 other cultures of this race obtained from the field. They were susceptible in the seedling stage to all 6 cultures of race 6A, one culture of race 6AF, and to the one culture of race 13AF. C.I. Nos. 3034 and 3259 were resistant to the greenhouse culture of 6AF in the adult plant stage but were susceptible to all cultures of races 6A, 6AF, and 13AF in the seedling stage. Rosen's Mutant was the most promising source of resistance to this group of races. It was resistant in the adult plant stage to the greenhouse culture of race 6AF and in the seedling stage to all cultures of 6AF and 13AF. It was susceptible in the seedling stage to all cultures of race 6A.

Genetics of Stem Rust Resistance

Very preliminary genetic studies indicate that C.I. Nos. 4529, 5844, 6558, 6792 and 6849 all have a single gene at the same locus, conferring resistance to one culture of race 6F and one of race 6AF. This gene is not associated in inheritance with genes A or B.

It has been possible to combine the resistance of genes A and F which had been considered allelic. Backcrosses of the recombination line to Rodney have revealed that the 2 genes behave as a single unit. Tests have still to be conducted to determine if gene D, which went into the original cross linked with A, has been combined with A and F.

Crown Rust

Losses to commercial oat varieties were small in 1963 despite the widespread occurrence of crown rust in Western Canada. The epiphytotic in Southern Manitoba reached intensities of 30% to 90% by late August, but the bulk of the oat crop had been sown early and escaped serious injury. A trace to 10% crown rust on oats and wild oats was found as far west as Swift Current, Saskatchewan.

In 1963, almost all isolates of crown rust identified across Canada were virulent on the predominant commercial varieties Garry and Rodney. A dramatic shift occurred, however, in the composition of the physiologic race population in Western Canada. Cultures virulent on Landhafer and Santa Fe increased from 11% in 1962 to 52% this year. Races 294 and 295, capable of attacking Landhafer and Santa Fe comprised one-third of the total number of isolates identified in the west.

This alarming change in the race population has undermined the breeding program for crown rust resistance in Western Canada in which Santa Fe and Landhafer are being widely used as sources of resistance. Two sources of resistance to the 294-295 race group, Ceirch du Bach--a Welsh oat and certain lines of Israeli wild oats, (*Avena sterilis*), are being introduced into the backcross program to overcome the current threat.

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JAPAN

*** Studies of Twins ***

by I. Nishiyama and M. Tabata
Faculty of Agriculture, Kyoto University, Kyoto, Japan

Twin seedlings occur in a higher frequency (0.15%) in Kanota than in other 4 varieties tested (0.02%). Cytological checks in sporocytes of 59 twins revealed that chromosome numbers were 2n: 2n in 26 cases, 2n : 3n in 25 cases, and 2n : n in one case. In the remaining 7 twins, one member was normal and the other member showed such chromosomal aberrations as a ring of four chromosomes, a fragment, and deficiency for a whole chromosome. Besides, there was one case of triplets having a chromosomal constitution of 2n : 2n : 3n.

Triploid plants are short, and have stiff leaves and large florets. The haploid has small plant parts, but tillering is good. Therefore, triploids and haploids can be distinguished from diploids by their morphological characteristics.

A study is underway to pick up monosomics and other aneuploids in the progenies of the haploid and triploids.

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*** Contribution from Hokkaido National Agricultural Experiment Station ***

by T. Kumagai and S. Tabata

The weather conditions were generally unfavorable for the 1963 oat crop. The yield of oat varieties was 93% in Zenshin, 87% in Honami and 84% in Victory No. 1, respectively, as compared with an average yield of 1954-1962. The main purpose of the oat breeding in Hokkaido is to produce the improved varieties with high standing ability, combined with eariness and high groat percentage. For that purpose the varieties introduced from Welsh Plant Breeding Station, Great Britain, have been used as the major gene sources. The F_2 and F_3 seed lots from the crosses are sown in rod rows in spaced plant arrangement and are now under tests.

Disease symptoms typical of northern cereals mosaic virus (1962 Oat Newsletter, p. 32) were widely observed especially in the space-planted nursery. Fourteen varieties were tested for the purpose of examining the response to northern cereals mosaic virus. The results of the field trials showed a decided varietal difference; A. strigosa, Albion and Fulghum predominated in all of the replicated plots, while Hokuyō, Fleur du nord and Strubes Gelb were most severely affected.

The experiments on winter hardiness were carried out by the use of two hundred varieties with winter growth habit in an attempt to select the winter hardy oats suited to Hokkaido. The fall and winter of 1962-'63, however, was so severe for growing oats, that only the poorly scattered survivors were found in seven varieties. Among the varieties tested, Grey Oat, introduced from the States, seems to be the most promising. The testing will be done again in the fall of 1963.

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NEW ZEALAND

*** Contribution from Crop Research Division, Lincoln, Christchurch ***

by G. M. Wright

A crown-rust resistant strain of Onward oat has been released as Onward (1963). Onward, bred by the English firm of Gartons Ltd., is the only milling variety widely grown in New Zealand. The new line was selected from the cross Garry x 5 Onward, using the original Garry variety, received from Canada in 1950. It gave appreciable yield increases in two of the eight yield trials which have been harvested, one increase being attributed to a reduced severity of straw break at maturity and the other, of 21%, to rust resistance in a trial in which crown rust developed earlier than usual, being well established some weeks before flowering.

Apart from rust resistance (0;-1 reaction, not quite as resistant as Garry in some seasons) and occasional improved resistance to straw break, the only differences from the original variety are in kernel characters. Onward (1963) has a thinner husk, but in the best growing conditions has a slightly smaller grain: in two full-scale milling trials each based on composites from one acre block sowings it averaged 56.4% oaten products, compared with 55.6% from the original variety. In samples from two replicated trials it had higher nitrogen and higher fat content.

A fuller description of Onward (1963) has been published in N. Z. Journal of Agriculture 107: 483-486.

Introduced Varieties

In 1962-63, Abegweit (Canada) proved to have high yield but poor milling quality. Of a group of recent introductions from the U.S.D.A., Niagara and Russell showed promise but were too susceptible to lodging. In 1963-64 Weibull's No. 16385 (Sweden) and the American varieties Burnett, Curt, and Newton were included in a yield trial on the basis of their performance in observation plots, but all except Curt were affected by oat mosaic. Of three recent Welsh varieties under trial Maelor was fairly susceptible to mosaic and Powys was very susceptible to barley yellow dwarf virus. Manod had some resistance to both viruses and was the most attractive of the three in general appearance but did not produce enough tillers to be high yielding.

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WALES

*** Physiological Specialization in Erysiphe graminis var. avenae ***

by J. D. Hayes
Welsh Plant Breeding Station, Aberystwyth, Wales

Mildew (*Erysiphe graminis* var. *avenae*) can cause serious reduction in yield of grain of oats in Britain, and for this reason considerable attention has been given to the production of mildew-resistant varieties in the oat breeding programme. During the course of this work physiological specialization in this pathogen has been established using varieties and segregates developed at the Welsh Plant Breeding Station. Different sources have often shown varying degrees of resistance to mildew but only recently, following the isolation of single pustule cultures, has it been finally demonstrated that the breakdown of resistance in hitherto resistant segregates can be attributed to the development of more virulent strains of the pathogen. It is proposed that the differential varieties listed below be used as a basis for physiological race differentiation in *Erysiphe graminis* f. sp. *avenae*.

Table 1. Differential Varieties of Oats Showing Source of Mildew Resistance.

Differential oat variety	Source of mildew resistance
Milford S.225	-
Manod S.235	01747/10/7 *A.byzantina* Koch
Cc 4146	Natural hybrid *A.sativa* x *A.ludoviciana* L.
9065 Cn 6/3/74	Cc 4346 *A.ludoviciana* L.
Cc 3678	*A.strigosa* sub-species *hirtula* (Lag.)

The two physiological races isolated in our recent investigations have been designated Races 2 and 3 respectively, using the reaction of the pathogen on the differential host varieties as given in Table 2. The physiological race to which Manod, Cc 4146, 9065 Cn 6/3/74 and Cc 3678 were originally resistant, has been allocated the reference No. Race 1.

Table 2. Mean Infection Types Scale 0 = immune; 4 = fully susceptible; Produced by Three Physiological Races of *Erysiphe graminis avenae*.

Physiological race	Milford S.225	Manod S.235	Cc 4146	9065 Cn 6/3/74	Cc 3678
1*	4	1-2	0	0-1†	0
2	4	4	0	0-1†	0
3	4	4	4	0-1†	0

* Varietal reactions observed and reported by Griffiths (unpublished data) under field and glasshouse conditions 1948-53, designated Race 1.

† 0-1, very resistant, only slight development of mycelium followed by necrosis of host tissue.

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IV. CONTRIBUTIONS FROM THE UNITED STATES: USDA and STATES

*** ARKANSAS ***

by R. L. Thurman and J. P. Jones (Fayetteville)

The low temperatures during the winter of 1962-63 followed by below normal soil moisture resulted in major losses in stands of oats. The situation has resulted in a substantial increase in rye and a slight increase in wheat acreage for fall and winter pasture. The acreage shift may have been due in part to the approval of wheat for ASC payments. It was accelerated by epidemics of crown rust on oats in the southwestern part of the state in the fall of 1960, 1961 and 1962. Crown rust races 203, 216 and to a lesser extent 290, have been the prevailing races in the fall epidemics. Races 264, 295, and 326 were isolated from the spring oat nursery at Fayetteville for the first time in the spring of 1963. These races had previously occurred only on an isolated basis in the southern part of the state.

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*** FLORIDA ***

by Dale Sechler and W. H. Chapman (Quincy)

The 1962-63 oat acreage in Florida was higher than normal due to favorable conditions for fall seeding. However, much of this acreage was never harvested due to very severe damage from low temperatures during the winter and drought in the spring. An estimated 16,000 acres were harvested at a yield of 23 bu/acre. Most oats are seeded for grazing only in Florida but grazing was almost non existant during the 1962-63 growing season with oats making little contribution during the critical December 15 to February 15 period when small grain pasture is most needed. Interest in rye for grazing has been stimulated by the comparative response of the two crops during cool weather.

Temperatures at Quincy dropped to 8°F in early December, 1962, the lowest temperature recorded since 1899. The season was characterized by alternate warm and extreme cold periods which eventually did severe damage to even the most hardy oat varieties. Rainfall was approximately 4 inches below normal in both March and April which resulted in extremely short straw and very light grain as most varieties were heading and filling during this period.

Crown rust was less prevalent than in recent years since weather conditions were not favorable for spread of the disease even after rust pockets had become established. Landhafer attacking races were prevalent where rust was observed. Races 290, 295, 276, and 326 were identified from samples taken across North Florida and submitted to Dr. M. D. Simons for identification.

Damping-off, from what is apparently a Pythium species, continues to be a serious problem in early seeded oats. The problem subsides as temperatures decline in the fall. Oats, however, are apparently much more tolerant than rye or wheat to this damping-off when seeded early. Good stands of all species can be maintained when seeded early on fumigated soil even though soil and air temperatures are very high.

Some Florida oats were seeded in September in the fall of 1963 but no rain fell during October or early November resulting in some stand loss and no early grazing. Total acreage seeded is down for the 1963-64 season due to unfavorable conditions for seeding during the normal seeding period. Cool weather after the fall rains began has resulted in very little growth and almost no grazing.

Emphasis in the oat breeding program at Quincy continues to be placed on forage production. Improvement of both diploid and hexaploid types are being attempted. Disease resistant forage types are being selected for maximum seasonal production. It is not felt that one variety can produce maximum forage throughout the long season when grazing is needed. Grain quality is being emphasized for those who desire to harvest part of the crop after grazing.

A new variety is being increased for possible release. It comes from the cross Florad 5 x Fulgrain-3 x Suregrain 4 x Victorgrain ^{2}2 x Bond x Fulghum 3 x Suregrain. It has good resistance to races 264 and 290 of crown rust, has very good grain quality, is short and early, makes a semi upright type of growth and is a good forage producer.

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*** GEORGIA ***

by U. R. Gore (Experiment)

Several severe freezes during the winter of 1962-1963, including -5° F on January 24, killed the fall sown oat nursery.

On February 24, a spring oat test was seeded. Yields were very good with MO-0-205 leading with 98 bushels per acre at Experiment. Other high yielding varieties were Suregrain, Radar, Roanoke, Beedee and Portage. At Blairsville, Portage, Suregrain, Fairfax, and Beedee gave the highest yields. Test weights were equal to fall sown oats from 30-35 pounds. Spring sown oats to replace winter oats frozen out has shown promise.

Oats and ryegrass mixture has given excellent yields of grazing and silage except during severe winters. Oats or oats and ryegrass mixtures should be harvested to get most of the crop before bloom. Thus harvesting should begin when the first heads appear in the field.

For best oat silage, 100 pounds per ton of ground snap corn, distillers grains or citrus pulp should be added.

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(Georgia)

by Darrell D. Morey (Tifton)

Golden X Hull-less Oats

The golden seedling character in oats behaves as a simple recessive. The hull-less (naked-seed) character has been considered by most investigators to behave as a simple dominant. Golden (CI-6760) was crossed with Hull-less Fulghum (CI-7884) at Tifton in 1962 and the results confirm those found in the literature for each separate character.

F_2 - Golden, hulled X Green, hull-less

(gghh) (GGHH)

	Actual	Expected	Ratio
Green, hull-less (GGHH)	125	130	9
Green, hulled (GGhh)	50	44	3
Golden, hull-less (ggHH)	48	44	3
Golden, hulled (gghh)	9	14	1
TOTAL	232	232	

Weakness and poor survival of golden seedlings may sometimes upset the green-golden ratio. Golden is a good genetic seedling marker, but the plants lack vigor and hardiness. The little study here reported should produce a Golden Hull-less (ggHH) of genetic interest. It should also be possible to select for more winter-hardy golden segregates. The tight linkage or association of the multiple-floret character and the hull-less grain was not observed to be broken in this cross. A limited number of plants will be observed and selected in later generations.

Dr. Robert Davis, Entomologist, has joined the staff of the Southern Grain Insects Research Laboratory at Tifton and will work closely with plant breeders and agronomists on small grain insect problems. His work will involve primarily the biology, ecology and methods of control for insects of small grains. In addition he will study Barley Yellow Dwarf Virus and its insect vectors.

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*** IDAHO ***

by Harland Stevens, Frank C. Petr, and Ralph M. Hayes (Aberdeen)

With ample moisture and cool temperatures in the early part of the season Idaho's oat crop was off to a good start. Most varieties grew about 10 inches taller than normal. The midlate and late types headed a week or more later than usual while most of the early varieties showed very little delay in heading when compared to their heading dates for other years. Excellent yields were reported in irrigated areas where most of the oat acreage is grown.

Four of the five highest yielding varieties grown at the Aberdeen station were selections from the cross: (C.I. 6740 x Garry) x [(Bonda x Hajira-Joanette x Santa Fe) x Mo. 0-205]. The highest yielding was C.I. 7588 with a yield of 201.1 bushels per acre. Park ranked fourth with a yield of 185.4 bushels per acre. It may be of interest to note that selections from the above cross were also among the five highest yielding entries in both the non-irrigated and irrigated Uniform Northwestern States Nurseries.

The research efforts at the Aberdeen experiment station are concentrated on the improvement of yield, straw strength and quality. The second cycle of the recurrent selection program indicates that improvement in straw strength can be made from crosses of varieties that already have a good straw strength rating.

The quality work consists mainly of improving kernel weight, test weight and protein content. Some selections with excellent kernel weight have been recovered from the crosses of Rodney x Shelby and Sauk x Simcoe. None of the high kernel weight lines selected to date yield as well as adapted commercial varieties with normal kernel weight.

A white-kerneled selection, C.I. 7588, from the multiple cross, (C.I. 6740 x Garry) x [(Bonda x Hajira-Joanette x Santa Fe) x Mo. 0-205], made by F. A. Coffman, is being considered for release for irrigated areas of Idaho. Its outstanding attributes are superior yielding ability and straw strength.

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*** ILLINOIS ***

by C. M. Brown and H. Jedlinski (Urbana)

Oats produced a state average yield of 57 bushels an acre in 1963. This is the highest yield on record for Illinois and is 13 bushels above the 1951-60 ten-year average. The acreage of oats harvested in Illinois continued its decline in 1963, with approximately 104,000 acres less being harvested in 1963 than in 1962. The acreage and yield per acre for the past several years follow:

	Acreage Harvested (000) A	Yield Bu/A
1951-60 average	2,833	44
1955	3,195	56
1956	3,041	46
1957	2,751	38
1958	2,724	55
1959	2,233	40
1960	1,898	51
1961	1,634	56
1962	1,320	53
1963	1,416	57

The four leading varieties in acreage in 1963, as in 1962, were Newton, Nemaha, Clintland, and Goodfield. Newton has occupied more than 40 percent of the acreage in each of the past three years. The percentage acreage of several varieties in Illinois during the past five years is as follows:

Variety	Percent of Total Acreage Planted				
	1959	1960	1961	1962	1963
Beedee	--	--	--	1	1
Bonham	3	3	3	2	2
Clintland	45	25	18	12	10
Clintland 60	--	--	3	6	6
Clinton	4	3	2	3	4
Goodfield	--	--	4	10	9
Minhafer	3	9	9	5	5
Nemaha	15	12	10	11	10
Newton	19	39	42	41	42
Putnam 61	--	--	--	--	1
Shield	--	--	1	2	2

New Variety

See under "New Varieties" release of BRAVE, C.I. 7690.

The Disease Situation

For the second consecutive year, halo and stripe blight were widely scattered throughout the state during the entire growing season. Pronounced differences in disease severity and incidence were observed, depending on whether or not the seed was treated. Barley yellow dwarf virus disease was a serious economic threat to winter oats in southern Illinois. A disease incidence of over 50 percent was observed in several fields. In spring plantings, the disease did not cause serious damage, although it was present in every field that was examined. Crown rust and stem rust of oats were conspicuous by their absence in 1963. This apparently can be attributed to the sparsity of inoculum in the South during the spring as the result of an unusually severe winter.

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*** INDIANA ***

by F. L. Patterson, J. F. Schafer, R. M. Caldwell, L. E. Compton (Breeding, Pathology, Genetics), R. K. Stivers (Varietal testing), M. L. Swearingin, and G. R. Miller (Extension)(Lafayette)

The 1962 Season

A cool May and June favored oat production and limited crown rust development. June was very dry but the state had a new record high of 62 bu/A state average yield. Acreage dropped sharply.

Oat Varieties

Clintland 60 became the leading variety in Indiana (20%) followed by Clintland (19%), Newton (14%), Goodfield (14%), Clinton 59 (12%), Putnam 61 (11%), and Putnam (3%). For 1964 Garland from Wisconsin is being added to the recommended list of Clintland 60, Goodfield, Putnam 61, and Newton, as well as the winter oats Norline and Dubois.

New Varieties

See under New Varieties for Clintland 64 and Tippecanoe.

Lodging Resistance

Results of research on lodging resistance were summarized in 4 papers (see publications). It was shown that variety blends increased standing ability somewhat but that greater total improvement was achieved by recombination in a breeding program.

The Scotch Club panicle type was found to be inherited as a single non-dominant factor pair completely associated with short stiff straw. While some improvement was made agronomically in the dwarf type, none approached commercial potential. The F_1 type was very desirable and may be useful if hybrid oats are developed.

The Milford-type mid-dense panicle was conditioned by one major factor pair (with modifiers), independent of the Scotch Club type. The association between panicle class, 1 (open) to 5 (mid-dense), and straw strength (C L r) was about 0.6. The selection of mid-dense panicles as early as F_2 should provide good progress in straw improvement in these crosses.

The associations of 11 morphological characters and lodging resistance were studied in a cross of Ottawa 3928-5-8 (normal) by a Milford-type. Diameter of culm was highly related to lodging resistance (r = .6). The influence of height and internode lengths were generally significant but low. The path-coefficient technique was used to analyze interrelationships of the effects.

An abstract appears in special reports in this issue of the Newsletter.

Cytogenetics

The male sterile oat reported in a Clintland 60 sib in the 1958 Newsletter was determined to be a nullisomic. The 20-chromosome gametes from monosomic plants are fully competitive in both male and female. Selfed monosomics produced 83% nullisomics, 16% monosomics, and 1% disomics. Nullisomics produced selfed seed at cool temperatures and were male sterile in warm temperatures.

A possible system of using aneuploids for commercial hybrid oats was explored. Low hybrid vigor and low natural crossing were the most limiting factors. Two manuscripts were prepared on these researches by Lafever and Patterson, and an abstract appears in special reports in this Newsletter.

Genetics in Puccinia coronata and oats

The corresponding gene concept proposed for virulence of the rust fungi and resistance in their hosts was applied to mutation and segregation studies of the pathogen to interpret the relationships of genes in oats for resistance to crown rust. An abstract of this analysis appears in the special report section of this Newsletter.

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*** IOWA ***

by K. J. Frey, M. D. Simons, K. Sadanaga, J. A. Browning (on leave) and R. L. Grindeland (Ames)

Agronomic performance of oat varieties released in different "eras"

Throughout the many years of oat breeding in the Midwest much of the research effort has been devoted to incorporating resistance to diseases, especially crown and stem rust, into new oat varieties. A majority of the oat crosses made in the past 35 years has each involved one parent that was "particularly good for disease resistance".

Some plant scientists have questioned if more attention should not have been given to improving agronomic characters with less emphasis given to disease resistance. It is not possible to turn back time and determine if another breeding approach would have been more profitable. However, during the past 4 years we have had an opportunity in Iowa to evaluate the progress made in improving agronomic performance of oat varieties with the breeding methods and materials that were used for the past 35 years.

For the years 1960-63 there was little or no disease damage to the oat yield tests grown in Iowa. Thus, it was possible to compare the agronomic performance of varieties from different "eras" without the confounding effects of differential reaction to diseases. Twelve elite oat varieties from 4 eras were compared at 5 test sites in Iowa for the 4 years, 1960-63 (see table).

Mean performance of elite oat varieties from different "eras" when tested at 5 locations in Iowa during the 4-year period, 1960-63

Variety	Era when released	Yield (bu./A.)	Lodging* score	Test weight (lbs./bu.)	Date headed (June)
Richland	Before 1945	89	3.7	30.4	15
Bonham	1945-	95	2.9	33.9	13
Cherokee	1950	96	2.9	33.5	12
Clinton		94	2.2	33.6	16
Burnett	1953-	102	2.9	34.4	14
Minhafer	1958	104	2.5	32.7	12
Newton		99	2.3	32.8	16
Dodge		99	1.9	34.3	17
Goodfield	1959-	95	1.6	35.9	16
Nodaway	1961	99	2.1	34.9	12
Putnam 61		98	2.5	33.5	11
Tonka		96	1.8	36.3	11

* 1.0 = erect and 5.0 = flat

The Bond varieties released during 1945-50 were 6% higher yielding, 1.0 score lower in lodging and 3 pounds heavier in test weight than Richland, the old pure-line variety. Oat varieties released in the mid 50's held the gain in lodging score and test weight and gave yield increases of another 8%. The newest varieties (1959-61) showed marked improvement in lodging resistance and test weight, while maintaining high yielding capacity. When compared to Richland the newest varieties show an improvement of 10-14% in yield, 5-6 pounds per bushel, and 2.0 units of lodging resistance.

Whether other breeding methods, or research programs with different goals, would have given more progress in the agronomic potential of oat varieties is a moot argument. In addition to incorporating disease resistance into new oat varieties, the oat breeders have made considerable progress in producing better agronomic varieties also. And from what we see the next group of oat varieties to be released in the Midwest will have even better lodging resistance and faster growth rates.

Sources of Crown Rust Resistance

Several of the lines of oats that have been shown to possess a high degree of field resistance to crown rust race 264 in the Puerto Rico nurseries are only moderately resistant to other races in the field in the United States. Genetic studies carried out at the Iowa Station have not yet furnished conclusion explanations of the inheritance of the resistance of these lines, but have shown that some of the lines differ in genes for resistance. This suggests the possibility of combining genes from two or more of these lines to produce a line more highly resistant or resistant to a larger number of races than any of the existing lines.

With this in mind, 7 apparently homozygous lines from the cross P.I. 185783 x P.I. 174544, and 14 similar lines from P.I. 174545 x P.I. 185783 were tested for three years on a rusted versus non-rusted basis. A mixture of crown rust races was introduced into the rusted plots from heavily infected spreader rows. The average seed weight ratio, on a rusted to non-rusted basis, for P.I. 185783 was .860; for P.I. 174544, .895; and for P.I. 174545, .940. The two best lines from the P.I. 185787 x P.I. 174544 cross had corresponding ratios of .920 and .902, suggesting that they had been less damaged by crown rust than their most resistant parent. The two best lines from P.I. 174545 x P.I. 185783 had ratios of .987 and .975. These values approached, but did not reach, statistical significance when compared with the better parent at the .05 level. Consequently, it was not possible to say that any of the lines had shown greater resistance than the most resistant of their parents. However, in view of the high coefficients of variability that were encountered and the difficulty of obtaining sufficient infection to appreciably depress the seed weight of the parents, this should not be regarded as conclusive. Further work, carried out under more nearly optimum conditions, might show that transgressive segregation for resistance to crown rust damage does occur when such lines are crossed.

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*** KANSAS ***

by E. G. Heyne, C. O. Johnston, James Lofgren, Lewis Browder, E. D. Hansing, and Ronald Livers (Manhattan)

The 1963 oat acreage continued to decline in Kansas. Most of the acreage reduction has been planted to grain sorghum and soybeans. There were only 344,000 acres harvested for a total of 10,320,000 bushels. This is the second lowest total production since 1880. Although total production was low, the average yield per acre was 30 bushels, which is the seventh highest yield per acre on record. Indications are that the oat acreage will continue to decline in Kansas. The varieties recommended for production in Kansas for 1964 are: Andrew, Mo. 0-205, Minhafer, and Tonka spring varieties and Cimarron and Arkwin winter oats.

Farmers' fields of winter oats in Kansas were killed nearly 100 percent and all experimental plantings at Manhattan, Hutchinson, and Mound Valley was abandoned. Spring oats was planted at a good time but under very dry conditions that prevailed until mid-May. Timely rains were utilized well by the oat plant and above average yields were obtained in most areas.

The rusts of oats were of little importance in Kansas in 1963. Crown rust developed to some extent in occasional fields of susceptible varieties, but it was late in starting and caused little damage. Many fields had no crown rust. Stem rust was very light and late in its development. Light infections were observed on susceptible varieties, but there was not enough stem rust to affect yield. Drought was so severe and conditions for rust infection were so unfavorable during April and the first half of May that it was extremely difficult to get the rusts started in the nursery. Even after crown rust infections were established many dried up without spreading to adjacent plants. However, conditions for rust infection became better late in May and moderate infection of both crown rust and stem rust developed. Barley yellow dwarf was severe on some selections in the rust nursery, but was not as destructive as it has been in recent years.

A few plants that survived the winter from the bulk hybrids grown at Hutchinson were saved for replanting. Studies in performance trials at Manhattan and Powhattan indicate there are no varieties superior to Andrew or Mo. 0-205. Although Tonka does not have the yield potential of Andrew, it is being recommended in 1964 to Kansas farmers who wish to have a very high test weight oats and one that matures early. Tonka is the only variety available that has some resistance to BYDV.

C. O. Johnston, long-time cereal rust pathologist, retired from USDA activities in November, 1963, and will retire from Kansas State University activities in 1964. In 1927, C. O. Johnston, H. C. Murphy, and John H. Parker observed, for the first time, the resistance of Victoria oats to crown rust on the present site of the Kansas State University Dairy buildings. This was later confirmed at Ames, Iowa and was the beginning of the many crown rust resistant varieties of the 1940's.

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(Kansas)

by Wayne L. Fowler and Max A. Urich (Manhattan)

The acreage of oats inspected for certified seed production by The Kansas Crop Improvement Association rose slightly in 1963. Only 153 acres were approved in 1963, compared with 105 in 1962 and 333 in 1961. Minhafer was again the most popular variety, followed by Andrew and Mo. 0-205. No winter oats were certified in 1963.

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*** MICHIGAN ***

by J. E. Grafius and A. H. Ellingboe (East Lansing)

Two varieties Coachman and AuSable were named and released by the Michigan Agricultural Experiment Station in 1963. These two varieties have been listed in the uniform midseason nursery as CI 7684 and CI 7670, respectively.

It is expected that Coachman will replace some of the acreage now devoted to Clintland types in Michigan and that AuSable will replace Rodney. Among the unusual attributes of these two varieties are resistance to red leaf, resistance to Septoria, large seeds, high test weight and high yield.

A backcross program to incorporate resistance to races 290 and 264 of leaf rust and resistance to 6, 7A and 13 of stem rust has been started.

The breeding program is utilizing a vector approach to obtain a higher yielding plant with lodging resistance, high test weight, etc. In this approach crosses were made towards several ideals.

These populations were planted at several locations to test which ideal of several was best for Michigan using the given gene pool. Unfortunately extreme drouth conditions ruined the test from the standpoint of usual Michigan conditions. The test will be repeated in 1964.

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*** MISSISSIPPI ***

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

The 1962-1963 oat crop was severely damaged throughout the State by extremely low temperatures in December and January. Total production was only 26 percent of the 5-year average (1957-61). Approximately 65 percent of the planted acreage was not harvested. The remaining acreage produced an average yield of only 29 bushels.

Many of the varieties and selections in the Central and Southern oat nurseries were not completely killed and recovered sufficiently to produce reasonably good yields. The foliage of selections containing Ballard in their parentage were damaged only slightly by the cold damage. Much of the breeding material at Stoneville which contained spring oat varieties in the parentage was completely killed. However, certain benefits were derived from the extreme conditions. Many advanced, phenotypically uniform selections were found which segregated sharply for cold tolerance. A Delair derivative, CI 7909 was found to be more cold tolerant than any commercially grown varieties in Mississippi.

As might be expected diseases were of minor importance on the surviving oat crop. In the late fall of 1962 the potential for a severe crown rust epiphytotic was present in the Central Delta area. One early planted field of over 250 acres was found to be severely infected with crown rust. However, very little crown rust developed in the spring. Crown rust races most frequently found in the Stoneville area were 203, 216, and 326.

In April, dead to partially dead plants were found scattered throughout the nursery at Stoneville. These were found to be infected by the southern blight fungus, *Sclerotium rolfsii*. Diseased plants ripened prematurely and were a bleached, tan color. Sclerotia occurred on the basal of leaf sheaths. Lower nodes of the affected culms were darkened.

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*** MISSOURI ***

by J. M. Poehlman, Gerry L. Posler, Charles F. Hayward, Paul H. Hoskins, Thomas D. Wyllie (Columbia); Carl Hayward (Mount Vernon); and Arnold Matson (Portageville)

Missouri oat acreage was up slightly from the record low of 316,000 acres in 1962. However, the 348,000 acres harvested in 1963 was the second lowest on record and much below the 1952 acreage of 1.2 million and the 2.2 million acres in 1942. Early high temperatures and low moisture conditions gave indication of a poor oat year, but with favorable May and June moisture and temperature, record yields were obtained. The state average was 42.0 bushels per acre and the highest on record. The 1957-61 average for Missouri was 32.1 bushels.

Breeding work in spring oats is being concentrated on the improvement of Nodaway for wider adaptation and to improve its resistance to crown rust and barley yellow dwarf virus. Several crosses made with Nodaway are being grown and tested at present. C.I. 7805, which has looked very favorable in the 1962 and 1963 Uniform Early Oat Performance Nursery is being further evaluated as a potential variety.

Winter oats grown at Columbia were almost entirely killed in 1963 as they were in 1962. The survivors of these two years exhibit the hardiness that we need and attempts to improve their disease resistance and straw strength are being made.

Personnel Item

Dr. J. M. Poehlman is now in India serving as Advisor to the Director of Research at the Orissa University of Agriculture and Technology, Bhubaneswar, Orissa, India. He is to serve in this capacity for two years.

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*** NEBRASKA ***

by D. D. Warnes (Lincoln)

Dr. D. P. McGill, who had been associated with the oat project since 1958, has been assigned to administrative duties in the College of Agriculture. Dennis D. Warnes, formerly with the Outstate Testing Service, University of Nebraska, has assumed leadership of the oats project and will also be responsible for winter and spring barley work.

A new oat variety will be increased in 1964 and we are contemplating possible release to farmers in 1965. This variety has been tested in state and regional nurseries as C.I. 7454, Clinton x [(Victory x Hajira-Banner) x Victory]. A name for this variety will be selected prior to its distribution.

This variety which is similar to Andrew in maturity has short stiff straw, is resistant to lodging and has white grain. Its performance to date indicates it will be adapted to northeastern Nebraska.

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*** NEW YORK ***

by Neal F. Jensen (Cornell University, Ithaca)

Personnel: The following persons contributed to the oat improvement project: L. V. Crowder (Extension, Plant Breeding), G. H. Willis (Experimentalist, Plant Breeding), Daulot Sajnani, Naim Al-Mohammed and Juan Acevado (graduate students, Plant Breeding), G. C. Kent, L. J. Tyler and W. Rochow (Faculty, Plant Pathology), and Curt Leonard (graduate student, Plant Pathology).

Production: Information from the Annual Crop Summary (USDA) indicates that New York harvested 569,000 acres in 1963. Total production was 30,157,000 bushels and the per acre yield was 53.0. New York ranked 12th (44 states) in oat acreage and the yields were about average those of recent years. The most recent 5-year average (1957-1961) showed yields in New York to be 52.0 bushels per acre (exceeded by only one state, Wisconsin).

Equipment: Tests have shown a readily available piece of machinery, a paint conditioner or shaker, to be ideal for processing oats prior to taking test weights. A note on this has been submitted to Crop Science.

Multiline varieties: An experimental multiline (5 lines) exceeded by 5 bushels per acre the next highest yielding variety in the 1963 New York regional nurseries grown at 10 locations (80 replicates).

New varieties: The schedule of seed availability to New York farmers (first year of commercial sale of Certified Seed) of new varieties is as follows:

Niagara - 1964
Tioga - 1965
Orbit - 1966

Approximately 100,000 bushels of Niagara will be offered for sale this spring. A description of Orbit will be found under the New Varieties section.

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*** NORTH CAROLINA ***

by Charles F. Murphy, T. T. Hebert, D. M. Kline (USDA)
M. F. Newton and Marilyn Holton (Raleigh)

The 1963 harvested oat acreage was reduced to a new low of 169,000 acres, by the extreme winter killing of the 1962-63 season. Record low temperatures in December threatened late seeded oats with a similar fate in 1964. Carolee and Moregrain continue to be the best standard varieties, with some Roanoke and Arlington being grown for forage purposes.

The primary objectives of the breeding program are to increase yield and straw strength. The variety Carolee has a high yield potential, which results from a large number of relatively small kernels. An attempt is being made to select "Carolee types" (high seed number) with increased seed size and stiff straw. Several very promising lines of this type are now being grown in yield tests.

The most serious oat disease in North Carolina continues to be Yellow Dwarf. Some of the crosses which appeared to have good resistance in 1962 showed a susceptible reaction to the virus in 1963. These observations would suggest the existance of more than one strain of the virus in this area.

Several studies which have been initiated will be grown in hill plots, in the advanced generations. In anticipation of this, three oat varieties grown in hill plots, planted at different seeding rates, are being compared to the same varieties grown in 8 foot, 4 row yield plots. Four replications of the row plots were grown and 10 replications were used for the hill plots. Preliminary data are shown in the following table:

Table 1. Significance levels and coefficients of variation for row and hill plots of oats, grown at Clayton, N.C., in 1962.

Kinds of plots seeds/hill	Rows	Hills 5	10	15	25
Significance level					
Height					
Reps	NS	NS	NS	NS	NS
Entries	**	**	**	**	**
Yield					
Reps	*	NS	NS	NS	NS
Entries	*	NS	NS	*	*
Coefficient of variation (%)					
Height	3.54	11.92	8.65	9.95	7.07
Yield	9.11	54.95	29.22	31.64	24.21

These preliminary data indicate that at least 25 seeds/hill would be desirable for measuring height or yield of winter oats. Further data including yield components may indicate, however, that a lighter planting rate is preferable for measuring heads/plant in the heavy tillering winter grains.

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*** NORTH DAKOTA ***

by David C. Ebeltoft and G. S. Smith (Fargo)

1963 Season

1963 was another good season for oats, though the average state yield did not approach that of 1962.

69,450,000 bushels were produced on 1,852,000 acres. Both the yield and the acres harvested exceed the state average for the five year period, 1957-61.

In general, crown rust and stem rust was not serious. At Fargo the incidence was very light. Along the northern part of the state some stem rust showed up in the nurseries, and crown rust was fairly heavy.

On the whole, yields and tests weights were good.

Yields in North Dakota appear to be creeping up. The average of the ten best varieties in the field plots for the following stations were:

Station	Location	Yields
Langdon	Far North & East	119 bu/ac
Fargo	Central & extreme East	100 bu/ac
Minot	North & Central	99 bu/ac
Dickinson	Far West & Central	73.5 bu/ac

Good increases were obtained this season on promising lines.

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*** OHIO ***

by Dale A. Ray (Columbus)

Ohio Production and Research in Ohio

1963 Season and Production

Spring oat stands in Ohio were excellent following early seeding and with adequate soil moisture. The development of the crop was delayed in late May by cool temperatures but maturity later was accelerated by extended periods of dry weather. Windstorms occurring just prior to harvest caused severe lodging in some areas. Harvesting progressed on schedule with excellent yields and high quality grain.

The average yield of 65 bushels per acre in Ohio for 1963 was an all-time record high for the crop. The estimated 50 million bushels of oats produced in Ohio represented an approximate increase of 5 percent over the figure for the previous year. The oat acreage of 775,000 in the state was a decline of nearly 7 percent and was one of the lowest oat acreages harvested since 1900.

The winter oat crop in Ohio suffered near elimination with severe winterkilling.

Diseases and Insects on Oats

Infestation with the cereal leaf beetle caused considerable damage and reduced yields of oats in some fields in northern Ohio. A high incidence of halo blight was noted to be widespread on susceptible varieties. Barley yellow dwarf was observed in local areas of oat fields but was not extensive. Septoria leaf blight was evident in many fields during the growing season and crown rust appeared to show some increase as the crop neared maturity but did not seriously affect grain yield.

Oat Varieties

Clintland 60 was the predominant variety grown in 1963. The recommendation of Clintland 60, Goodfield, Dodge, Putnam 61, Clarion and Rodney is continued for 1964. Norline, Dubois and Bronco winter oat varieties are acceptable only in southern Ohio.

Oat Variety Trials

Replicated oat variety yield trials of ten entries were harvested with a farm combine at seven agricultural research farms. Garry, Garland, Newton, and Clarion were outstanding for yield, while Goodfield and Newton were consistently highest in bushel weight and lowest in percent lodged plants.

Oat Investigations

D. S. Bains is conducting a study on the effect of several morphological characteristics and of fertility level on lodging in oat varieties. Robert W. Miller completed work for the Ph.D. with a thesis on the effects of certain mechanical and chemical treatments on oat seedings and production.

Crosses of short, stiff-strawed spring oat selections with crown rust resistant materials noted in the regional nurseries were continued in a backcross breeding program. Severe winterkilling in the winter oat breeding materials eliminated several selections that were in increase based on survival and performance in previous seasons. The few surviving selections were collected for further consideration.

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*** OKLAHOMA ***

by C. L. Moore, B. C. Curtis, A. M. Schlehuber, B. R. Jackson and H. C. Young, Jr. (Stillwater)

Production

The harvested oat acreage in Oklahoma in 1963 was only 217,000 acres and total production was the lowest on record at 4,774,000 bushels. The low production may be attributed to a combination of low planted acreage and high abandonment (61%) which resulted primarily from severe winterkilling. Grain yield from harvested acres (22.0 bu/A) was rather close to the 1951-1960 average of 22.7 bushels per acre but under the 1957-1961 average by 4.7 bushels.

The acreage of oats grown in Oklahoma has been on the decline for the past several years. The number of planted acres has decreased from 1.4 million in 1955 to slightly over 0.5 million in 1963. For the period 1954-1958, when wheat acreage controls caused an increase in oat production, 1.2 million acres were planted. Much of the decrease in oat acreage since that time may be attributed to increased acreage devoted to barley production. Not until 1960 did barley acreage exceed that of oats; it has continued to do so up to the present.

Winter Survival

The winter of 1963 was one of the most damaging to winter oats on record. It is believed that a combination of alternating high and low temperatures and inadequate soil moisture were primarily responsible for severe winterkilling. Once again the need for increased winterhardiness in oats was apparent as the varieties Cimarron, Forkedeer and Bronco survived about 5 percent at the Stillwater station. Wintok survived no more than 10 percent while Winter Excel C.I. 7603 survived better than most varieties (ranged from 16 to 45 percent).

The oat breeding nurseries were subjected to rigorous winterhardiness tests and provided an excellent opportunity to practice selection for winterhardiness.

Breeding

Greater emphasis in the oat breeding program has been placed on increasing straw strength, better seed type, and increased winterhardiness in present commercial varieties. Germ plasm sources from several winter and spring types are being used.

The fourth generation of the oat cross composite outlined in the 1959 Oat Newsletter was successfully completed. The composite has been grown in large blocks beginning with the second generation. Heavy natural selection for winterhardiness occurred in 1963 as only about 10 percent of the population survived. The harvested seed from these surviving plants has been planted in a one-half acre block for the 1963-64 crop year.

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*** PENNSYLVANIA ***

by H. G. Marshall (USDA)

Winter Oats

Conditions were very unfavorable for winter oat production in Pennsylvania for the second consecutive year. Most producers lost their crop because of an unusually severe winter characterized by prolonged periods of low temperature. This situation has now occurred during 3 of the last 5 years, and has resulted in a sharp decline in the number of producers willing to "take a chance" with winter oats at their present level of winter hardiness. It is estimated that a peak of 60,000 to 75,000 acres of winter oats per year were seeded during the period 1956-58, but indications are that the acreage has severely declined since 1959. Recovery of the lost acreage will be difficult and probably not possible with varieties at the present level of winter hardiness.

Breeding Program. Only trace survival occurred in a large winter oat nursery located near University Park, and scattered survivors from segregating populations were saved for increase and future evaluation. A good differential winter-kill occurred in most areas of a nursery located near Landisville in southeastern Pennsylvania. Useful winter survival data were obtained for selections grown in small blocks of 5 foot, single row plots (replicated 3 times), but experimental error was high where larger 4 row plots were used and little significant data resulted.

Numerous F_3 and F_4 bulk populations from the first and second cycles of a multiple crossing program were grown at Landisville. Only bulks with a level of winter hardiness similar to that of the check variety Norline (C.I. 6903) and showing selection potential for other desirable characteristics were harvested. Approximately 1200 F_2 bulks from the second and third cycles of crossing were grown at the Southeastern Virginia Research Station near Warsaw, Virginia, in order to insure a safe increase of that early generation. These will be evaluated for winter hardiness during 1963-64 in replicated rod row tests of the F_3 bulks and entire populations will be eliminated on the basis of poor survival.

Controlled Freezing Experiments. A technique of freezing plant crowns in paper freezer bags, after removal of the tops and roots from field hardened plants, has given consistent differentiation of varieties for cold hardiness. Cold hardiness of varieties included in the USDA uniform winter oat nurseries, as determined by this technique, was highly correlated with winter survival in the field during 1963. Experiments utilizing this technique have consistently had much lower coefficients of variability (2.8 to 13.0%) than controlled freezing tests utilizing plants in flats of soil or sand, and differentiation of varieties within a considerably narrower range of cold resistance has been possible. A detailed description of the technique will be provided upon request.

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*** TENNESSEE ***

by H. L. Early (Knoxville)

Progenies from crosses of spring type, hexaploid *Avena strigosa* derivatives with Fordedeer and LeConte are in the F_4 and F_5 generation. The crosses had previously been made for the purpose of transferring the high level of crown rust resistance of *A. strigosa* to adapted varieties. Progenies from these crosses have been selected for winter habit. Rust readings taken last year on approximately 1000 head rows showed that 12 percent appeared to be resistant. Unfortunately, many of these resistant plants were lost due to winter kill during the very severe winter last year. However, surviving plants showing resistance were planted in September this year to establish the next generation of head rows. Eventually we hope to develop crown rust-resistant, forage-type lines.

Preliminary tests are being continued to evaluate promising early-maturing selections derived from complex crosses. These selections are also being selected for improved yield and straw strength.

Dr. E. L. Smith has resigned as small grain breeder at the Tennessee Agricultural Experiment Station to accept a position with the USAID/E program located at the Central Research Station in Ethiopia. This program is sponsored by Oklahoma State University.

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*** TEXAS ***

by I. M. Atkins, Paul E. Pawlisch, J. H. Gardenhire (Denton), K. B. Porter (Bushland), M. C. Futrell and graduate students James Justin, Dennis Peier and Clifford Hobbs. Departments of Soil and Crop Sciences and Plant Sciences, Texas A & M University in cooperation with the Crops Research Division, ARS, USDA

The Texas oat crop suffered severe damage from low temperatures in 1963, greatly exceeding those of 1962. An estimated 45 percent of the 2,208,000 acres were destroyed and stands were reduced on most of the remainder. Growth was stopped in early January and, as the spring season was very dry, recovery was slow so that use of the crop for winter pasture was greatly reduced. Our estimate indicated a loss of grain and forage valued at 31 million dollars.

Classification and evaluation of the 700 strains of feral oats was completed by Mr. Dennis Peier as a Ph.D. thesis entitled "Evaluation and classification of Avena ssp. collected from naturalized populations in Texas". Strains having resistance to certain crown rust races, others resistant to some stem rust races and some resistant to Helminthosporium were found as well as some with cold tolerance or good agronomic characters. Tests of about 400 strains for greenbug reaction were made by J. H. Gardenhire but no resistant strains were found. Mr. Peier is now employed as a plant breeder by Taylor-Evans Seed Company of Tulia, Texas.

A study entitled "Heritability of floret size in selected lines of an oat cross and relationship of certain floret characters to test weight in oats" was completed as a Ph.D. thesis by James R. Justin. Floret volume and density were the major components of test weight but these attributes were negatively correlated making selection more complex. Heritability of floret length was much higher than width or thickness. The air pycnometer was found to be satisfactory for measuring quality but, with the present equipment, requires as much seed as the test weight apparatus. Mr. Justin is now employed as Extension Agronomist by the University of Minnesota.

Two strains of oats, Alamo x Mindo-Hajira-Joanette, C. I. 7358 and 7359, developed in our program have proved valuable in Mexico and will be jointly named and distributed. Numerous strains were taken to Mexico by M. C. Futrell and Lucas Reyes as part of the cooperative rust program. The above strains have given high yields of very high quality grain under irrigation at high elevations in Mexico.

The past two severe winters have provided rigorous tests of hardiness of all experimental strains and most strains have been great disappointments. Increased emphasis on hardiness must be given or oats will be replaced as a grazing crop by the new forage ryes, winter wheat and barley. Dubois, Norline, Blount, LeConte, Arkwin and Roanoke are being more extensively tested to determine their value. Several experimental strains from more northern stations appeared of some promise this year. Alamo-X again demonstrated much greater hardiness than its parent and appears superior to Moregrain and New Nortex in this respect.

The Uniform Oat Rust Nursery was grown in the lower Rio Grande Valley during the 1962-63 growing season and all entries except one in this nursery crown rusted. The resistant entry was P.I. 174545. Suregrain gave a reading of 100% prevalence and 50S severity.

During the fall of 1963 oats growing in the area between San Antonio and Fredericksburg were damaged by a disease believed to be caused by a virus. The leaf blades showed yellow to white striates between the veins. The plants also showed a lack of growth, but the dwarfing was not as severe as that caused by yellow dwarf. Leaf hopper populations were heavy in the early seeded oat fields that showed this condition.

Backcross F_2 populations from the cross C.I. 7145 x Suregrain^5 are being tested for stem rust resistance in the greenhouse. It is hoped that stem rust resistant lines from this cross will be adapted to the South Texas area.

In 1960 a backcross program was initiated to produce a cytoplasmic male sterile oat by substituting the chromosomes of hexaploid oat varieties into the tetraploid cytoplasm of <u>Avena barbata</u>. Backcross F_1's from <u>A. barbata</u> x <u>A. sativa</u>^{5} have appeared to be highly self sterile yet completely cross compatible. All observations have been based on greenhouse plants.

A manuscript entitled "Inheritance of greenbug resistance in oats" is in press. Additional crosses have been made to transfer this resistance to adapted varieties.

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*** UTAH ***

by Rollo W. Woodward (Logan)

Oats did well in 1963 showing no diseases or lodging in fields observed. Yields are usually good, but fail to compete with barley or wheat for cash returns. Crops were late seeded due to a rainy April followed by good rains thru June. A general shift in order of yield resulted with Bannock at the top and Overland at the bottom. Yields ranged from 145.4 to 96.6 bushels per acre with a LSD of 13.7 for P = .05. Park, Victory, Markton, and Hull-less were in the middle for their yields.

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*** WISCONSIN ***

by H. L. Shands and R. A. Forsberg

Wisconsin State Oat Yields and Variety Performance

The 1963 Wisconsin state average yield for oats was 55.5 bushels per acre, or down 1.5 bushels from 1962. The western side of the state was droughty, resembling the southeastern drought of 1962. Acreage dropped about 1 per cent, to 2,162,000 acres. The drop probably would have been greater, except for favorable planting conditions early in the season.

Variety Performance

Each year the Wisconsin Seed Certification Service has made available yield reports for varieties certified in Wisconsin. Table 1 lists the 1963 results of averages of variety yields and their departures from similar reports of 1962. Lodi and Garland had highest yields. Garry, Beedee, and Garland showed overall gains per acre, while Goodfield, Dodge, Portage, and Sauk showed losses in yields per acre. One 24 acre field of Lodi was said to have produced 132 bushels per acre. The same grower had 150 acres of Garland that yielded 118 bushels per acre.

Table 1. Seed growers' reports of yields of oat varieties in Wisconsin in 1963 with departure from 1962.

Variety	No. of growers	Yield in Bu/A	Departure from 1962	Variety	No. of growers	Yield in Bu/A	Departure from 1962
Ajax	18	50.6	+ .2	Goodfield	14	52.2	-1.7
Beedee	101	59.8	+2.5	Lodi	118	63.4	--
Dodge	44	53.4	-2.8	Portage	38	51.5	-3.6
Garland	118	63.0	+1.3	Sauk	12	43.5	-8.1
Garry	32	59.8	+3.8				

Specific Diseases

Halo blight prevailed over a longer period of time than in previous years. After oat harvest, crown rust was widespread on volunteer oat plants in the Madison area. A collection of this rust did not attack plants with the Grey Algerian resistance, or some of the more recently discovered sources of resistance. Stem rust race 6AF may have been present late in the season.

Personnel items: J. J. Pavek and D. M. Wesenberg are continuing their thesis problems on oats. D. C. Hess returned from military service in September to continue graduate studies, with an oat thesis problem. D. W. Burrows, P. A. Salm, and Paul Sun are graduate assistants in small grains.

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(BIRDS)

*** BIRD CONTROL FOR GRAIN PLOTS ***

by Robert P. Pfeifer*

Since bird damage to grain plots is important and the number of partially effective control methods are few, new and improved methods are needed. The development of effective methods has

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depended in part upon the researchers understanding of the problem and in part upon his resourcefulness. An attempt was made to formulate certain principles and at the same time review control methods using the application of the principles. The purpose of this paper was to help orient the researcher with the problem of bird control so that he may choose among existing methods or if necessary improve upon and develop new methods for control. Those who have developed the more advanced methods have given much thought to their problem, and certain of these concepts are recorded here.

Principles of Control

Bird control is different from that used for most pests because highly specialized methods are required. Effective control methods can be designed providing the researcher has an understanding of the principles concerning the control of these animals.

Birds have a relatively high level of intelligence since they communicate with each other about feeding places, roosting places, physical danger and harm. Obviously they effectively communicate with each other with warning and distress calls. They recognize signs of danger such as a predatory animal, and they shy away from unusual objects and noises. All of these responses may be characterized as innate, however birds have been conditioned to sound, and the sight of and presence of predators. Therefore, birds can be trained. Effective control must use to advantage the level of intelligence of the animal for training purposes, but not disregard the ability of the animal to become conditioned to certain stimuli.

Birds have many times demonstrated their ability to differentiate among simple situations. For example, birds will at first shy away from a place where there are unusual noises, but they soon learn that these noises, such as explosions, are not to be feared since they cause no harm. Thus, the birds become conditioned to the explosive device and fed on the grain as if there were no explosions occurring near by. I have seen blackbirds feed and roost within a two-foot distance from an active acetylene exploder. Similar conclusions may be drawn concerning the use of colored streamers or mock predator birds. Control measures such as these are effective only where the problem is slight, and the birds have been insufficiently challenged to learn that there is no danger to be associated with these sights or sounds.

Probably the most important principle in bird control is to make the controlled area undesirable to birds. This can be a difficult problem for the field plot researcher because the birds instinctively recognize that near ripe grain is excellent feed. Any method that does not affect the experimental plots but will make the plot area unattractive to the birds will give good control. Since it is often difficult to materially change the appearance of the field, it becomes necessary to have a training program to condition birds to differentiate between attractive and unattractive grain fields. Continued effectiveness of control depends upon the degree of ability of the birds to differentiate between the control mechanisms and the grain field. If the control mechanism is complex from the point of view of the birds' ability to differentiate, then it will continue to be effective under severe conditions of bird population.

One principle that has limited use in bird control is to eliminate the population of birds so that the problem does not exist. True, this principle acts on the very source of the cause of damage, but it is very difficult to use practically on large populations of blackbirds and sparrows because they range over vast areas of land. Use of biological controls with populations such as these may meet with success and certainly should be explored with these undesirable species.

Specific Control Measures

Patrol of plots from dawn to dark will control birds effectively but there may be more desirable methods. If the patrolman is armed with a shotgun, the work may be more interesting, but the expense of control will be increased. Furthermore, shotgun damage to small grain plots is equally as effective as total bird damage. If the experimenter decides to use this method, he should make sure that he never takes an assignment on the patrol except for the sport and shooting practice. One soon finds that it can be uncomfortably cold and wet on the 4:30 A.M. patrol. Also, the days seem long from 4:30 A.M. to 8:00 P.M., 7 days a week, for 6 weeks in a row. There are plots that are protected in this way, and they usually are in the southern climates where the time between heading and maturity is relatively short. This method of control, for the most part, does not take advantage of the principle of making the plot area unattractive to the birds. Also, the method is so undesirable that it has become the incentive for some researchers to devise other methods of control.

Use of noise makers, streamers, danglers, stuffed birds, and etc. may work if the population pressure of the birds is low and they can find abundant food elsewhere. These methods tend to make the field unattractive, but they are so simple that the birds soon learn to differentiate between the added devise and the grain. As soon as the birds discover that there is no harm from these things, they feed on the grain. There have been several different methods used to generate sound, but none have been totally effective in bird control. Frings (2) has recorded distress calls of birds and broadcast the calls over sound systems. These measures will work until the birds learn that there are no birds in distress.

H. R. Klink (3) described a method for bird control that should be excellent. It involved an element to make the protected plots unattractive, by providing actual distress calls and birds in actual distress. This control has elements required for success with only one exception, it may not be complicated enough to work under all conditions. But until failure reports are received, it is one of the best ideas proposed to date. If additional "bird danger signs" could be displayed with Klink's method, perhaps the area of protection could be extended. Additional "danger signs" for the birds might be something like a black sphere mounted on a white square, or a caught bird might activate a switch which turned colored lights on and off and activated a horn. It is probable that the "signs" posted in the control area would be effective when posted around the perimeter of the plots. Quoting Klink for his method: "Soon after the plants reached the heading stage, five-foot stakes were set at about 50 foot intervals along pathways between sections of plots. Several lines of No. 10 cotton black thread were strung from stake to stake at vertical intervals of 4 to 6 inches, from the level of the bottom of the lower heads to one foot above the tops of the plants. The pathways were left clear in order to permit access to the plots for note-taking and selection."

"The threads did not prevent occasional feeding by individual birds, which do little damage in any case, but were very effective in warding off the large flocks which are prevalent at that time of year. Part of this effectiveness appeared to result from distress calls created by the odd bird that got caught up in the threads."

Klink's method is particularly attractive because it was used with sparrows. Birds that perch on the ground, as sparrows do, are hard to control by any method that does not exclude the birds from the plot. A suggestion that may improve this method is to start the bird training period earlier and train the birds to recognize unattractive locations by use of the principles stated above.

Electric bird perches were suggested by Pfeifer (4.5). They were effective in control of blackbirds. The blackbird usually does not feed or perch on the ground, and therefore they habitually use a perch. The electric perch is an effective conditioning or training device because some birds are harmed physically and most of the harmed birds are immediately released. These birds obviously "relayed their shocking experience to other birds in the form of distress calls and displays of physical distress." For migratory birds the training period must be short and effective to achieve control. Apparently birds had great fear of electric shock because control was almost immediate even though there were many hungry birds. Blackbirds soon became conditioned to noise makers of several kinds, but they never became conditioned to the electric perch.

The source of power in the electric perch as proposed needs improvement. Change from alternating to direct current in the perch is desirable from the point of view of safety. Insulation of long spans of perch wire has been a problem in areas where there was high humidity. Enough power is required to evaporate the moisture.

Edwardson and Molyneux (1) chose to use a different approach to bird control from the methods discussed above. They used a spray on sorghum heads which rendered the grain and the field completely unattractive to the birds. This type of control is nearly ideal except that the spray for the entire area is costly and could be damaging to the crop if applied early. Differential maturity of plants may require more than one application of materials. Sprays may not be effective for covered grains unless they contain an odor repellent.

A last resort for protection is to exclude the crop from birds by use of nets or screen houses or some sort of bird proof enclosure. One need not offer criticism of these methods because their adequacies and deficiencies are obvious.

One form of bird control not yet mentioned that uses the principle of elimination of the species is trapping. Mr. M. B. Moore, of the Minnesota station has managed a trapping system for several years. Dr. Harold Marshall, USDA and the Pennsylvania station, recently discussed the problem with Mr. Moore, and concluded from the discussion that trapping had effectively reduced numbers of non-migratory birds during winter months, but did not provide satisfactory control of either the non-migrating or migrating birds during the summer months.

Vandenbergh and Davis (6) fed sexual sterilizing materials to blackbirds and decreased the reproduction of flocks in a local area, but marked reduction of population of birds was not observed.

Summary

Progress has been made in control of birds in small grain plots. From a review of methods, a study of problems and experience in bird control, principles of control were suggested. The most effective principle upon which control can be based is to make the control area unattractive to birds. Control methods that accomplish this result usually involve a training program which must convert a previously attractive area to a presently unattractive one. The complexity of control methods depend upon the severity of the problem. In some situations noise makers and streamers are effective, while other situations require a form of harm or repellent to the bird. All situations require that the birds do not discover what the control mechanism is so that it can be avoided. The black thread method, electric perch method and the grain repellent method were specifically discussed.

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*** NEW OAT VARIETIES ***

a) List:

Name	C.I. No.	Origin
AuSable	7670	Michigan
Brave	7690	Illinois
Clintland 64	7639	Indiana (Purdue)
Coachman	7684	Michigan
Onward*	--	New Zealand
Orbit	7811	New York (Cornell)
Peniarth S.238**	8062	Aberystwyth, Wales
Tippecanoe	7680	Indiana (Purdue)

* See page 41
** Winter
Tentative selections: See under Florida, pp. 45; Idaho, pp. 48; Nebraska, pp. 58.

b) Description:

AuSable:

AuSable, C.I. 7670, was derived from a cross of (Beaver-Garry Clinton) Clintland x Minor. This variety is a late white oat with a high test weight and excellent yield under central Michigan conditions. It has a better yield record than Rodney in Michigan and is expected to replace this variety. The disease reaction and lodging resistance are similar to Coachman except in the case of stem rust. AuSable is a mixture of ABC, abcD and abcd types for resistance to stem rust, and for this reason is recommended only for central Michigan where stemrust is less of a problem.

Brave:

Brave, C.I. 7690, was developed cooperatively by workers of the Illinois Agricultural Experiment Station and the U.S. Department of Agriculture. Seed is being shared with the North Central states for increase in 1964 and for distribution to certified seed growers in 1965. This variety originated from the cross Putnam x LMHJA. The LMHJA parent was an unnamed selection obtained from Minnesota in 1954. Brave has been tested for four years in Illinois and three years in the U.S.D.A. Uniform Mid-season and Uniform Early Nurseries.

Performance data from Illinois tests and Uniform tests indicate that Brave is generally a high yielding variety with wide adaptation. Characteristics of Brave, other than yield in Illinois, are: Maturity: three to four days earlier than Clintland. Seed Quality: large, yellow kernels, with medium to thin hulls. Test weight: similar to or slightly below Clintland and Newton. Straw strength: fair but inferior to Newton and Clintland. Height: similar to Clintland. Disease reaction: barley yellow dwarf tolerance equal or superior to Newton, which has been the most tolerant of varieties adapted for Illinois. Resistant to 203, 216, and 290, but susceptible to 294 and 264 of crown rust. Has a BCDef genotype for stem rust. Excellent resistance to smut and tolerance to Septoria.

Clintland 64:

Clintland 64, C.I. 7639, is a Clintland type with genes ABD for stem rust resistance and Grey Algerian, Landhafer, and Bond resistance to crown rust. Parentage is: Clintland 5X LMHJA 3X Clinton 59 6X Grey Algerian 2X Clintland. The variety is similar to Clintland in type and performance. In tests of M. D. Simons Clintland 64 was resistant to 943 isolations and susceptible to 115 isolates of *Puccinia coronata* from collections made in 1961. It is the first American variety possessing Grey Algerian resistance, adding this resistance to the Bond and Landhafer types possessed by Clintland and Clintland 60.

About 1500 bushels of Foundation seed were distributed for 1964 planting.

Coachman:

Coachman, C.I. 7684, was derived from a cross of (Beaver-Garry Clinton) Clintland x $Marne^2$. It has the Landhafer gene for resistance to leaf rust and the ABCd genes for stem rust resistance. It has had a higher yield than Clintland in Michigan. It is resistant to lodging, red leaf and to prevalent strains of Septoria. Coachman is a large seeded variety and has a very high test weight under Michigan conditions. It is adapted to Southern Michigan and it also may find a place in the Upper Peninsula as an early oat.

Orbit:

The Cornell University Agricultural Experiment Station recently approved for release N.Y. Sel. 5279a1B-3B-70 with the name Orbit. C.I. number is 7811. Public announcement will coincide with a later stage of seed increase. Orbit is from the cross: Alamo 4x Garry (Sel. 5)3x Goldwin 2x Victoria x Rainbow. Orbit combines short stature with high yield and excellent disease resistance. It has been approximately 5 bushels per acre higher yielding than Garry in New York. More detailed performance data may be obtained from the USDA Cooperative Midseason nurseries summaries for 1962 and 1963. Projected seed increase plans should result in first commercial sale of Certified Seed for the spring of 1966 in New York. Seed is white.

New Winter Oat Variety Peniarth S.238:

This new high-yielding variety of winter oats has been developed at the Welsh Plant Breeding Station from a cross of S.172 and an F_2 selection from a cross of S.147 and 01747/10/7.

Tested in official National Institute of Agricultural Botany trials in Britain over three years under the code number E2297, Peniarth yielded 11% more grain than Powys and 17% more than S.147. The straw is about 8 inches shorter than that of S.147, equal in length, but stiffer than Powys. It performs well under a wide range of fertility conditions. Peniarth has been shown to have a fairly high degree of winter hardiness being superior to most other winter oat varieties grown in Britain at this time. It also possesses resistance to stem eelworm (<u>Ditylenchus dipsaci</u> Khun) and under British conditions has a moderate degree of resistance to mildew.

Peniarth was registered in 1963 and will be released into commerce as a recommended variety in the Autumn of 1964. C.I. No. 8062. (By J. D. Hayes, Welsh Plant Breeding Station, Aberystwyth)

Tippecanoe:

Tippecanoe, C.I. 7680, was derived from Clintland 60 ^{2}x

Mo. 0-205. It was selected from a family outstanding in straw strength. It possesses the AB genes for resistance to stem rust and the Landhafer gene for crown rust resistance. Tippecanoe has excellent standing ability at both pre-ripe and post-ripe stages.

About 325 bushels of breeders seed were produced in Indiana in 1963.

Tippecanoe has been tested in the Uniform Midseason Oat Nursery where it has excelled for lodging resistance.

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*** C.I. NUMBERS ASSIGNED TO OATS DURING 1963 ***

by J. C. Craddock, U.S.D.A., Beltsville, Maryland

CI Number	Name or Designation	Pedigree	Origin and/or Source
7948	Belts. 62-64	Minn. 0-131-6 x Sel. 3886	USDA-Belts.
7949	Belts. 62-72	Cleo x Gy 5x Bda 2x Hj x Jt 3x SF 4x Mo 0-205	"
7950	Belts. 62-73	Cleo x Imp Gy 5x Bda 2x Hj x Jt 3x SF 4x Mo 0-205	"
7951	Belts. 62-74	Cleo x Imp Gy 5x Bda 2x Hj x Jt 3x SF 4x Mo 0-205	"
7952	Belts. 62-77	Minn. 0-131-15 x Belts. H.R.4 2x Vg 48-93	"
7953	Belts. 62-83	Cleo x Imp Gy 5x Bda 2x Hj x Jt 3x SF 4x Mo 0-205	"
7954	Belts. 62-85	Cld 5x Osg 4x Bda 2x Hj x Jt 3x SF 6x Ovl 4x Bd x Rb 2x Hj x Jt 3x SF	"
7955	Rodney Sel.	OFF-TYPE Sel. of Rodney R.L. 2123.10	Canada
7956	Rodney Sel.	OFF-TYPE Sel. of Rodney R.L. 2123.50	"
7957	Rodney Sel.	OFF-TYPE Sel. of Rodney R.L. 2123.9	"
7958	Rodney Sel.	OFF-TYPE Sel. of Rodney R.L. 2123.66	"
7959	R.L. 2306	SF 4x Hj x Bnr 2x Vtra 3x Ajax 5x Gy	"
7960	47-Ab-2685	Bond x Anthony 2x Overland	Idaho
7961	Ab-59-7018	Sauk x Simcoe	USDA-Idaho
7962	Rodney Sel.	OFF-TYPE Sel. of Rodney R.L. 2123.11	Canada

CI Number	Name or Designation	Pedigree	Origin and/or Source
7963	Rodney Sel.	OFF-TYPE Sel. of Rodney R.L. 2123.42	Canada
7964	Rodney Sel.	OFF-TYPE Sel. of Rodney R.L. 2123.70	"
7965	56-Ab-6501	Hj x Jt 2x Bd x Rb 3x Sf 4x Ovl	Idaho
7966	Ill. 30907	Albion x 2Clintland 60	Illinois
7967	Ill. 61-8056	Albion x 5Minhafer	"
7968	Ill. 61-8057	Albion x 5Minhafer	"
7969	Ill. 61-8079	Albion x 5Minhafer	"
7970	Iowa C237-89	Clintland x Garry-5	Iowa
7971	Ill. 30840	Cld 3x Gy 2x Hwk x Vtra 4x Ptm	Illinois
7972	Ill. 30839	Cld 3x Gy 2x Hwk x Vtra 4x Ptm	"
7973	Ark. Sel. 3-74-190	Lee x Vtra 2x Fwn 3x Bd 4x Lh 5x Mg	Arkansas
7974	Ark. Sel. 3-74-533	Lee x Vtra 2x Fwn 3x Bd 4x Lh 5x Mg	"
7975	Ark. Sel. 3-74-534	Lee x Vtra 2x Fwn 3x Bd 4x Lh 5x Mg	"
7976	Ark. Sel. 3-74-543	Lee x Vtra 2x Fwn 3x Bd 4x Lh 5x Mg	"
7977	Ill. 30836	Cln 3x Rxt x R.L. 1276 2x Ajax x R.L. 1276	Illinois
7978	Wis. x 643-75	Cld 3x Gy 2x Hwk x Vtra	Wisconsin
7979	Ill. 30849	Cld 3x Gy 2x Hwk x Vtra 4x Rxt x R.L. 1276 2x Ajax x R.L. 1276	Illinois
7980	Purdue 5414 13-23-2	Clintland 60 2x Mo. 0-205	Indiana
7981	Mass. C-2-8-57	Gy 3x Ctn 2x Bne x Car	Mass.
7982	Mass. C-2-2-58	Gy 3x Ctn 2x Bne x Car	"
7983	Minn. II-54-22	LMHJA 2x Ctn 3x Rdy	Minnesota
7984	Minn. II-54-31	LMHJA 2x Ctn 3x Rdy	"
7985	Minn. II-54-43	LMHJA 2x Ctn 3x Rdy	"
7986	Minn. II-54-4	Lh 3x Mdo 2x Hj x Jt 4x 2And 5x Rdg	"
7987	Mich. 56-26-3232-2	Mar2 4x Bvr x Gy 2x Ctn 3x Cld	Michigan
7988	Wis. x 697-3	Rld x Bd 3x Gy 2x Hwk x Vtra	Wisconsin
7989	O.T. 607	Vtra 2x Hj x Bnr 3x Rxt 4x Bcn 5x Rdg	Canada
7990	Browning 211	Purification of C.I. 2413	Iowa
7991	Browning 212	Purification of C.I. 2710	"
7992	Browning 213	Purification of C.I. 3030 (hull-less HA14)	"
7993	Browning 214	Purification of C.I. 3031 (hull-less HA1)	"
7994	Browning 215	Purification of C.I. 3037 (Kherson 27)	"

CI Number	Name or Designation	Pedigree	Origin and/or Source
7995	Browning 216	Purification of C.I. 3038 (Kherson 99)	Iowa
7996	Browning 217	Purification of C.I. 3039 (Kherson 22)	"
7997	Browning 218	Purification of C.I. 3040 (Kherson 34)	"
7998	Ark. Sel. 3-68-551	Lee x Vtra 2x Fwn 3x Bda 4x Lh 5x Mg	Arkansas
7999	Ark. Sel. 3-13-2	Lee x Vtra 2x Fwn 3x Bda 4x Lh 5x Mg	"
8000	Ark. Sel. 2-51-20	Mg x Vg 48-93 2x Dso	"
8001	Wahl No. 2	A. Sterilis	Israel
8002	Mo. 05059	Wintok x Tech	Missouri
8003	Mo. 05060	Wintok x Tech	"
8004	Mo. 05051	Hairy Culberson x Nysel	"
8005	Mo. 05052	Hairy Culberson x Nysel	"
8006	Mass. 13-A-3-62	Dubois x Nysel	Mass.
8007	Ky. 60-830	Dubois x LeConte	Kentucky
8008	Ky. 60-872	LeConte 2x Dubois	"
8009	Ky. 60-874	LeConte 2x Dubois	"
8010	Ky. 60-876	LeConte 2x Dubois	"
8011	Ky. 60-892	LeConte 2x Dubois	"
8012	Ky. 60-920	LeConte 2x Dubois	"
8013	Ky. 60-952	Dubois 2x LeConte	"
8014	Ill. 60-3132	Clinton x Forkedeer 2x Nysel	Illinois
8015	Ill. 60-3244-1	Dubois x Nysel	"
8016	Ill. 60-3555	Dubois x Nysel	"
8017	Tex. 239-58-6	Mdo 2x Hj x Jt 3x Lh 4x Bco	Texas
8018	Tex. 254-59-10	Colo. x Wtk 2x Hj x Jt 3x Aln 2x Ctn x SF	"
8019	Mustang Sel.	Selection of Mustang	"
8020	Tex. 57C 1958	Fwn 2x Lee x Vtra 3x RR 4x Hj x Jt 3x Lh 2x Lee x Vtra 4x Bd x Ath x Lh	"
8021	Tifton 7245	Sg x LMHJA 4x Arl x Dlr 2x Ts 3x Wg	Georgia
8022	Va. 61-31-15	Selection of Irradiated Arlington	Virginia
8023	Fla. 61-Ab-500	Flr 5x Fg 3x Sg 4x Vg^2 2x Bd x Flg 3x Sg	Florida
8024	Corer 63-18	Wg x Sg 4x Vg^2 2x Bd x Flg 3x Sg	S. Car.
8025	Corer 62-11	Reselection of Moregrain	"
8026	Delta 3507	LMHJA 6x Hj x Jt 3x Lee x Vtra 2x Flg 4x Bd x Ath 5x Lh 7x Vg 55111	Miss.
8027	Delta 6349	Hj x Jt 3x Lee x Vtra 2x Flg 4x Bd x Ath 5x ^{2}Lh 6x NTX 107	"

CI Number	Name or Designation	Pedigree	Origin and/or Source
8028	N.D. 59.14 A-1-1-3-1	Ajax x Ran 3x Rdy 2x SF x ^{2}Ctn	N. Dakota
8029	N.D. 59.2 A-1-5-3-1	Ajax x Ran 3x Rxt x R.L. 1276 2x Ajax x R.L. 1276	"
8030	N.D. 60.11 A-4-24-1	Ctn 60 6x Cleo x Imp Gy 5x Bda 2x Hj x Jt 3x SF 4x Mo. 0-205	"
8031	N.D. 58.13 A-1-3-1-1-1	Ctn 60 6x Ctn 59 5x Hj x Jt 2x Bd x Rb 3x SF 4x And x Lh	"
8032	N.D. 55.10 A-2-12-2-1	Ctn 59 5x Hj x Jt 2x Bd x Rb 3x SF 4x And x Lh	"
8033	N.D. 56.9 A-1-49-2	Fyt x Gy	"
8034	N.D. 56.9 A-1-49-4	Fyt x Gy	"
8035	N.D. 56.9 A-1-70-1	Fyt x Gy	"
8036	N.D. 56.9 A-1-71-7	Fty x Gy	"
8037	Fla. 62-Ab-629	Flr 5x Fg 3x Sg 4x Vg^2 2x Bd x Flg 3x Sg	"
8038	Mo. 05182	Yugoslavia Sel.(P.I. 184019) x Mo. 0-205	Missouri
8039	Mo. 05183	Yugoslavia Sel.(P.I. 184019) x Mo. 0-205	"
8040	Wis. X957-2	K.H.C. R.48 (P.I. 174544) 2x Ctn 4x Lh 3x Garland	Wisconsin
8041	N.D. 58.19 A-1-3	Ajax x Ran 2x 58.12 A-1	N. Dakota
8042	Iowa C237-89 I	Ctn x Gy-5	Iowa
8043	Iowa C237-89 II	Ctn x Gy-5	"
8044	Iowa C237-89 III	Ctn x Gy-5	"
8045	Iowa C237-89 IV	Ctn x Gy-5	"
8046	N.D. 56.10 A-1-13-2-2	Fyt x Mhf	N. Dakota
8047	N.D. 56.10 A-1-13-3	Fyt x Mhf	"
8048	N.D. 56.21 A-1-2-2	Gy Sel. 4x Ctn x Vtry 3x Vtra 2x Hj x Bnr	"
8049	R.L. 2791	Hj x Jt 2x LMHJA	Canada
8050	N.D. 58.5 A-1-21-4	Mhf 2x Ajax x Ran	N. Dakota
8051	N.D. 58.7 A-1-2-1	Ptm x Mhf	"
8052	N.D. 57.2 A-1-8-2	Rxt x R.L. 1276 2x Ajax x R.L. 1276 5x Bda 2x Hj x Jt 3x SF 4x Mrn	"
8053	N.D. 57.2 A-1-8-4	Rxt x R.L. 1276 2x Ajax x R.L. 1276 5x Bda 2x Hj x Jt 3x SF 4x Mrn	"

CI Number	Name or Designation	Pedigree	Origin and/or Source
8054	N.D. 57.2 A-1-10-2	Rxt x R.L. 1276 2x Ajax x R.L. 1276 5x Bda 2x Hj x Jt 3x SF 4x Mrn	N. Dakota
8055	N.D. 57.2 A-1-19-3	Rxt x R.L. 1276 2x Ajax x R.L. 1276 5x Bda 2x Hj x Jt 3x SF 4x Mrn	"
8056	Mo. 05344	Yugoslavia Sel. (P.I. 184019)	Missouri
8057	Mo. 05345	Yugoslavia Sel. (P.I. 184019) x Mo. 0-205	"
8058	Delta 6111-12	Dlr 2x Lh	Miss.
8059	Delta 61108-15	NN x Lh 6x Hj x Jt 4x Lee x Vtra 2x Fwn 3x Bd x Ath 5x Lh	"
8060	Delta 61106-9	NN x Lh 6x Hj x Jt 4x Lee x Vtra 2x Fwn 3x Bd x Ath 5x Lh	"
8061	59-Ab-7016	Sauk x Simcoe	Idaho

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