1960

OAT NEWSLETTER

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Sponsored by the National Oat Conference

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Vol. 11

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March 1, 1961

Sponsored by the National Oat Conference

Neal F. Jensen, Editor

ANNOUNCEMENTS

Because unavoidable time delays are involved in overseas correspondence foreign contributors are urged to anticipate the annual preparation of future newsletters and to submit articles or notes to the editor at any time of the year without waiting for the call for material. Your contribution of news will be carefully filed, and all material received by about mid-January will be printed in the current newsletter.

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Back issues of the following volumes of the Oat Newsletter are available and will be distributed on request as long as the supply lasts:

Year	Volume	Number of copies
1952	3	14
1953	4	12
1954	5	10
1956	7	28
1957	8	6
1958	9	19
1959	10	4

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A 1961 issue of Crops Science (ASA) will carry an article outlining a plan to prolong the life of and make more available to cooperators the sources of world variability in the cereals. This proposal has been discussed with a number of persons and it seems likely that the plan will be put in operation. Crops Science will give details of the proposal and it is hoped that operating details will be worked out by crop groups in due time. Not to anticipate details of the article but in order that cooperators will be alerted, there are two categories of seed in particular for which any surplus lots now in existence should be saved: (1) surplus F2 (harvested from F1 plants) from any cross, in any quantity, lots may be bulked together; and (2) surplus seed from any F3 (harvested from F2 plants) population, up to one pound from each cross, lots may be combined into one lot for holding.

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Neal F. Jensen
Department of Plant Breeding
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Ithaca, New York

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I. CONFERENCE AND REGIONAL NOTES

*** Report of the Chairman, National Oat Conference ***

The National Oat Conference did not meet during the past year. However, in early October the Executive Committee was contacted concerning a possible time and place for the next meeting of the Conference. There was considerable interest in holding the next meeting in Florida and everyone was in agreement that the best time would be in the winter of 1961-1962.

A meeting of the Executive Committee was held at the Agronomy meetings in Chicago and it was tentatively agreed that the next meeting would be held at Gainesville, Florida, in late January or February 1962. It is my understanding that plans are being made for the Southern Small Grain Technical Committee and the North Central Oat Technical Committee to hold their meetings in conjunction with the National Oat Conference at Gainesville.

W. H. Chapman, Chairman

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*** Secretary's Report - National Oat Conference ***

No meetings of the Conference Committee were held in 1960. The only regional meeting was that of the Northeastern group (N.E. 23) held in New York in January 1960. No action as to representatives on the National Oat Conference Committee were taken so far as known and at present members of the Executive Committee remain as indicated in Oat Newsletter, Volume X, page 2.

Franklin A. Coffman
Secretary to Committee

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*** Report on Oat Monograph ***

The Oat Monograph has made further although slow progress toward final publication. The primary reason for the books' failure to appear in 1960 stems from compiling all 15 literature cited lists into one list.

When the galley proofs were received neither the editor nor the chapter authors had available a copy of the compiled list for checking purposes and even when the page proofs were received by the authors copies of the corrected Literature List still were lacking.

The first galley copy of the Literature Cited List was received late in July. As no typed copy of the entire compiled list was available it was necessary to check each listed entry to the carbon copies of each of the 15 chapter lists.

A second galley copy of the Literature Cited list was received during the busy fall oat planting season. When finally checked and edited it too included hundreds of marks for the printer's attention.

Before completing checking and correcting this second "Literature Cited" galley the page proofs of many chapters had been received from their authors. They had, therefore, very unfortunately, been checked to a galley needing much additional editorial attention. As a result the Monograph editor in fairness to the chapter authors, the prospective readers and the American Society of Agronomy proceeded to recheck every citation on every page throughout the entire some 600+ pages of text in the Monograph. There are approximately 1,750 entries in the "Literature Cited" list and each is cited 1 to about 100 times. As a result, this was no small undertaking on top of a full-time official assignment in the U.S.D.A. However, that job was eventually finished off.

As of now the "double checked" page proofs of all the 15 chapters; the considerably marked-up proofs of all the "cuts", the very, very, much handled, dirtied and dog-eared 21 corrected, second-run galleys of the Literature Cited plus the Preface, etc., etc., of the Oat Monograph have all been sent registered-mail to Madison.

In mid-December the last cards, prepared by those authors who presumably intend to prepare "Subject Index" cards, were received. The editor has attempted to prepare cards for those chapters for which none or few were received in order to give a reasonably good coverage in the Index. He is now assembling these cards in alphabetical order preparatory to making up the final Subject Index. (He still believes the Oat Monograph will appear in December but is uncertain about what year.)

Franklin A. Coffman
Editor of the Oat Monograph

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II. ARTICLES OF SPECIAL INTEREST

*** The 1960 Oat Crop ***

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

A near record high yield and high test weight oat crop was harvested in the United States in 1960 from the smallest acreage since 1891. The average yield of 42.9 bushels per acre was the second highest on record, being only 1.6 bushels lower than the record yield of 44.5 in 1958 and 4.6 bushels higher than the third highest obtained in 1955. Yields per acre, as reported by the Agricultural Marketing Service, were above 1959 in all regions except the North Atlantic and West, with the South Central Region being above the 1958 record. Reports indicate that the test weight of the 1960 crop was one of the highest on record.

The 1960 oat crop of 1,161,512,000 bushels was 9 percent larger than in 1959 but about a tenth below the 10-year average. Only one other smaller total production was reported in 1956 during the last decade.

Yields in Pennsylvania, New York, New Jersey, and Maryland were reduced by a heavy infection of the barley yellow dwarf virus, with losses in individual fields ranging from 10 to 50 percent. All-time record yields probably would have been obtained in these States had it not been for the damage caused by BYDV. Other oat diseases were relatively minor throughout the Nation in 1960. Yields were generally held down by prolonged cool, wet weather in the spring which delayed planting in the heavy-spring-oat-producing North Central Region. Unfavorable weather delayed fall planting in the heavy-winter-oat-producing areas in the South. Hot, dry weather also tended to lower yields in the Pacific Northwest and Northern Plains.

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*** Suggestion for Evaluating Growth Type in Winter Oats ***

by F. A. Coffman, USDA

Plant pathologists have long used a series of numerical classes to designate the different types of susceptible, intermediate, and resistant reaction to rust in oats. These numerical evaluations are so widely accepted and are so much used that they now are thoroughly understood by both pathologists and agronomists. Agronomists, however, have made little use of such numerical schemes in describing agronomic characters although it would seem logical that they do so.

Observation of the growth types of different varieties of winter oats reveals wide differences. Some are decumbent; i.e., the tillers of the young plant remain very flat or extend out from the crown, close to, if not actually in contact with, the soils surface. In other varieties the plants are decidedly upright in growth habit, all juvenile tillers growing erect.

A series of classes between these two is generally recognized. In agronomic notes usually the growth habit of the flat growing oat is indicated by "D", meaning decumbent, whereas "U" is used to indicate the upright type of growth. The midway type between these is usually indicated by use of the letter "I" as the designation for intermediate. However, two designations between I and D and two between I and U are also used. "D-I" indicates close to, but not fully decumbent, and "I-D" indicates it approaches the intermediate. On the other hand, "I-U" indicates close to intermediate but having a tendency toward the upright, and "U-I" indicates close to, but not fully upright.

The fact that the intermediate types are often influenced by the weather is recognized. Regardless of the winter, the truly upright growing variety will appear upright whereas all types exhibiting any degree of decumbency will appear more decumbent in a cold than in a mild winter. As a result, in any given winter a variety included in a uniform nursery at one station may be rated "D" whereas at another station under a more mild set of weather conditions it may be rated as "d-I" or even "I-D". The summarizing or averaging of such designations to obtain an overall average poses a serious problem. In order to overcome this difficulty, the writer has devised the following scale of numerical evaluations:

Designation	Value	Designations	Value
D	1	I-U	5
D-I	2	U-I	6
I-D	3	U	7
I	4		

With such a system it is possible to determine a numerical average from evaluations received from any number of stations in a single season or even to calculate meaningful averages for a period of several years.

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*** Physiologic Races of Puccinia graminis var. avenae in the United States in 1960 ***

Donald M. Stewart[1] and Bill J. Roberts[2]
Cooperative Rust Laboratory

From 100 rusted samples in 16 States, 10 races and subraces of oat stem rust were identified in the Cooperative Rust Laboratory at St.Paul, Minnesota, in 1960 (Table 1). Among 117 isolates, race 7 (combined with 12) was first in prevalence for the 11th consecutive year but decreased from 59 percent in 1959 to 25 percent in 1960. Race 6 (with 13) comprised 24 percent of the isolates, compared with 11 percent in 1959. Race 2 (with 5) was third in prevalence, comprising 20 percent of the isolates, an increase from the previous year of 14 percent. Race 8 (combined with 10) increased from 11 to 15 percent. Subrace 7A comprised 12 percent of the isolates, a slight increase of 1 percent. Subrace 6A, identified for the first time in the United States, comprised 4 percent of the isolates.

Race 6 (with 13), which is generally virulent on most commercial varieties at high temperature, increased in distribution from 7 States in 1959 to 9 in 1960, as follows: Illinois, Iowa, Kansas, Minnesota, Missouri, New York, Pennsylvania, South Dakota, and Texas. The most striking shift was in South Dakota, where 17 of the 25 isolates were of this race-group compared with 3 isolates in 1959.

The virulent subrace 6A was found once near barberries in Maine and three times in New York. It was also identified once from Urbana, Illinois.

Subrace 7A, which can attack oat varieties with the so-called Canadian type of resistance at both low and high temperatures, was fairly common in Minnesota and North Dakota and was found three times in South Dakota.

Table 1. Physiologic races of oat stem rust in the U. S. in 1958-1960[a]

Race	Percentage of isolates		
	1958	1959	1960
2 and 5	14	6	20
6 and 13	1	11	24
6A	-	-	4
7 and 12	54	59	25
7A	5	11	12
8 and 10	26	11	15

a/ Preliminary results as of January 13, 1961

1/ Plant Pathologist, Plant Pest Control Division, Agricultural Research Service, U. S. Department of Agriculture.

2/ Plant Pathologist, Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture.

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*** Registered Oat Varieties ***

H. C. Murphy, USDA

The cooperative registration of varieties of oats and other field crops by the American Society of Agronomy and Bureau of Plant Industry of the United States Department of Agriculture was approved by the American Society of Agronomy in 1922. A Memorandum of Understanding between the two agencies was signed in 1923. The first applications for the registration of varieties of oats were received by the Committee on Varietal Standardization and Registration in 1924, and the first report on the registration of 64 varieties of oats was published in 1926. A total of 170 oat varieties have been registered to date.

The principle objectives of varietal registration are to give recognition to an improved variety and to provide a permanent and readily available record of the history, description, and important characteristics of the variety.

Registration is on a voluntary basis. The Committee on Varietal Standardization and Registration of the American Society of Agronomy would appreciate receiving applications for the registration of superior or important varieties of oats and other field crops that have not been registered. Application blanks for registration are available upon request to any Committee member.

The variety name, year registration article was published in the Agronomy Journal, C.I. number, and registration number, for each of the 170 oat varieties registered to date, are listed as follows:

Variety	Year Reg.	C. I. No.	Reg. No.
Ajax	1960	4157	162
Alamo	1955	5371	133
Albion	1926	729	46
Andrew	1952	4170	113
Anthony	1929	2143	75
Arkwin	1958	5850	157
Arlington	1952	4657	122
Atlantic	1952	4599	123
Awnless Probsteier	1926	1888	28
Bannock	1938	2592	86
Belyak	1926	1630	5
Bentland	1958	6930	147
Benton	1950	3910	106
Black Diamond	1926	1878	6
Black Mesdag	1926	1877	7
Black Norway	1926	1874	8
Black Tartar	1926	991	35
Bonda	1950	4329	108
Bonham	1958	4676	161

Variety	Year Reg.	C. I. No.	Reg. No.
Boone	1940	3305	87
Bridger	1943	2611	102
Brunker	1929	2054	73
Burnett	1958	6537	140
Burt	1926	293	1
Canadian	1926	1625	9
Carleton	1938	2378	85
Cedar	1944	3314	103
Centore	1958	3865	141
Cherokee	1952	3846	114
Cimarron	1955	5106	134
Clarion	1960	5647	163
Clintland	1958	6701	148
Clinton	1950	3971	105
Coastblack	1926	1025	2
Cody	1952	3916	116
Colburt	1926	2019	43
Colorado No. 37	1926	1640	53
Columbia	1931	2820	78
Comewell	1926	1317	54
Cornellian	1926	1242	50
Craig	1953	5332	128
Crater	1958	7295	142
Culberson	1926	273	10
Curt	1960	7424	169
Danish Island	1926	1684	11
Delair	1954	4653	132
DeSoto	1943	3923	101
Dubois	1958	6572	149
Dupree	1958	4672	154
Early Champion	1926	1623	12
Early Mountain	1926	1624	13
Eaton	1950	3908	109
Empire	1926	1974	55
Ferguson 560	1958	7161	158
Floriland	1955	6588	136
Forkedeer	1950	3170	110
Forward	1926	2242	56
Franklin	1931	2892	79
Frazier	1927	2381	65
Fulghum	1926	708	3
Fultex	1941	3531	92
Fulton	1938	3327	84
Fulwin	1940	3168	90

Variety	Year Reg.	C. I. No.	Reg. No.
Garry	1960	6662	164
Garton 473	1926	1883	15
Garton No. 5	1926	1311	14
Garton Gray	1926	1864	36
Golden Giant	1926	1606	37
Golden Rain	1926	1890	16
Gopher	1926	2027	47
Gothland	1926	1898	17
Green Mountain	1926	1892	38
Green Russian	1926	1978	18
Hancock	1940	3346	88
Huron	1941	3756*	96
Idamine	1926	1834	57
Indio	1958	7292	138
Iogold	1928	2329	72
Iogren	1926	2024	51
Iowar	1926	847	48
Irish Victor	1926	2994	19
Ithacan	1926	2141	58
Jackson	1958	5441	159
James	1958	5015	155
Japan	1926	1889	20
Joanette	1926	1880	21
Kanota	1927	839	66
Keystone	1927	2146	68
Kherson	1926	459	22
LeConte	1953	5107	129
Lee	1926	2042	64
Lenroc	1935	3205	80
Letoria	1952	3392	124
Lincoln	1926	1262	23
Macon	1960	6625	168
Madrid	1926	603	24
Marida	1942	2571	100
Marion	1940	3247	89
Markton	1926	2053	52
Miami	1929	2245	76
Mid-South	1958	6977	150
Mindo	1950	4328	107
Minhafer	1958	6913	143
Minland	1958	6765	144

Variety	Year Reg.	C. I. No.	Reg. No.
Minota	1926	1285	59
Mission	1945	2588	104
Mo. 0-200	1953	4626	125
Mo. 0-205	1953	4988	126
Mohawk	1953	4327	127
Monarch	1926	1876	25
Moregrain	1960	7229	165
Mustang	1952	4660	120
Nemaha	1952	4301	115
Neosho	1950	4141	112
Newton	1958	6642	151
Nehawka	1960	7194	170
Nortex	1927	2382	67
North Finnish	1926	1882	26
Old Island Black	1926	1756	27
Osage	1950	3991	111
Otoe	1942	2886	98
Overland	1952	4181	117
Palestine	1958	2328	139
Park	1958	6611	160
Patterson	1927	2147	69
Putnam	1958	6927	152
Rainbow	1929	2345	74
Ranger	1941	3417	94
Ranson	1958	5927	145
Red Rustproof	1926	1079	4
Richland	1926	787	44
Rodney	1960	6661	166
Rusota	1935	2343	81
Rustler	1941	3754	95
Seminole	1955	5924	135
Scottish Chief	1926	1699	29
Shelby	1952	4372	118
Silvermine	1926	1013	30
Simcoe	1960	6767	167
Southland	1953	5207	131
Sparrowbill	1926	1604	39
Spooner	1935	3165	82
Standwell	1926	1975	60
State Pride	1926	1154	45
Storm King	1926	1602	40
Support	1935	3180	83
Suregrain	1958	7155	153
Swedish Select	1926	134	31

Variety	Year Reg.	C. I. No.	Reg. No.
Taggart	1953	4652	130
Tama	1942	3502	99
Tartar King	1926	1599	41
Tech	1926	947	63
Tennex	1940	3169	91
Tobolsk	1926	1709	32
Upright	1926	2142	61
Uton	1941	3141	97
Vicland	1941	3611	93
Victor	1926	803	33
Victorgrain 48-93	1955	5355	137
Waubay	1958	5440	156
Wayne	1929	2567	77
White Cross	1926	2026	49
White Tartar	1926	1614	42
Winema	1958	4373	146
Winter Turf	1926	1570	34
Wintok	1952	3424	121
Wisconsin Wonder	1926	1645	62
Wolverine	1927	1591	70
Worthy	1927	1590	71
Zephyr	1952	4800	119

*The C.I. No. for Huron has been erroneously listed as 3656 in some publications.

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*** Preliminary Studies on the Development of an Antiserum for Barley Yellow Dwarf Virus ***

Ellen M. Ball (Lincoln) and W. F. Rochow (Ithaca)

A cooperative project was initiated during 1960 between USDA workers at the University of Nebraska and at Cornell University to develop an antiserum specific for the identification of barley yellow dwarf virus (BYDV). The strain of virus used was the vector-specific one transmitted by Macrosiphum granarium, a strain previously studied in New York. Partial purification of the virus was by extraction with organic solvents, differential centrifugation, and density-gradient centrifugation. Virus zones from density-gradient tubes were identified by membrane-feeding and aphid-injection techniques.

Virus preparations injected into the first series of rabbits produced antisera which reacted with the virus but which also showed some cross reactions with a partially-purified preparation of healthy plant antigens. A second series of rabbits has been immunized with more highly purified virus preparations, but the sera have not yet been evaluated. Work along these lines will continue because of the great value a specific antiserum would have for identification of BYDV and for research on strains of the virus.

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*** World Collection of Oats ***

by J. C. Craddock, USDA
Beltsville, Md.

During 1960 the World Collection of Oats received 369 additional sources of germ plasm. Plant Introduction (P. I.) numbers were assigned to 255 entries received from foreign countries. Domestic plant breeders submitted 114 new entries for Cereal Investigation (C. I.) numbers. Seed stocks of the new additions will be made available for distribution as soon as possible.

The attention of plant breeders is called to a collection of 215 entries received from Russia. As near as can be determined these entries are probably equivalent to the USDA Oat Classification Nursery.

The active collection of oats (4573 entries) was grown at the Aberdeen Branch Experiment Station, Aberdeen, Idaho, during the summer of 1960. Each entry in the collection with a C. I. number was thoroughly checked by H. C. Murphy, D. D. Morey, F. A. Coffman and D. E. Western for trueness to type, purity and over-all agronomic characters. Those rows with only a few off-types were rogued and those with considerable mixtures were noted and new seed stocks will be established from a typical panicle selected from the panicle collection of the World Collection of Oats. It is hoped that after this initial purification, the C. I. Collection can be maintained so that all named varieties are true to type. This procedure was not applied to those entries that were introduced as a mixed population. In these instances, the populations are being maintained as mixtures - just as they were when received. A complete inventory of the World Collection of Oats is contemplated provided time and finances permit. It is proposed that this inventory show the C. I. and P. I. numbers, name, pedigree, origin, and any outstanding characters the entries may possess.

The method of keeping the records of the World Collection of Oats was reviewed and new procedures have been adopted for writing pedigrees and abbreviating variety names.

The writing of the complex pedigrees was simplified by adopting the method described in an accompanying article in this Newsletter entitled "On Writing Complex Hybrids in Small Grains Breeding," by G. A. Wiebe. The pedigrees of the oats assigned C.I.₂ numbers during 1960 were written in accord with this proposed method.

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(Note: The following article may be of interest since it represents an attempt by an experiment station staff to develop a comprehensive seed policy consonant with modern seed usage. The statement was drafted by the (Cornell) College Seed Committee and approved April 25, 1960. It applies to most crops under the Station's jurisdiction. -- N. F. Jensen, Chairman of Policy Drafting Sub-Committee)

*** New York State College of Agriculture
Policy for Distribution of Breeding Stocks ***

The timely interchange of seed or plant materials of unreleased stocks can make a significant contribution to progress in genetics and plant breeding. Historically, this distribution, which is a form of communication between scientists, was almost entirely between workers in the USDA and State Experiment Stations. Broad undercurrents of change in recent years have introduced at least two new elements which today play an increasingly important part in this picture. These elements are the development and growth of plant breeding as a commercial enterprise, and the increasing complexity and ingenuity found in the application of genetic principles and plant breeding techniques to the development of new varieties. It is the purpose of this policy statement to attempt to reconcile the historical principles of seed interchanges between colleagues with the realities of private and public interests and the present-day usage of these seed and plant materials.

The New York State College of Agriculture* has a continuing interest in basic and applied research in genetics and plant breeding. In its research programs it is charged with a dual responsibility: in basic research it carries the obligation to pioneer for the future; in applied research it bears a direct responsibility to the farmer and the general public because of the efficiencies in production which are made possible by the results of applied research. Furthermore, in plant breeding, the College recognizes its obligation to develop varieties specially adapted to the climate and environment of New York State. These responsibilities can be discharged only by vigorously pursuing the dual activities of fundamental and applied research.

There is apparent a trend toward greater participation by private enterprise in applied research in plant breeding. The College welcomes and encourages this as a desirable move in bringing to bear greater support to the solution of

farm problems. The responsibilities of a public institution imply a broader spectrum of activity in its research programs than may be possible or desirable in private plant breeding programs. To the extent that private programs demonstrate adequate competency in a given area, the College would view this as an opportunity to divert some of its efforts to other problem areas. Public and private research agencies, the farmer and the public share a common interest in the conduct of research from its inception to final results; a clear statement of policy on the distribution of unreleased breeding stocks is a move aimed to facilitate progress toward a common goal.

The breeding material developed at the College should be available for use by plant breeders elsewhere. This statement outlines the conditions governing the distribution of materials under the care of the College staff. Underlying is a belief that users have a responsibility to make known to the originator the extent and manner in which unreleased plant materials are used in order to aid in the evaluation and measure progress in the research programs. Such recognition of the originating plant breeder's contribution will foster a freer interchange of materials and, at the same time, make a contribution to the general welfare. Also, it is recognized that the originating plant breeder or station has certain rights in his unreleased material and that these rights are not waived with the distribution of seeds or stocks but remain with the originator to be dispensed as he directs. The plant breeder, in effect, is custodian of these rights for the public. A simple guarantee of protection of these rights would be afforded by no distribution whatsoever of unreleased material; our desire, rather, is to promote the widest and freest distribution under adequate safeguards.

(Suggested operating statement)

It is the policy of the New York State College of Agriculture that unreleased breeding material may be sent to interested individuals, representing either public or private agencies, subject to the conditions outlined herein:

1. The distribution of a seed lot or other propagating material grants permission for a) testing, and b) use as a parent for making crosses from which selections will be made. The recipient of a seed lot is encouraged to develop new or additional information about the material. All other uses, such as increase and release as a variety, selection from the stock, use as parents in commercial F_1 hybrids or synthetic varieties, further distribution, and so forth, require the approval of the originating plant breeder or station, whichever is appropriate.

2. It is recognized that plant breeders may make a valuable contribution to breeding progress on a crop by making available new germ plasm for use of other breeders. Certain breeding lines which possess gene combinations with special merit for use only as parents in breeding programs may be considered worthy of release to plant breeders for that particular use. Such lines can follow the formal release procedure with the approval of the College Seed Committee. The plant breeder proposing such a release will prepare a memorandum to accompany seed of the line released for use as germ plasm setting forth its particular attributes and limitations.

3. Plant materials in crop variety trials conducted by the College in cooperation with others, such as farmers, processors, county agricultural agents, other experiment stations and the USDA, shall not be used for seed increase.

Most varieties released from the New York State College of Agriculture are approved by the College Seed Committee and offered to the New York Foundation Seed Stocks Cooperative, Inc., for multiplication and distribution. For any variety accepted and maintained by the Cooperative, the only source of Foundation seed will be the Cooperative.

4. It will be the policy of the College to apply these procedures to seed and stocks received, unless otherwise instructed.

* The term "College" as used herein includes the Agricultural Experiment Stations at Ithaca and Geneva.

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*** Puerto Rico Oat Rust Nurseries, 1960-61 ***

H. C. Murphy and Marie Prechtl, USDA

New and virulent races and subraces of crown and stem rust continue to represent a serious threat to oats in the United States and other countries in the Northern Hemisphere. Until these races and subraces become widespread and firmly established, in both the alternate-host-functioning areas of the North and the over-wintering areas of the South, it does not seem advisable to use them on the Continent for inoculating rust spreaders in the field or for testing in the greenhouse, wherever there is danger of escape to the field.

Facilities for testing parental and early generation lines of oats and wheat with dangerous races of rust have been made available by the Federal Experiment Station, Mayaguez, Puerto Rico, and by Substations of the Puerto Rico Agricultural Experiment Station. The Crops Research and Territorial Experiment Station Divisions, Agricultural Research Service, U.S. Department of Agriculture are cooperating in this program. Thomas Theis, Assistant Officer-in-Charge, and Donald V. McVey, pathologist, Federal Experiment Station, Mayaguez, Puerto Rico, are handling the Puerto Rico phase of the program. The over-all wheat and oat rust testing program in Puerto Rico is coordinated by Louis P. Reitz, Crops Research Division, Beltsville, Maryland. All seed is assembled and data summarized and distributed from Beltsville.

Races 264 and 294 of crown rust and race 13A of stem rust were used to inoculate the 1960-61 oat nurseries grown at Isabela, Lajas, and Ponce, respectively. Race 294 was substituted for the 290 used the previous two seasons, because of its increasing prevalence in the United States and the observation

that it appeared to attack certain selections previously found resistant to 290 in Puerto Rico.

M. D. Simons and B. J. Roberts have supplied the crown and stem rust inoculum, respectively, for the Puerto Rico nurseries since they were initiated in 1947 and 1958. Supplying adequate, viable, and pure inoculum for these nurseries has been a major contribution to the Puerto Rico oat rust nursery program.

The number of cooperators submitting entries, states and countries participating, and rows grown in each nursery, for the past four seasons, have been as follows:

	1957-58	1958-59	1959-60	1960-61
Cooperators participating	17	18	25	24
States and countries represented	13	12	16	15
Approximate number of rows:				
Crown rust race 264	4,800	4,800	5,700	5,002
Crown rust race 290	---	1,200	5,000	---
Crown rust race 216	---	600	---	---
Crown rust race 294	---	---	---	4,899
Stem rust race 13A	---	540	1,900	547
Total	4,800	7,140	12,600	10,448

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*** "Lucky Strikes" in Oats ***

Franklin A. Coffman

To one long involved in crop improvement it appears the inveterate gambler and dedicated plant breeder have kindred characteristics. Both are motivated by that hope of a "lucky strike." Fortune is fickle and odds for unusual success are small frequently resulting in the passing of decades of effort by the breeder with only minor accomplishments. Then again, Fortune's favors may be very gratifying. Within the brief space of 2 years, 3 fortunate results have been noted.

A whole group of oat strains having superior winter hardiness was obtained from winter oat crosses made in 1951. This resulted from 4 or 5 different crosses, and 35-station average survivals indicate a step-up of over 10 percent in hardiness above Wintok, our standard of hardiness for 2 decades.

Whereas most of these more hardy strains have gray kernels and a tendency to weak straw, many derived from cross X51AI, Wintok Selection x Hairy Culberson, have excellent straw and plump, yellow kernels. They also yield exceptionally well. Such give hopes that we eventually may have oats more hardy than Wintok and with acceptable plant and kernel characters. Small increases of certain of the group are being made and efforts have also been made to breed into them resistance to disease.

A second fortunate, entirely unexpected result was transferring crown rust resistance with practically complete fertility in the cross X57BL, Black Mesdag x Abd. 101: (42 x 28 chromosomes). This was not an entirely unheard of result as the resistant Abd. 101 (C.I. 7232), resulting from a species cross (28 x 14 chromosomes), was found fully fertile in the F_4. The original plant was found by H. C. Murphy at Aberdeen, Idaho. Here seemingly is a case of "lightning striking twice."

Matt Moore, of St. Paul, found F_3 progeny plants of the cross X57BL resistant as seedlings to crown rust race 263, 274, and 294; Harold Marshall, of Penn. State found other progeny resistant to race 264; and more recently Marr Simons, of Ames, Iowa, found F_5 segregates resistant to crown rust races 205, 216, 264 and 290.

This writer has experienced no difficulty in crossing progeny from cross X57BL with numerous standard oat varieties. Recently H. C. Murphy, using crown rust race 264 as inoculum, inoculated F_2 and F_3 segregating populations from these crosses. Many gave resistant reactions to race 264, hence this source of resistance to crown rust appears readily useable.

Seed of lines from the original cross and of many later crosses between its segregates and standard oats has, on written request, been sent to cooperators in 20 states and Canada.

A third fortunate combination was the 1956 cross: X56CE, /(Wintok x Clinton 2 - Santa Fe) x Improved Garry/ x /(Bonda x Hajira-Joanette) x Mo. 0-205/ from which the "Bingham" strains were selected at Aberdeen, Bingham County, Idaho.

Tests in 1959 at Aberdeen indicated the surprising yield potential and exceptional standing ability of these midseason, white-kerneled, oats as 17 strains averaged of 217.7 bushels per acre. (Oat Newsletter, Vol. X, p. 11). In 1960, these selections were grown on 35 stations in 18 stages; from Maine to Maryland; westward to Washington. The 1960 records (entries x stations) compared with Garry, the most widely grown midseason, white oat in North America were as follows:

	Comp.	Yield (Bu.)	Comp.	T. Wt. (Lbs.)	Comp.	Lodg. (Pct.)
"Bingham"	182	84.1	141	30.53	95	2.98
Garry	182	78.7	141	32.33	95	10.17

Thus in these extensive tests, some of which were conducted too far south; the "Binghams", in 182 comparisons produced 5.4 bushels (172 pounds) per acre more than Garry; in 141 comparisons they tested 1.8 pounds per bushel less and in 95 comparisons lodged only some three-tenths as much as Garry. In 54 irrigated-station tests; extending over 5 years Clinton and Garry have had almost exactly the same bushel weight.

Matt Moore, of St. Paul, found the "Binghams" have resistance to races 6 and 7A of stem rust but are highly susceptible to crown rust. C. S. Holton, of Pullman, found all "Binghams" he tested were resistant to prevalent races of smut.

Using as parents segregates of cross X57BL, mentioned above, crown rust resistance has been transmitted to these oats; other crosses were made to improve their resistance to stem rust and still others to improve their test weights. The F_1's of these are now being grown. Consequently, it would appear that 3 usually "lucky strikes" have become evident in quick succession.

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*** On Writing Complex Hybrids in Small Grain Breeding ***

G. A. Wiebe, USDA

In the course of applied small grain breeding it often happens that numerous varieties are used in the synthesis of a commercial variety. The breeding involved may consist of various combinations of simple crosses, multiple crosses, and backcrosses. Common practices of writing such complex crosses are to use parentheses, brackets, quotation marks, braces, etc., to describe the sequence of crosses used. The difficulty encountered in reading such hybrids and of writing them on a typewriter needs no comment. For most routine uses complex hybrids need not be written out in full, as hybrid numbers or other short-cut devices will usually suffice. On the other hand, when a complete history or synthesis of the cross is needed, a concise straightforward method of writing the parental stocks used is highly desirable. It is to meet this latter need that the following proposed suggestions are made. The suitability of the method for use on a typewriter and by the printer has been kept in mind. The following rules are adopted:

1. Crosses are designated by the symbols X, 2X, 3X, etc., and indicate successive crosses in the pedigree of the hybrid. The action carried out for any particular cross in the sequence is described by the numerical value of that cross and any attached superscripts in conformity with rules 2 and 3.

2. The parental material involved in any particular cross (X, 2X, 3X, etc.) includes all that listed on either side of the symbol in question and up to the next higher value of (X).

3. Backcrosses are indicated by superscript numerals at the (X) symbol and placed on the same side of the symbol as the recurrent parent. The numerals indicate the number of times the recurrent variety or hybrid was used as a parent.

Example using rules 1 and 2

Simple

Proposed method - Lulu X Tuxedo 2X Cicero
Present method[1/] - (Lulu X Tuxedo) X Cicero

Complex

Proposed - Hero X Hobbs 2X Maggie X Swing 4X Major 3X Butler X Cape 2X Corky X Bell

Present - /̄(Hero X Hobbs) X (Maggie X Swing)/̄ X "Major X /̄(Butler X Cape) X Corky X Bell)/̄"

Example using rules 1, 2, 3

Simple

Proposed - Polo X^3 Polk
Present - Polo X $Polk^3$

Complex

Proposed - Sky X^2 Lark 2X Rock ^{4}3X Pole 2X Dale X Bibb $4X^6$ Stone

Present - "/̄(Sky X $Lark^2$) X Rock/̄^{4} X/̄Pole X (Dale X Bibb)/̄" X $Stone^6$

1/ One the writer is familiar with. The symbols ( ), /̄ /̄ and " ", are in ascending order of includibility of parental material.

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*** Oat Variety Name Abbreviations ***

by J. C. Craddock and H. C. Murphy
USDA

The procedure for abbreviating variety names is that adopted by the National Wheat Improvement Committee and is described in an article entitled "Rules for Abbreviating Wheat Variety Names," by L. W. Briggle, J. W. Schmit, E. G. Heyne, and H. C. Young, Jr., published in the Agronomy Journal, 52:613, 1960. A list of the abbreviations for all the named varieties in the World Collection of Oats is available for distribution upon request.

The rules for writing abbreviations and a list of varieties with their abbreviations follows:

Specific rules, with examples:

a. Use the first letter of the name and the first consonant of the second syllable (Ashkof = Ak).

1. If there is duplication add the next appearing consant in the second or higher order syllable. (Since Chancellor, C.I. 12333 = Cc; then Cascade, C.I. 12376 = Ccd; and Concho, C.I. 12517 = Cch). Note that lower C.I. numbers are given precedence.

2. When all consonants in the second or higher order syllable appear in duplicate abbreviations, use the first letter of the name, the final consonant of the first syllable, and the previously used consonant of the second syllable. (Honor, C.I. 6161 = Hnr, Hr having been assigned to Huron, C.I. 3315).

3. If duplication still exists, use the first consonant of the second syllable as the second letter and the final vowel of the name as the third letter of the abbreviation. (Mentana = Mta).

b. When the second syllable is composed of a vowel(s) only, the vowel is used with the first letter of the name. (Wichita = Wi).

1. If there is duplication, add the first (or succeeding) consonant in the third syllable. (Ariette, C.I. 6243 = Ai; Alicel, C.I. 11700 = Aic).

2. If there are no consonants in the second or higher order syllables, use the vowels in order of appearance, along with the first letter of the name. (Bowie = Bi; in case of duplication, Bowie would be Bie).

c. In the case of one-syllable names, the final consonant is used with the first letter. (Baart = Bt).

1. If there is duplication the consonant preceding the final one is added (Baart would be Brt).

c. When a name is compound, use the first letter of each word, capitalizing both letters (American Banner = AB).

1. When abbreviations of compound names are duplicated, add the first consonant of the second word to the variety name having the higher C.I. number. (Red Russian = RR; Red Rock = RRC).

e. A varietal name followed by a number is abbreviated according to the above rules. The number is written immediately after the abbreviation. (Atlas 66 = Atl 66).

f. Underline the first letter of generic and specific names to indicate italics (Aegilops umbellulata = Au).

g. When two names are nearly identical, use the first distinguishing letter as the third letter of the abbreviation. (Supreme = Spe; Supremo = Spo).

The abbreviations for some of the more important oat varieties and those used as parents in crosses are listed below:

Aa 676	--	Arkwin	Awn
AA 708	--	Arlington	Alt
Aa 712	--	Ascencao	Acc
AB 110	--	Atlantic	Atlt
AB	--	Aurora	Aur
Abd 101	--	Avena abyssinica	Aa
Abegweit	Aw	Avena byzantina	Abz
Abundance	Abd	Avena fatua	Af
Advance	Av	Avena strigossa	Asg
Ajax	--	Awnless Culred	ACl
Alamo	Am	Awnless Monarch	AM
Alaska	Alk	Arnless Probsteier	AP
Alber	Abr		
Albion	Abn	Bage	--
Algerian	Ag	Ballard	Bl
Almeria	Alm	Bambu	Bmb
Amisade	Asd	Bancroft	Bc
Anderson	Ads	Banner	Bn
Andrew	And	Bannock	Bnk
Anthony	Ath	Basin	Bsn
Appler	Ap	Beacon	Bcn
Argentine 12	Agt 12	Beaver	Bvr
Arkansas	Ak 674	Beedee	Bde

Belar	Br	Cherokee	Ck
Belyak	By	Cimarron	Crn
Bentland	Bln	Clarion	Cln
Benton	Btn	Clintafe	Ctf
Berger	Bgr	Clintland	Cld
Bicknell	Bnl	Clintland 60	Cld 60
Binder	Bndr	Clinton	Ctn
Bingham	Bgh	Clinton 59	Ctn 59
Black Algerian	BAg	Coastblack	Cb
Black Beauty	BBt	Cody	--
Black Bell	BlB	Coker	Ckr
Black Diamond	BD	Colbert	Cbt
Black Mesdag	BM	Cole	--
Black Norway	BN	Colo	--
Black Rival	BR	Colorado 37	Cr 37
Black Tartar	BT	Columbia	Clb
Blanche Rigide de Gembloux	BRG	Comewell	Cwl
		Control	Ctl
Bond	--	Cornellian	Cnln
Bonda	Bda	Cowra	Cra
Bondvic	Bvc	Coy	--
Bonham	Bhm	Craig	Cg
Boone	Bne	Craig Afterlea	CAl
Branch	Bnh	Crater	Ctr
Bridger	Bgr	Culberson	Cvs
Brighton	Bht	Culred	Crd
Bronco	Bco	Curt	--
Brunker	Bkr	Custis	Cts
Buck	--		
Burke	Brk	D-69	--
Burnett	Bnt	D-77	--
Burt	--	D.L.M.	--
		Danish Island	DI
Calcutta	Cc	Dasix	Dx
California Red	CRd	Daubeney	Db
Camas	Cms	Delair	Dr
Camellia	Cml	Delta Red 88	DR 88
Canadian	Cd	DeSota	Dst
Canuck	Cn	DeWitt	Dw
Capa	--	Dodge	Dg
Carleton	Clt	Don de Dieu	DD
Carolee	Co	Dubois	Dbs
Carolina Red	Cr Rd	Duodecaploid	Dd
Cartier	Crtr	Dupree	Dpr
Cassel	Cs	Dwarf Culberson	DC
Castleton	Ctt	Dwarf Mutant	DM
Cedar	Cdr		
Ceirch dubach	Cdb	Eagle	Eg
Centore	Cntr	Early Champion	EC

Early Joanette	EJ
Early Mountain	EMn
Early Red Rustproof	ERR
Eaton	En
Edkin	Ek
Elder	Ed
Empire	Ep
Erban	Ebn
Espoir de Gembloux	EGm
Exter	Et
Fairfax	Ffx
Fayette	Ftt
Ferguson 560	Fgs 560
Florad	Fr
Florida 167	Fd 167
Floriland	Fll
Florilee	Fle
Forkedeer	Fdr
Fortune	Ftne
Forward	Fw
Forvic	Fv
Franklin	Fln
Frazier	Fz
Fulghum	Fg
Fulgrain	Fgn
Fulgrain 3	Fgn 3
Fulgrain 4	Fgn 4
Fulmer	Fm
Fultex	Ftx
Fulton	Ftn
Fulwin	Fwn
Fulwood	Fw
Fundy	Fdy
Garry	Gy
Garton 5	Gt 5
Garton 473	Gt 473
Garton 748	Gt 748
Garton 784	Gt 784
Garton Gray	Ggy
Garton Yellow	GY
Glabrota	Gb
Glen	--
Golden	Gn
Golden Giant	GG
Golden Rain	GR
Goldwin	Gw
Goodfield	Gf
Gopher	Gp
Gothland	Gl
Gray Winter	GW
Great Mogul	GM
Green Mountain	BMt
Green Russian	Grs
Grey Algerian	GA
Hairy Culberson	HC
Hajira	Hj
Hancock	Hck
Hawkeye	Hy
Hay	--
Holmberg	Hbg
Hudson	Hsn
Hull-less	Hl
Huron	Hr
Idamine	Im
Indio	Ido
Iogold	Ig
Iogren	Igr
Iowa D67	--
Iowa D69	--
Iowa 444	--
Iowar	Iw
Irish Victor	IV
Ithacan	It
Jackson	Js
James	Jm
Japan	Jpn
Joanette	Jt
Johnson	Jsn
Jostrain	Jst
K.H.C.	--
Kanota	Kt
Kareela	Kl
Kent	--
Keystone	Ks
Kherson	Ksn
Kilby Hull-less	KH
Klein Mar	KM
La Estanzuela	LE
La Industria	LI
La Prevision	LP
La Salle	LSl

Lampton	Lt
Lanark	La
Landhafer	Lh
Lorain	Lrn
Laurel	Lrl
LeConte	Lcn
Lee	--
Lega	--
Legacy	Lcy
Lelate	Llt
Lelina	Lln
Lemont	Lm
Lenoir	Lnr
Lenroc	Lr
Leroy	Lry
Letoria	Ltr
Levic	Lv
Libertas	Lbs
Liberty	Lb
Lincoln	Lc
Logan	Log
Mabel	Mb
Macon	Mc
Macrocarpa	Mr
Madrid	Md
Magistral	Mst
Maine 340	Man 340
Marida	Mrd
Marian	Mrn
Markton	Mk
Marmac	Mmc
Marne	Mar
Marvic	Mv
Miami	Mm
Mid-South	MS
Milford	Mf
Mindo	Mnd
Minhafer	Mhf
Minland	Mln
Minnesota 295	Mnt 295
Minnesota 313	Mnt 313
Minor	Mnr
Minota	Mt
Minrus	Mrs
Minton	Mntn
Miomark	Mmk
Mission	Msn
Mo 0-200	--
Mo 0-205	--
Mohawk	Mh
Monarch	Mrh
Moregrain	Mgr
Morota	Mrt
Mulga	Mlg
Mustang	Mtg
Nakota	Nkt
Navarro	Nv
Nehawka	Nhw
Nemaha	Nh
Neosho	Nsh
New Nortex	NN
Newton	Nwt
Niagra	Ng
Nicol	Nc
Nodaway	Nwy
Norline	Nl
Nortex	Nt
Nortex 107	Nt 107
North Finnish	NF
Nysel	Nsl
Oneida	Ond
Ontario Agric. College No. 3	OAC-3
Ontario Agric. College No. 72	OAC-72
Ontario Agric. College No. 144	OAC-144
Old Island Black	OIB
Oriental	Ontl
Osage	Os
Otoe	--
Ottawa	Otw
Overland	Ol
Palamino	Pm
Palestine	Psn
Park	--
Patterson	Pt
Pnedex	Pdx
Pentagon	Pgn
Pioneer	Pnr
Portage	Ptg
Prolifique Blanche	PBn
Putnam	Pnm
Putnam 61	Pnm 61

Quincy Gray	QG
Quincy Red	QR
Radar 1	Rdr 1
Radar 2	Rdr 2
Rainbow	Rb
Ranger	Rgr
Rangler	Rgl
Ransom	Rsm
Red Algerian	RA
Red Rustproof	RR
Richland	Rl
Roanoke	Rnk
Rodney	Rny
Romana	Rn
Roxton	Rtn
Ruakura	Rk
Rusota	Rt
Russell	Rsl
Rustler	Rlr
S.E.S. 42	--
S.E.S. 49	--
S.E.S. 52	--
Sac	--
Saia	--
Sandy	Sy
Santa Fe	SF
Sauk	--
Schoolman	Smn
Schumacher 7	Smk 7
Scotian	Stn
Scotland	Stld
Scottish Chief	SCf
Segetal	Sgl
Seizure	Szr
Seminole	Snl
Sevnothree	Snt
Shasta	Sst
Shefford	Sfd
Shelby	Sby
Shield	Shd
Silber	Sbr
Silvermine	Svm
Simcoe	Smc
Sir Douglas Haig	SDH
Sixty Day	SD
Southland	Sln
Sparrowbill	Sr
Spooner	Snr
Standwell	Swl
Stanton	Stt
Stanton 2	Stt 2
Stanton 3	Stt 3
Stanton 4	Stt 4
Star	--
State Pride	SP
Statesville	Svl
Sterisel	Ssl
Storm King	SK
Sturdy	Sdy
Sunland	Slnd
Sunrise	Srs
Support	Spr
Suregrain	Sg
Swedish Select	SS
Tabor	Tbr
Taggart	Tg
Tama	--
Tartar King	TK
Tech	--
Tennex	Tnx
Terry	Ty
Three Grain Mesh	TGM
Tift	--
Tioga	Tog
Tobolsk	Tb
Tonka	Tk
Torch	Th
Traveler	Tl
Trelle Dwarf	TDw
Trisperma	Ts
Trispernia	Tst
Trojan	Tj
Ukraine	Uk
Upright	Ur
Uruguay	Ug
Uton	--
Valor	Vr
Vanguard	Vg
Vzvilov	Vlv
Ventura	Vt
Verde	Vd
Vicar	Vcr
Vicland	Vl

Victor	Btr
Victorgrain	Vtg
Victorgrain 48-93	Vtg 48-93
Victoria	Vtra
Victory	Vtry
Vidahore	Vh
Vikota	Vkt
Wauby	Wb
Wayne	Wn
Weibulls	Wbl
Westdale	Wd
White Bonanza	WBn
White Cross	WC
White Maine	WM
White Tartar	WT
Winema	Wn
Winter Fulghum	WF
Winter Turf	WTf
Wintok	Wtk
Wisconsin Wonder	WcWd
Wodan	Wdn
Wolverine	Wv
Woodgrain	Wgr
Worthy	Wth
Yakutsk	Yt
Yenmesk	Ym
Yielder	Yd
Zanster	Zs
Zephyr	Zp

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*** Oat Investigations in Mexico ***

by D. E. Western,
The Quaker Oats Company

While establishing the first oat testing plots, out in the high elevation Interior of Mexico, it was discovered what we believe is the greatest concentrated oat acreage in the world. The inspection trip was made early this past October by Dr. H. C. (Pat) Murphy, Leader - Oat Investigations, U.S.D.A., and myself. While in Mexico, we were accompanied at all times by Dr. Ignacio Narvaez, Director of Cereal Investigations of Rockefeller Foundation, located at Mexico City, and Pierson Oliver, Jr., President, Productos Quaker de Mexico, also located at Mexico City.

In co-operation with the above group, oat-testing plots were established during the current growing season in the state of Chihuahua located directly south of our state of New Mexico. In addition to these plots, the 1959 and 1960 International Oat Rust Nursery was planted at Toluca located approximately 25 miles west of Mexico City.

In the state of Chihuahua, we had three oat plots planted and supervised by Mr. Willard Stucky, who is the Educational Leader of the Mennonite Colony. The plots were established in the two adjoining valleys of the San Antonio and Santa Clara, which cover a combined area of approximately 80 miles long, and up to 45 miles wide which is north and west of the town of Cuauhtemoc. This area is located approximately 250 air miles directly south of El Paso, Texas. These valleys are farmed by approximately 15,000 Mennonite farmers who came from Canada and who originally purchased the area from the Mexican Government in 1933. The valleys lay at an altitude of 7,600 feet and the area gets 95% of its moisture during the months of July, August, and early September. Their only crops are oats, corn, and edible beans. Oats are planted on approximately 250,000 acres and is at least 50% of their entire cultivated acreage. Unless someone can prove Pat and myself wrong, we believe this to be the heaviest concentration of oats commensurate with land area of any place on earth.

The Mennonites originally brought oats with them from Canada which were not adapted. A year or two later they tried an oat from Texas which they found did very well. We agreed it had all of the appearances of Burt. A mature plant was taken back to Frank Coffman and he quickly identified it as Burt, so now there is no question about it. It is, of course, a red oat selected some 30 years ago.

One hundred (100) percent of the acreage is still planted to this variety and, believe it or not, is extremely uniform. Every field looked as though it had been planted from reselected seed. We estimated the yields per acre would be fairly good but the quality of the grain is very poor, indeed. Since precipitation falls during a very limited period, perennial forage crops are out of the question; therefore, oats are used for hay as well as grain to feed their horses and cattle. Many of their oats, harvested for threshing are cut on the green side so that the straw will be suitable for feed. Up to now, wheat has not been a good crop here and while barley will do well, the Mennonites are prejudiced against growing it since barley is used for making beer. It is of interest to know that the oats grown in this area comprises at least 98% of the oats grown in all Mexico. Since oats for milling purposes must be purchased from this area, it is of little wonder the oats are not only of poor quality, but contain a large percentage of green kernels, which gives the oatmeal a very unpleasant grassy flavor.

Because there had never been any oat investigation work done here and we were informed that oats were planted around the first of July, when light intensity is high, and at such a high altitude, we were quite in the dark as to what varieties and selections to submit for planting in the plots. After considerable deliberation, we submitted about 50 selections made up of 30 named varieties and the rest unnamed selections from crosses. As stated before, all of these were planted at three locations, one 80 miles north of Cuauhtemoc which can only be approached by a dirt wagon road, taking 5 1/2 dirty and bouncy hours each way, another plot located about 20 miles northwest of Cuauhtemoc, and the other 40 miles west of Cuauhtemoc.

On the basis of only a one year test, we found many of the selections were not adapted; however, we found several that were. Just from the basis of our judgment, we estimated the good selections would outyield the native oats by at least 25% and have a test weight of a minimum of 38 pounds to the bushel. We were in agreement that even on a one-year testing program, we could immediately recommend varieties which will greatly increase yields and quality. Actually, we now have a better idea as to other material which should be submitted into future testing programs. The three varieties which were outstanding at all three locations were Clintland 60 and Newton from the Midwest, and AB-110 from Georgia. As far as we could learn, diseases seem to be of no problem in this isolated area which is of high altitude and having relatively dry and cool weather during the growing season.

We had a real thrill taking the various readings. You see, we had never encountered conditions like this before. All late varieties like Garry will not mature by October 1 and, therefore, get caught by frost. Some winter type oats

like Suregrain, Cimarron, Delair, Mustang, and Moregrain continued in the vegetative stage and never shot a single head. On the other hand, some of the other winter type oats like Florad, Radar 1, Southland, and AB-110 made a very good to excellent appearance. A few varieties like Indio, Palestine, and Curt were entirely too early and had headed on very short straw. A complete report may be obtained by writing Doctor Murphy.

The Mexico City Area

Heretofore, we had been told that the possibility of growing oats closer to Mexico City was pretty much out of the question. Our investigation indicates strongly that this is not so. Doctor Narvaez of the Rockefeller Foundation, in co-operation with Doctor Murphy, had planted the International Rust Nursery at Toluca which is about 25 miles west of Mexico City. Diseases are, of course, prevalent but for the present at least, none of the newer and more virulent races of either crown or stem rust were found. Victoria and its derivatives were heavily infected with crown rust, but there appeared to be no races of crown rust present which attached Landhafer, Santa Fe, and Trispernia, and their derivatives. Also varieties having the A and BC genes for resistance to stem rust were free from attack. Unfortunately, very little of the resistant material is adapted to the area, but it wouldn't take long for a good oat breeder to make a heck of a good showing in this part of Mexico.

Pat and I found possibilities in Mexico quite exciting - cultivated oats, that is!

Other Testing Programs in Mexico

The Texas Experiment Station have recently established an Oat Testing Program in Mexico in the state of Coahuila, one of which is located at Saltilo, where the Mexican Government have an Experiment Station of their own. The state of Coahuila is located just across the border from South Texas where much of the cultivated areas are of low altitudes. Fall plantings seem preferable with harvest coming in May. We plan to visit these plots in early May at which time Doctor Narvaez of the Rockefeller Foundation will come up to meet us.

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*** Nitrate Accumulation in Oats Pasture Forage Irrigated with Sewage Effluent ***

A. D. Day, T. C. Tucker, and M. G. Vavich[1]

Nitrate poisoning has caused considerable concern among livestock farmers for a number of years. Burnside and Sippel (1) indicated that forage that contains more than 1.5% potassium nitrate is relatively unsafe for livestock and should be fed with extreme caution.

Crawford and Kennedy (2) found that small grains (barley, oats, and wheat) may accumulate enough nitrates to be toxic to animals if grazing is practiced while the plants are young. High nitrogen fertilization increased the danger of nitrate poisoning when grazing young small grains. Under New York conditions, only 35 pounds of elemental nitrogen per acre per year were recommended on young oats for pasture.

Sewage plant effluents have been approved for the irrigation of field crops for animal feed in Texas (4). High yields of oats pasture forage using sewage effluent as a source of irrigation water and plant nutrients were reported in Arizona (3).

Since sewage effluent contains considerably more nitrogen than normal irrigation water, it seemed desirable to determine the effect of sewage effluent on the nitrate accumulation in oats pasture forage. An experiment was conducted over a two-year period (1957-58) at Cortaro, Arizona to compare the nitrate accumulation in Palestine oats pasture forage irrigated with sewage effluent with the nitrate content in oats irrigated with normal irrigation water and fertilized with different amounts of commercial fertilizer. The soil was a Gila Silt Loam. The mean precipitation for the area during the oats growing season (December through May) was 3.8 inches. Sewage effluent from the sewage plant in Tucson, Arizona was used in the experiment. This effluent had received the standard activated sludge treatment and it contained approximately 65 pounds of N, 50 pounds of P_2O_5, and 32 pounds of K_2O per acre-foot. About three acre-feet of effluent were used to grow the oat crop to maturity. Normal pump irrigation water in the area contained about 10 pounds of N, 0.5 pounds of P_2O_5, and 14 pounds of K_2O per acre-foot. Three acre-feet of normal irrigation water were applied on the plots that did not receive sewage effluent. The plots were 33 feet wide and 50 feet long. Four irrigation and fertilizer treatments were used: (1) pump water with no fertilizer (control), (2) pump water with recommended commercial fertilizer (100 pounds of N, 75 pounds of P_2O_5, and 0 pounds of K_2O per acre). (3) pump water with "synthetic sewage" (200 pounds of N, 150 pounds of P_2O_5, and 100 pounds of K_2O per acre), and (4) sewage effluent with no additional fertilizer. The "synthetic sewage" was

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[1]Agronomist, Soil Scientist, and Agricultural Biochemist, Arizona Agricultural Experiment Station, University of Arizona, Tucson, Arizona, respectively.

prepared with commercial fertilizer and supplied the approximate amounts of nitrogen, phosphate, and potash per acre that were applied during the growing season in the sewage effluent. The commercial fertilizer and synthetic sewage were applied at planting time. Each irrigation and fertilizer treatment was replicated four times in a randomized complete block design. The oats were planted at the rate of 100 pounds of seed per acre in December and the pasture forage was harvested at the jointing stage of plant growth (average plant height 17 inches) in March of the following year. Representative samples of forage were taken from each replication to make one composite sample for each treatment. The composite samples were analyzed for total nitrate percentage according to the method used by Johnson and Ulrich (5).

The data for the total nitrate accumulation in the oats pasture forage for the four irrigation and fertilizer treatments in 1957 and 1958 are given in Table 1. In 1957, the nitrate accumulation ranged from 0.07% in the control plots that received only pump water to 1.15% in the plots that were irrigated with pump water and fertilized with synthetic sewage. In 1958, the nitrate accumulation ranged from 0.90% in the control plots to 1.67% in the plots that were irrigated with pump water and fertilized with synthetic sewage. Plots that received sewage effluent with no additional fertilizer had a lower nitrate accumulation than plots that received pump water with synthetic sewage in both years. It is interesting to note that the nitrate accumulation for all treatments was lower in 1957 than in 1958. Possible local environmental differences between the two years may be a partial explanation. A second reason for the higher accumulation of nitrate in 1958 may have been the fact that the forage was harvested between 9:00 and 11:00 a.m. in 1958 and between 1:00 and 3:00 p.m. in 1957. Pistor[2] observed that the nitrate accumulation in young actively growing forage plants was highest in the morning and gradually decreased as the day progressed. In 1958, steers were grazed on a barley pasture that was irrigated with sewage effluent adjacent to the experiment reported herein without any noticeable undesirable effects. However, if one were interested in using sewage effluent to grow oats pasture forage under conditions similar to those reported in this paper, it might be advisable to limit grazing to the afternoon hours, dilute the sewage effluent with normal pump water, or provide supplementary forage to reduce the danger of nitrate poisoning. The results reported herein do not preclude the possibility that a higher nitrate content at an earlier stage of growth might be toxic to livestock if grazing were started before the jointing stage of plant growth.

The response of barley and wheat to sewage effluent when grown for pasture forage was similar to that obtained from oats, except that the total nitrate accumulation in wheat was higher in the plots that received sewage effluent than in the plots that received pump water with synthetic sewage.

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[2]Personal communication from W. J. Pistor

Table 1. Total nitrate accumulation in Palestine oats pasture forage grown under different irrigation and fertilizer treatments at Cortaro, Arizona in 1957 and 1958.

Irrigation and fertilizer treatment	Total nitrate accumulation in pasture forage		
	1957	1958	1957-58 av.
	%	%	%
1. Pump water with no fertilizer (control	0.07	0.90	0.49
2. Pump water with recommended fertilizer*	0.34	1.20	0.77
3. Pump water with synthetic sewage†	1.15	1.67	1.41
4. Sewage effluent with no fertilizer	1.06	1.12	1.09

*Recommended commercial fertilizer = 100 pounds of N, 75 pounds of P_2O_5, and 0 pounds of K_2O per acre.

†Synthetic sewage = 200 pounds of N, 150 pounds of P_2O_5, and 100 pounds of K_2O per acre.

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III. CONTRIBUTIONS FROM OTHER COUNTRIES

*** CANADA ***

by F. J. Zillinsky, R. V. Clark and P. Dyck
(Central Experimental Farm, Ottawa)

Oat yields in Ontario were generally satisfactory in spite of relatively low precipitation, particularly in southwestern Ontario. Very little lodging occurred either as a result of weather or disease. Harvesting conditions were excellent and unusually high quality seed samples were obtained. Stem rust continues to be the important threat to the oat crop and provides headaches to oat breeders and pathologists. Severe stem rust damage was observed in localized areas. Garry and Rodney were among the heavily infected varieties. The rust appeared late in the season and could be found in scattered areas throughout eastern Ontario and southern Quebec.

Crown rust was prevalent in many areas in eastern Ontario and western Quebec but was not too important because of its late appearance in most cases. A crown rust nursery located at Merrickvale, Ontario resulted in an excellent natural infection because of a heavy buckthorn population and indicated that good resistance was available to the races present including the newer ones. Much of the resistance was derived from the oat species Avenae strigosa. Barley yellow dwarf virus was not as prevalent as in previous years but it was rather severe in several scattered areas.

The Septoria disease of oats caused by the fungus Leptosphaeria avenaria f.sp. avenaria was not as prevalent in eastern Canada this past summer. However, it was still of considerable importance, especially in the Maritime Provinces. Late sown crops were more severely affected than those sown early. The usual leaf and stem symptoms were fairly plentiful but at maturity the stem lesions had not advanced to the stage where rotting of stems resulted in lodging. In previous years much of the yield loss was due to severe lodging and subsequent difficulty in harvesting the crop. The Septoria disease leaf symptom picture on oats this year was complicated by an unusually heavy infection of Helminthosporium leaf blotch caused by H. avenae. This situation was general throughout eastern Canada and Helminthosporium leaf blotch no doubt was responsible for considerable damage to the oat crop. Where either fungus occurred alone on the plants the disease in question could be identified fairly readily but when both fungi occurred on the same plants then it was difficult to determine which lesion was caused by which fungus and to assess the damage caused by each. Furthermore, leaf samples infected with both fungi showed that the fruiting structures of both could occur very close to each other and in such cases the two diseases were impossible to separate by looking at lesion symptoms only. For this reason it is difficult to give an accurate estimate of the amount of each disease present. The reason for the increased prevalence of Helminthosporium leaf blotch is not known. Seedling

infection of oats by this fungus was not heavy but favorable conditions for an unusually heavy buildup of inoculum for leaf blotch infection must have been present.

Several other diseases of minor importance were noted during the growing season, especially in the experimental plot areas. Halo blight was found occasionally but mostly in hybrid material. Some unusual leaf symptoms were observed in certain hybrid material originating from both Avena sativa and interspecific crosses. However, the symptoms on the A. sativa crosses were not the same as the symptoms on the interspecific material. In some of the affected material the damage to the leaves was quite striking and the cause of the trouble appeared to be physiological and somewhat similar to that described previously on oats.

The heavy snow cover in the Ottawa area during the past two winters provided a favourable environment for winter cereals. A Cornell strain of winter oats, C.I.6231, survived both winters with less than 50% winter injury. Temperatures of -20°F or less were recorded several times during this period.

Russell Oats

A new oat variety Russell, adapted to Ontario, was released in 1960. It was developed through the cooperative efforts of the Eastern Cerealists Committee, and the Ontario Project Group from a backcross selection of Ott.5055 made at the Central Experimental Farm, Ottawa. The new variety is similar to Garry in resistance to stem rust, crown rust, smut and other diseases, and it ripens at about the same time. The seed quality is good, having a larger kernel and lower percentage of hull than Garry. It is more tolerant to Septoria leaf blotch and black stem than the currently grown varieties. The straw is slightly shorter than Garry. It appears to have slightly less resistance to lodging and to seedling infection by Helminthosporium avenae than Garry.

In yield tests conducted during the past four years, Russell has generally outyielded the recommended varieties in all areas of Ontario except in the northern part of the province. Although considerable interest in this variety has arisen in other areas of Canada, it is expected that the largest acreages will be found on the medium and light textured soils of Ontario. The variety was entered in the uniform North Central Oat Nursery in 1960 under C.I.7557.

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Department of Agriculture Research Station, Winnipeg

by G. J. Green, R. I. H. McKenzie, and D. J. Samborski

Yields of oats in Western Canada were generally good in 1960 despite very dry weather in July. Only in south-western Saskatchewan and southern Alberta, where drought is the main crop hazard, were yields low. Losses from oat diseases were insignificant largely because of the dry weather during July. Stem rust and crown rust appeared unusually late in the season and did not have time to develop before the crop matured.

The 1960 survey of physiologic races of oat stem rust showed that there was a distinct difference between the race distribution in Eastern and in Western Canada. In the eastern provinces of Ontario and Quebec the distribution was similar to that of 1959. Races in the 6A-13A group continued to predominate; races 6, 7A, and 8A were isolated also. In the rust area of Western Canada race 7A displaced race 7 as the most prevalent race. This change resulted mainly from a reduction in the number of isolates of race 7, not from an increase in the amount of 7A which comprised about 35 per cent of the isolates in 1959 and about 40 per cent in 1960. Race 8 increased in 1960, comprising about 20 per cent of the isolates, and was about as prevalent as race 7. Race 6, which has occurred rarely and sporadically in Western Canada, comprised about 10 per cent of the 1960 isolates.

Most races of crown rust from Eastern and Western Canada were virulent on the varieties Rodney and Garry. Race groups 264 and 290, which can attack the variety Landhafer, were not found in Western Canada but were obtained from collections originating in Eastern Canada. A few isolates of races virulent on the differential host variety Saia also attacked the variety Ceirch dubach but no culture attacked both Ceirch dubach and Landhafer.

The emphasis on breeding work at Winnipeg has been directed toward obtaining resistance to the new and dangerous races of stem and crown rust. A cross was made in 1960 to combine the crown rust resistance of Santa Fe and Ceirch dubach with the stem rust resistance of Garry and C.I. 4023. The last mentioned variety is a line from the cross Hajira x Joanette which is resistant to all the races of stem rust found in Canada. F_3 lines from this cross that appear to have the combined resistance of the parental varieties are now being grown in plant growth cabinets.

Other crosses have been made to transfer the rust resistance of several varieties into Rodney and Garry. Ceirch dubach, Santa Fe, Trispernia, and a hexaploid derivative of Avena strigosa supplied by Dr. F. J. Zillinsky are the sources of crown rust resistance being used. Jostrain, R.L. 524.1 (Hajira x Banner), C.I. 4023, and varieties carrying both the Richland and White Tartar types of resistance are being used as sources of stem rust resistance. One or two backcrosses have been completed.

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*** COLOMBIA ***

*** Oat Breeding in Colombia ***

Charles F. Krull and John W. Gibler, Rockefeller Foundation

The oat breeding program of Colombia received another serious setback in 1960 from a shift in the stem rust race complex. When the breeding program was inaugurated, several lines from the International Oat Rust Nurserys were resistant to stem rust, and additional resistance was found in the U. S. D. A. world collection. In the following semesters, however, these lines plus several thousand promising lines from the breeding program became susceptible. This trend culminated in the complete breakdown during the first semester of 1960 of all previously resistant strains and varieties.

Such a breakdown is particularly disturbing when it is noted that all obtainable material including the U. S. D. A. world collection, promising lines from various state experiment stations, and locally produced hybrids were susceptible in the field. The lowest reading in the International Oat Rust Nursery during the first or A semester of 1960 at Tibaitata was 70S. The infection was so severe that approximately 75 per cent of the 400 lines in yield trials set less than 10 per cent seed. None of the 705 F1, 325 F2, 170 F3, and 769 F4 lines were harvested because of failure to set seed. Even the generally highly resistant diploid, Saia, was susceptible. Part of the same material was tested in the cooperative nursery in Ecuador with the same general results.

Adequate control of high greenhouse temperatures was available for the first time during 1960. Greenhouse data from 150 field collections indicates that a single oat stem rust race can attack all the standard and supplementary differentials including Saia. Such highly virulent races are of potential importance to the oat industry of the United States and Canada since these races might be reproduced again in nature of inadvertently introduced.

The crossing program has been suspended temporarily because of lack of resistant parents. The most pressing task now is to make a survey of the oat rust races and screen all available material for sources of resistance. There is optimism that adequate resistance may be found in this manner.

*** JAPAN ***

*** Hokkaido National Agricultural Experiment Station ***

Takeshi Kumagai and Seiji Tabata

The growing season in 1960 was a relatively poor one for oat production. Oat development in the early growing stage was unavoidably delayed by cold weather late in May and early in June, followed by a rainey period in early and middle June; the excessive rainfall in June brought a severe lodging and hampered harvest operations. Moreover, considerable hot weather continued in August and that affecte the maturation of oat kernels a great deal. These conditions constituted a very important factor in the poor yield. The leading varieties of oats grown in Hokkaido are Zenshin and Victory No. 1. Honami, new released oat of last year, is expected to be a promising variety which gradually shows an increase in acreage.

Our breeding program is designed to develop varieties with lodging resistance and high productivity. Considerable emphasis is also placed on selecting materials for good quality as fodder and earliness. We cannot overlook the recent increasing demand for oats not only for food but also for silage at early cutting. The varieties fitted peculiarly well for such purposes are desired. Considering the breeding of oats from the above standpoints, we should place emphasis upon the improvement of oats with good quality fitted for food and upon the selection of the varieties of more vigorous growth for early cutting in the near future.

Cold tolerance test of winter oat varieties: Oat seeds were sown in the autumn of 1959 to test whether or not they survive through winter and to select the superior type of winter resistance. Most varieties used are those called winter oats. According to the observation of this spring, most of the tested varieties suffered heavy winter-killing. However, studying the field in greater detail, a few individuals among the following varieties survived with difficulty:

A. fatua, Lee Coldproof, La Prevision 13, Kirsche Weisshafer. Furthermore, sixty-six varieties have been tested since last fall. The results suggest that winter oats have great difficulty in growing normally in the northern area having such a severe winter as Hokkaido. However, it is considered that Tohoku districts, the northern part of the mainland in Japan, offer a very promising prospect for growing of winter oats of cold resistance, because the climate of winter there is not so rigorous as in Hokkaido.

Performance tests of oat varieties from foreign countries: In 1960, some varieties introduced from foreign countries, including the U.S.A., France, Argentina, Denmark, were tested for grain yield at our station. The varieties used in the test were eight from the U.S.A., five from France, six from Argentina and two from Denmark, respectively. The top performing varieties are Fleur du nord, from France, Resistance from the U.S.A., Minor X Express from Denmark. Fleur du nord, France, was the best, seeming to be fairly good in adaptation to our climatic conditions. Grain yields of top promising varieties grown in our field are given in the following table.

Varieties	Date of Heading	Grain Yield Kg/acre	Percent of Victory No. 1
Fleur du nord	July 7	1371.83	109
Zenshin*	" 11	1359.69	108
Minor X Express	" 10	1298.99	103
Resistance	" 12	1278.76	101
Victory No. 1*	" 13	1262.57	100
Flamande Desprez	" 10	1238.29	98
Pegasa	" 9	1193.78	95

*Check varieties

The following varieties from the U.S.A. were tested: Columbia, Clinton 59, Newton Oat, Beedee Oat, Garry Oat, White Oat, Grey Oat and DuBois Oat, but none of them showed better results this year, in comparison with our varieties now widely used.

Dry dormant seeds of oat varieties were irradiated by γ-rays from ^{60}Co source for the purpose of improvement of our varieties with lodging resistance at the National Institute of Agricultural Science, Hiratsuka, where about 50g seeds of the materials were exposed to 10 Kr and 20 Kr. The names of the oat varieties used are Victory No. 1 and Zenshin, extensively distributed varieties in Hokkaido. Those seeds were sown in our station late in April immediately after being sent by mail. We carried out the observation of individuals of R_1 generation this year.

Varieties	γ-ray dose (Kr)	Culm Height	
		Average(cm)	Variance
Victory No. 1	0	130.6	42.02
"	10	122.9	110.96
"	20	121.0	149.08
Zenshin	0	112.3	63.56
"	10	110.5	73.52
"	20	108.0	101.69

Some changes were recognized in the morphological and physiological character. Namely there was remarkable tendency in both varieties that the more the dosage increased, the shorter the culm heights became and the more the variances increased. It was found that a few plants had white or yellow stripe in the margin of leaves and sheath about early in the heading period, but radiation damage was slight as a whole.

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IV. CONTRIBUTIONS FROM THE UNITED STATES: USDA AND STATES

*** ARKANSAS ***

by R. L. Thurman (Fayetteville)

The 1960 oat crop in Arkansas was in general disease free. Limited collections of crown rust indicated that the prevailing race was 216.

Future oat disease work will be carried out by Dr. John P. Jones, who replaced Dr. Templeton. Dr. Templeton has been shifted to disease work on rice. Dr. Jones formerly worked on soybean diseases with the U.S.D.A. at Stoneville, Mississippi.

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*** CALIFORNIA ***

by C. A. Suneson and M. D. Miller, U.S.D.A. and U. C. (Davis)

*** Performance of Curt Oats ***

Oat yields in California are being sharply increased by breeding. The new variety Curt -- developed by chromosome substitution and selective breeding -- is moving into commercial production with an impressive test record. Results from cooperative state-wide guarded row, 5 replicate tests in 1960 show:

Variety	No. of test locations	Grain yield as % of Kanota
Calif. Red	9	65
Ventura	13	98
Indio	13	133
Curt	11	139

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*** FLORIDA ***

Dale Sechler and W. H. Chapman (Quincy)

The oat acreage in Florida increased slightly in 1959-60 although, as usual, most oats were grazed out or turned under prior to harvest. According to the Florida Marketing Bureau only 27,000 of the 192,000 acres planted to oats in 1959 were harvested. Average yield for the state was estimated at 26 bushels per acre. Yields in the Quincy nurseries were good with several entries exceeding 100 bu/acre.

Crown rust was prevalent in the 1959-60 oat nurseries at Quincy but not as damaging as in many years. Races 202, 213, 216, and 264 were identified from collections made in early June in the nursery. Race 216 appeared to be the most widespread race of crown rust. Stem rust was not a problem in 1959-60. Some form of Helminthosporium or a very similar disease severely damaged a number of strains in the Quincy nursery. Stem breakage was very severe in susceptible lines. Lines from the cross P.I. 197791 x (0-200-10 x Southland) expressed extreme susceptibility.

A new variety, Florad, was made available to farmers through the Florida Foundation Seed Producers Association in the fall of 1960. This variety is the irradiated Floriland selection AB 180. Florad has very little winter hardiness but it has good disease resistance with an extreme upright and rapid vegetative growth. Straw is tall but relatively stiff and seed quality is good.

The 1960-61 oat crop in Florida has not made much early growth. Seeding was late due to dry weather and, since seeding, cool, dry weather has resulted in less growth than normal.

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*** GEORGIA ***

by D. D. Morey (Tifton)

The U.S.D.A. Active World Oat Collection of 3,318 entries was planted October 20, 1959, at Tifton, Georgia. The principal objective was to observe these oats for possible differences in their reaction to red-leaf or barley yellow dwarf virus in the field. They came up to good stands and were uniformly infected by the greenbug, Toxoptera graminum, before January, 1960.

Cold weather reduced the greenbug population and damaged the spring oats to some extent. However, no entries were completely eliminated by cold weather and all recovered and started growth in early spring. Natural infection of crown rust started early and upset the planned observations for red-leaf infection. So many of the entries were susceptible to crown rust that good

readings for red-leaf were not possible. Crown rust practically killed a great many of the A. sativa type oats. Notes were obtained on crown rust, growth types and to some extent on maturity classes.

We are indebted to Marr Simons for the following information about crown rust races present at Tifton in May, 1960. Race 216 was identified 10 times; race 290, 4 times; race 213, 3 times; and races 240 and 295 one time each. Race 264 was not identified from Tifton, but was collected from other locations in Georgia and North Florida.

As a group, the Red Rustproof types gave the lowest rust readings, and manifested the best yields of forage and grain. Red Rustproof types seemed to occur under various names and from numerous sources throughout the collection.

Other articles in this report will stress additional aspects and problems encountered with the World Oat Collection. There is much to be learned about oats by growing and observing all or a portion of the U.S.D.A. World Oat Collection.

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*** IDAHO ***

Frank C. Petr and Ralph M. Hayes (Aberdeen)

The production of oats in Idaho in 1960 has been estimated at 6,500,00 bushels -- the smallest crop since 1948. The reduction is attributed to unfavorable moisture conditions in parts of the state and to a smaller harvested acreage.

Overland and Park are extremely popular on irrigated land and have replaced Bannock, Victory and Swedish Select. Marida is grown on much of the dryland oat acreage in the northern part of the state. In spite of its excellent yielding ability, Cody has never gained popularity among farmers because of its yellow lemma and relatively small seed.

Oat diseases were not of importance in Idaho in 1960. Very little yellow dwarf was reported in the state. In experimental plots at Aberdeen aphids were first observed on July 11 when most varieties were headed. A natural infection of stem rust (probably race 8) was observed late in the season on late-planted experimental material, however, commercial fields were harvested prior to this.

Increase seed size and groat percentage are being emphasized in Idaho's oat breeding program. Lines superior in seed weight to their parental varieties have been obtained. Further testing is in progress to determine if yields and other agronomic characteristics compare favorably with currently recommended

varieties. Work on the development of stiffer-strawed varieties through recurrent selection is being continued.

A new cereal greenhouse was completed and put into operation in December. This important addition to our cereal breeding facilities is the high light of the year. It will be especially useful in the improvement of varieties by back-crossing, and in developing varieties to fill specific needs without delay.

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*** ILLINOIS ***

by C. M. Brown and Henry Jedlinski, Urbana

Oats produced a state average yield of 51 bushels an acre in 1960. This is an increase of 11 bushels an acre above the relatively poor crop in 1959, when yellow dwarf caused a considerable amount of damage. The 1960 yields were good in spite of a very late planting season. The cool, wet weather that delayed oat seeding extended well into early summer and thus favored the late planted oats. Yields, test weights, and grain quality were lowered in some areas where storms caused lodging and delayed harvest.

The acreage of oats harvested in Illinois continued to decline in 1960. Part of the decline was likely caused by unfavorable early spring weather conditions which made it impossible to seed oats at near the normal planting date in most of Illinois. The acreage and yield per acre for the past several years are as follows:

	Acreage Harvested Thous. Acres	Yield Bu/A
1955	3195	42
1956	3041	46
1957	2751	38
1958	2724	55
1959	2233	40
1960	1898	51

The four leading oat varieties in acreage in 1960 were Newton, Clintland, Nemaha, and Minhafer. Varieties that showed a significant increase in acreage over 1959 were Newton and Minhafer, while Clintland, Clinton and Nemaha declined. It is interested to note that Clintland dropped from 45 percent in 1959 to 25 percent in 1960, while Newton increased from 19 percent to 39 percent. The severe attack of yellow dwarf on Clintland in 1959 was mostly responsible for its large decrease in acreage in 1960. Most of this acreage was replaced by Newton, the only recommended variety that showed a considerable degree of tolerance to yellow dwarf attack in 1959. The percentage acreage of several varieties in Illinois for the past 5 years is as follows:

Variety	Percent of Total Acres Planted				
	1956	1957	1958	1959	1960
Bonham	2	3	2	3	3
Clarion	4	6	2	1	1
Clinton	39	35	7	4	3
Clintland	11	18	36	45	25
Columbia	5	2	1	1	1
Minhafer	--	--	1	3	9
Mo. 0-205	4	2	1	2	1
Nemaha	23	20	24	15	12
Newton	--	3	16	19	39

The Disease Situation

The 1960 oat crop in Illinois suffered relatively little damage from barley yellow dwarf virus, as compared with the epiphytotic of 1959. The disease typically was limited to the margins and scattered patches of affected fields. Extensive damage was, however, observed in the very late planted fields especially in the northern part of the state where an unusually late and rainy season delayed the normal sowing of the spring small grains.

Halo and stripe blight were widely distributed early in the season, being especially pronounced on Newton oats. The disease was confused by a number of farmers with barley yellow dwarf. It was, however, of little importance since its further development was completely arrested with the onset of dry and warmer weather.

Rust and septoria leaf and stem blight, although presenting some problem in localized areas were not wide spread. It should be indicated that an appreciable toll was taken by other inconspicuous pathogens such as those causing crown and root rots.

The occurrence of Cephalosporium graminum, Nisikado and Ikata on oats was recorded for the first time in isolated fields of east-central Illinois. Although it occurred in relatively few isolated areas this disease may represent a potential threat to small grain production in Illinois.

One of the important objectives of the spring oat program at Illinois has been the development of selections resistant or tolerant yellow dwarf. A number of selections that originated from crosses of varieties such as Newton, Burnett, Clintland, Fayette and others with yellow dwarf tolerant strains are now available. On the basis of performance tests to date, many of the segregates appear to have yellow dwarf tolerance equal to Albion, which has been the most yellow dwarf tolerant variety in Illinois. Most of them are superior to Albion in test weight and in resistant to rusts and lodging; but they are not as good in these respects as many of the newer well adapted varieties. A limited amount of seed of many of these selections is available for distribution to oat breeders that are interested.

Backcrossing has been used in recent years in attempts to incorporate yellow dwarf resistance in some of the well adapted varieties. Albion has been used as the non-recurrent parent and so far Clintland type, Minhafer and Goodfield have been used as recurrent parents. As many as 4 backcrosses have been made and a major part of the yellow dwarf tolerance of Albion has been maintained. Consequently, it appears that well-adapted varieties resistant to yellow dwarf can be developed by the backcross method. It does, however, appear much easier to transfer tolerance to some varieties than to others. For example, it has been much more difficult to maintain a high level of tolerance in the backcross lines of Clintland type than of Minhafer or Goodfield.

Preliminary experiments indicate that a successful cross has been made between autotetraploid C.I. 3815, obtained from Dr. Sadanaga, and Clintland 60. Apparently some completely fertile lines with 42 chromosomes have been derived from the first backcross in which pollen from the F_1 of the autotetraploid was used to pollinate Clintland 60. Some F_3 lines from this backcross have tolerance to yellow dwarf and resistance to Race 290 of crown rust that apparently came from autotetraploid C.I. 3815. However, the rust resistance and the yellow dwarf tolerance appear to be of somewhat lower level than in the original autotetraploid.

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*** INDIANA ***

by F. L. Patterson, J. F. Schafer. R. M Caldwell, L. E. Compton (U.S.D.A.) (Breeding, Pathology, Genetics).
H. F. Hodges, R. R. Mulvey and C. F. Douglas (Varietal testing).
K. E. Beeson (Extension)
W. D. Sewell, D. E. Zimmer, H. F. Lafever, P. Bhamonchant, S. K. Gilbert, and M. A. J. Miah (Graduate Students).
Purdue University, Lafayette

The 1960 Season

Although seeding was delayed about 2 weeks by a late spring, the season was favorable for oats. The state average yield of 59 bushels per acre was the highest on record but acreage declined about 8% below 1959 to about 807,000 acres. Disease losses were less than average.

Nursery yield trials were so damaged from spraying with 2,4-D at ½ pound per acre in the tillering stage that yield evaluations could not be made.

Varieties

Clintland 60, Clintland, Putnam, Newton, Goodfield, Minhafer and Bentland spring oats are currently recommended. Dubois and Norline are recommended for winter varieties.

Certification in Indiana for 1960 was as follows:

	Class		
	Foundation	Registered	Certified
	acres	acres	acres
Clintland		165	17
Clintland 60	160	4,643	
Goodfield	70	626	
Minhafer		417	78
Newton	30	573	462
Putnam	20	255	133
Dubois	21	71	110
Norline	54		
Total	355	6,750	801

Release of Putnam 61 Spring Oats

About 3,500 bushels of the Putnam 61 (C.I. 7531) spring oats were distributed to seedsmen in February, 1961. Release was speeded by the Agricultural Alumni Seed Improvement Association with a winter increase in Arizona followed by a spring increase in Wisconsin in 1960.

Putnam 61 is a Putnam backcross derivative, Putnam^4 x Minn. 313 (L M H F A), possessing the Landhafer (LL) crown rust resistance and the Hajira (BB) and linked-gene (AADD) stem rust resistance from the Minn. 313 parent. This release provides a stem rust and crown rust resistant counterpart of the moderately yellow dwarf resistant variety Putnam.

Severe losses from crown rust in 1957 and from yellow dwarf in 1959 pointed up the immediate need of a variety, such as Putnam 61, with combined resistance to the major oat diseases in Indiana.

Genetics and Expression of Male Sterility in Oats

Howard Lafever is investigating male sterility in oats as an M.S. thesis problem. Evidence to date indicates that male sterility is governed by a dominant genetic factor without interaction with cytoplasmic factors. Normally, heterozygous plants are male sterile and outcrossing to normal recessive types results in 1:1 ratios in the next generation. The male sterile gene appeared independent of the LL factor for crown rust resistance and the BB factor for stem rust resistance.

Under certain conditions, (80°F in controlled climate rooms) some viable pollen was produced by plants heterozygous for male sterility and F_2 ratios of 3 sterile to 1 fertile were obtained. Anther size was reduced, however, on heterozygous plants whether or not viable pollen was produced.

Inheritance of Straw Strength in Oats

Lines from crosses with the Milford variety have been selected with outstanding straw strength. Most of these are shorter and have a more compact panicle type than varieties now grown. Prakrit Bhamonchant is studying the inheritance of straw strength, height and panicle type and the associations of these characters with each other and with yield in crosses involving these types and commercial varieties. Of prime concern is whether the association of compact panicle and straw strength is great enough to be of value in visual selecting of lines by panicle type to obtain better straw strength. It is anticipated that this research will be summarized in a Ph.D. thesis in August, 1961.

Breeding for Resistance to the Barley Yellow Dwarf Virus

Good field and greenhouse infections with BYD virus have speeded breeding for resistance using Albion and Fulghum (obtained from R. M. Endo) as sources of resistance. Nearly 100% infection of breeding materials in 1960 was obtained by multiplying viruliferous apple grain aphids on barley and transferring them to plants in the field at about the 3-leaf stage. Damage was confined to the intended nursery area by killing the aphids after 4 days with dimethoate.

F_3 and F_4 families following crosses or backcrosses of 8 different varieties with Albion or Fulghum were tested in the field. Few plants were equal to Albion or Fulghum. Better types were much more frequent in crosses to Putnam than in crosses to other varieties. Outstanding plants were used in further crosses. These F_1 and parent plants were re-evaluated for BYD resistance in the greenhouse and additional crosses have been made.

Mutations for Virulence in the Crown Rust Fungus

Investigations were undertaken to study the role of mutation and parasexualism in variation for pathogenicity in Puccinia coronata. Serial culturing of monosporus clones of races 202 and 290, each under complete isolation, demonstrated the occurrence of virulent pustules on varieties previously highly resistant to the original clones. Pathogenic variation occurred on Ascencao and Ukraine from the clone of race 202, whereas only Ukraine exhibited variation in race 290. Variant cultures were tested simultaneously with the parental clones on 26 selected oat varieties. These tests indicated single gene mutations for virulence in heterozygous clones to be the most plausible explanation for the variation. Preliminary determinations of frequencies suggest that mutations play an important role in the production of new virulent races of crown rust. Report of this work as part of a Ph.D. thesis by David E. Zimmer in June, 1961, is contemplated.

Tolerance in Oats to Puccinia coronata

Studies of the comparative tolerance of the Benton oat and other varieties to crown rust have been continued by M. A. J. Miah under controlled inoculation in the greenhouse. The results are being summarized as a thesis for the M. S. degree. The greenhouse studies confirmed earlier, field results showing that the Benton variety, although fully susceptible, suffers less percentage yield reduction than Clinton 59 and Cartier.

Pustule counts at the seedling and adult stages confirm previous estimates that the intensity of infection is equally as severe for the Benton variety as for the less tolerant ones. Tissues of the blades, sheaths and peduncles of the tolerant Benton remain green and vital for many days after those of the less tolerant varieties become chlorotic and later apparently dead. Preliminary greenhouse results also indicate that the Andrew variety may possess a measure of tolerance.

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*** IOWA ***

by K. J. Frey, J. A. Browning, M. D. Simons, K. Sadanaga (Ames)

In 1947 Bonnett and Bever (J.A.S.A. 39:442-5) reported on a hill method of planting for testing small grain head selections. Subsequently, Ross and Miller (Agron. Jour. 47:253-5. 1955) extended the hill-plot method to replicated yield tests. They concluded that hill yield tests were not satisfactory for evaluating small grain strains for heading, plant height, lodging or test weight, and that for small grains the method had only supplemental [illegible].

In 1955, 56, and 57 the hill method of conducting replicated yield tests was evaluated for oats at the Iowa Station. A series of varieties were planted in standard yield plots where 2 eight-foot rows were harvested from each plot and in hill plots where 25 seeds were sown in the center of a one-square-foot plot. The correlations (table 1) for yield, test weight, plant height, and date of heading between the standard and hill plot experiments were highly significant in each of the 3 years. The low correlation for yield in 1956 may have been due to the fact that severe drought reduced oats drastically. These correlations are encouraging and suggest a more optimistic conclusion than that drawn by Ross and Miller. The mean coefficient of variability for yield from the same 3 years was approximately 2.5 times greater in the hill plots than in the standard yield experiments (table 2). Consequently, to establish a given degree of significance it would be necessary to use more replications in the hill plots than in the standard yield experiments.

In 1958 and 1959 the hill plot method was used more extensively and a number of different characters were measured. On the basis of the coefficients of variability (table 3) it appears that plant height, weight per volume, weight per 100 seeds, and panicles per plant can be evaluated with a satisfactory degree of accuracy in hill plots.

From experience during the last 6 years it appears that a number of plant characters in oats can be evaluated with a satisfactory degree of accuracy and precision by using hill plots. At present the hill plots have greatest utility in the following situations: (a) when plant characters which exhibits a low C.V. (e.g. weight per 100 seeds, plant height, etc.) are being evaluated, (b) when testing for yield in early generations (where large differences are expected), and (c) when a theory or hypothesis is being tested which requires the evaluation of a large numberof strains and a plant character can be used which is subject to accurate evaluation in hill plots.

The 1960 crown rust race survey turned up one item of special interest. A collection made at Madison, Wisconsin, by L. S. Wood contained a race of crown rust that was highly pathogenic on both Landhafer and Saia. Cultures of crown rust highly pathogenic on Landhafer that were of intermediate pathogenicity on Saia have been reported previously to the writer by M. B. Moore, and several isolates of this latter type have been noted by the writer since then. Under greenhouse conditions such isolates generally appear to be somewhat more virulent on tetraploid and hexaploid lines carrying the major crown rust resistance gene of the diploid Saia, than they do on Saia itself. In the absence of good field data, however, it would be difficult to predict whether such isolates represent a real menace to Saia or its derivatives. On the other hand seedlings of both Landhafer and Saia, and also the Saia derivatives, appear to be "completely susceptible" to the new Madison isolate. Consequently it appears quite likely that varieties of oats possessing either or both of these types of resistance could be damaged by the Madison isolate. This isolate apparently is very rare and has not been identified anywhere else in the world. It has been assigned race number 321.

K. Sadanaga is spending a year's leave (Sept., 1960 to Sept., 1961) in Japan to study the genetics of diploid oats.

Table 1. Correlations for yield, test weight, plant height, and date of heading from oat varieties evaluated in standard and hill-plot yield tests.

Year	No. of replications		No. of	Correlations			
	Standard	Hills	Varieties	Yield	T. Wt.	Ht.	Date
1955	3	36	36	.61**	.58**	.79**	.97**
1956	3	9	64	.39**	.77**	.63**	.96**
1957	3	9	100	.67**	.62**	.76**	.89**

Table 2. Mean weights and coefficients of variability for yield of oats in standard and hill-plot experiments.

Year	Mean yield (gms.)		C.V. (%)	
	Standard	Hills	Standard	Hills
1955	665	32.5	6.2	14.8
1956	325	11.7	16.0	25.6
1957	406	22.8	5.1	25.0
Mean	-	-	9.3	21.8

Table 3. Coefficients of variability for several characters of oats measured in hill plots in 1958 and 1959.

Year	Character	Unit of measure	No. entries	Mean	C.V.
1958	Yield	gms.	1660	25.4	18.4
	Plant ht.	ins.	1660	34.9	4.7
	Wt. per vol.	gms.	660	70.0	3.1
1959	Yield	gms.	500	29.7	20.1
	Wt. per 100 seeds	gms.	2100	3.0	4.9
	Panicles per plant	no.	100	1.1	7.3
	Spikelets per head	no.	100	37.2	15.2
	Plant ht.	ins.	2100	38.6	5.2

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*** KANSAS ***

by E. G. Heyne, Charles Sing, C. O. Johnston, Lewis Browder,
E. D. Hansing, Webster Sill, Jr. (Manhattan), and James Wilson (Hays)

Despite late seeding of spring oats in Kansas, the 1960 oat crop averaged 34 bushels per acre, which is considerably above average, but the total production for Kansas was only 14,348,000 bushels. This was the third lowest crop since 1882. The acreage was also low, 422,000 harvested acres, the smallest acreage in 80 years. Most of the crop was planted at a date from which only a 75% production or less is expected in comparison with the optimum planting date. However, June was a very pleasant month in Kansas and no serious diseases, insects, or weather damage occurred.

Results of oat performance trials indicate that Mo. 0-205 is among the better varieties. The farmers still grow the Nemaha type extensively, primarily because of its good quality grain. There appear to be no new varieties that will give a better performance than Minhafer and Andrew, the other recommended varieties for the state. In nursery trials, Kansas-developed strains have performed well, but, in all cases, they lack certain important features, such as test weight, smut resistance, or rust resistance. Crosses have been made with Kansas-adapted material and several of F. A. Coffman's Ab101 - Black Mesdag derivatives.

In 1959, there appeared to be considerable difference in phenotypic appearance of several lots of Minhafer certified seed. These differences remained evident throughout the season. Approximately 100 panicles were gathered at random from four sources of seed grown at Manhattan in 1959. The 1958 sources were Minnesota and Nebraska foundation seed, and Kansas and Illinois certified seed. In 1960, these 400 panicle rows appeared to come from the same population. Each lot, however, averaged about 5% definite mixtures. These were taller or shorter types, variations in panicle shape, maturity, and smut resistance. This represents a high degree of mixtures, but one lot was no better or worse than the others. For a crop such as oats this may not be a serious problem, but it does not represent very "pure" seed. The difference so evident in 1959 was attributed to the effect of source of seed as there were distinct differences in germination, test weight, and field emergence of these various lots of 1958 seed.

Winter oat bulks were grown at Manhattan and Hutchinson and out of nine bulk populations only six plants survived at Manhattan and about 120 at Hutchinson. These bulks have had severe losses in prior years in Kansas and these surviving plants may represent a rather high level of winter hardiness.

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by Wayne L. Fowler and Tom Roberts (Manhattan)

The acreage of oats approved for certified seed production declined to 348 in 1960. This is less than 40% of the small 1959 acreage. Minhafer was the most popular variety for certification.

Although planted late, the seed production fields developed very well and growers reported excellent yields of high quality seed. The price of certified seed oats offers no incentive for seed production, although out-of-state peddlers still command, and get, high prices for seed of less well adapted varieties.

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by Earl D. Hansing (Manhattan)

Seed treatment of oats in Kansas is of value for the control of loose and covered smuts; especially in the variety Kanota which is susceptible to several races of each species. It also is of value in our resistant varieties to help prevent the increase of new races.

In addition seed treatment protects the seed and young seedlings from seed- and soil-borne organisms that cause seed rot and seedling blights. Improved stand, yield and quality result. Treatment gives greatest response when cool, wet weather occurs between planting and emergence, or when seed of inferior quality is used. Seed treatments are tested extensively for at least three years before they are recommended.

Seed Treatments Recommended for Oats

Liquids				Dust
Panogen 15	Ceresan 75	Chipcote 75		Ceresan M
Panogen 42	Ceresan 100	Chipcote 25	Ortho LM Conc.	
	Ceresan 200			

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*** KENTUCKY ***

by Verne C. Finkner, Lexington

1960 season.- The 1959-60 season was very dry in the fall until October. The winter was moderately severe with fair differential winter killing. It was unusual in that we had heavy snow cover all of March and our coldest weather occurred in March. Spring oats could not be planted until late and yields were somewhat reduced. Record average bushel per acre yields were produced in Kentucky for oats, wheat and barley nevertheless.

State yield trials.- Experimental varieties continued to perform better than currently available varieties. Best performers from our material included C.I. 7296, C.I. 7483, C.I. 7484, C.I. 7621. All of these are performing superior to the recommended varieties of Dubois, Bronco, Forkedeer and Atlantic.

Hardy oats from world collection.- The group of approximately 300 collections from the world oat collection have been used to evaluate the effect of natural selection on per cent survival. In 1960, natural selection resulting from the years 1957, 1958 and 1959 and all possible two and three year combinations, were evaluated. Natural selection resulted in an increase in % survival of progenies produced in 1957 and 1958 but not in 1959. Two and three year combinations were no more effective in increasing % survival than the best (1957) single year. This type of study is being continued with heterogeneous populations of homozygous and heterozygous individuals.

Spring oats.- Winter oats continue to perform better than spring oats. Some of the newer entries in the uniform spring red oat nursery appear promising however.

Breeding program.- Changes are being made in our small grain breeding program which we hope will result in more rapid progress. More time will be spent on the winter oat program. We hope to make preliminary evaluations for winterhardiness using seed from spaced plants at about four locations each year rather than from head selections. We hope to move into some of the more northern states for part of our winter hardiness evaluations. Strength of straw continues to be our second objective.

New varieties and increases.- No new varieties have been released. Proposed increases of C.I. 7132 have been made. The variety was not uniform and reselections are being made. We are starting a preliminary increase of C.I. 7296 (Ky.54-488) which is being tested in the uniform northern winter oat nursery.

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*** MASSACHUSETTS ***

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

The winter of 1959-60 was less severe than that of 1958-59. Low temperatures came at a time when the soil was covered by snow, preventing significant winter killing of winter oats.

After three years of testing in our winterhardiness nursery and one year in the uniform nursery, our CI 7300 line of winter oats gives a very good picture as to its hardiness and relative yielding ability. The data below provide information on percentage surviving plants and yield.

	% Survived				
	1958	1959	1960	3 Year Ave.	1960 Yield Bu/A
CI 7300	74.5	64.2	77.5	72.0	67.1
Norline	-	-	76.5	-	75.4
Nysel	73.1	58.3	62.6	64.7	65.2
Dubois	72.2	52.5	71.3	65.3	64.3
Wintok	70.8	57.1	73.2	67.0	62.6
CI 6980 (Pent. resel.)	72.0	57.5	74.9	68.8	69.7
Fulwin	65.6	51.6	66.6	61.2	-
Lee	45.5	39.3	51.6	45.5	49.1
Fulghum	29.7	22.2	33.9	28.5	-

As CI 7300 is heterozygous, it was reselected again last year. Three other lines surviving in the severe winter of 1958-59 were selected and increased in 1960.

One line, selected from a cross of Nysel x Torch, is hull-less and has been included in the 1960-61 winter-hardiness nursery. I believe this may represent a first winter type hull-less oat line.

The 1960 growing season for both winter and spring oats was favorable.

The yields of many varieties and selections of spring oats were high. The highest yielding entry was the new selection CI 7588 which yielded 88.2 bu/A. Ranking next were CI 7589, Rodney, CI 7575, Oneida, Putnam and Mo. 0-205, which averaged 86.7, 86.3, 85.4, 84.1, 82.4 and 79.8 bu/A respectively. The poorest yielding entries were Goodfield and CI7540 which produced 56.2 and 54.5 bu/A respectively.

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*** MICHIGAN ***

Upper Peninsula Experiment Station
by S. M. King (Chatham)

In spite of planting two weeks late, the oat plots produced record yields. The highest yielders and the recommended varieties are those which prefer cool nights, such as Simcoe, Garry and Ajax. Test weights were high, with three varieties reaching 39.5. There was little red leaf, average Septoria, low crown rust and no stem rust. Simcoe yielded 113.3 bushels per acre, and 20 varieties averaged 99 bushels.

In addition, several selections from East Lansing were grown. Many of these showed resistance to Septoria and red leaf, but yielded less than the named varieties.

Oats thrive in Michigan's Upper Peninsula.

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*** MINNESOTA ***

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

I. In our tests and others, it was learned that some derivatives of Black Mesdag x S.P. 101 obtained from F. A. Coffman were resistant to crown rust races 202, 217, 263, 264, 274, 276, and 294* in the seedling stage. Several of these resistant stocks have been employed in crosses with commercial varieties and promising breeding strains and the second and third backcrosses are to be made in the greenhouse early this spring. This group of backcrosses may provide promising breeding material that carries the much-sought sources of seedling resistance to new crown rust races that have become prevalent in the region.

II. Another source of resistance to both stem and crown rust from Saia has been successfully transferred to the hexaploid oat varieties through an original cross of the autotetraploid Saia with hexaploid varieties followed by successive backcrosses to the hexaploids. Seed set on selfing appeared to be much improved after the third backcrosses in some of the plants grown in the field, 1960.

III. Attempts are being made to incorporate the adult plant resistance to crown rust races 264 and 290 from P.I. 174544 and Ascencao, respectively, into commercial varieties. The tests of F_4's in Puerto Rico in 1959-60 indicate that a numberof lines involving P.I. 174544 were highly resistant to race 264 and

*Not typical 294. Is similar to 294 at 65°F. and to 295 at 75-80°F. but at both temperatures can attack Saia and Sp. 101.

others involving Ascencao were moderately resistant to race 290. The progeny of some of these lines are being retested in Puerto Rico in 1960-61.

IV. Oat crossing has been a difficult task in the greenhouse during the winter in Minnesota. However, in the past season, the success of the back-crossing program has been improved by increasing the humidity following pollination by covering the panicle with two wet crossing bags, one over the other, or by placing the whole plant in a moisture chamber after pollination. The double bag method seems to give better seed set than the single bag method. The results with the moisture chamber were about equal to the double bag. A critical comparison of results was not possible, however, because the double bag was applied to the crosses in the first part of the season and the moisture chamber was used toward the end of the crossing period. The chamber, in a dimension of 6' x 3' x 5', was built with 7 pieces of wood frames which were covered with plastic sheets on both sides to insure a cooler temperature inside the chamber. A steady flow of mist was provided by a mechanical humidifier for a period of 4-6 hours after pollination. The average seed set with both methods was about 20% or better.

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*** MISSISSIPPI ***

Control of Helminthosporium Leaf Blotch of Oats in Mississippi

By S. S. Ivanoff, Department of Plant Pathology and Physiology, Mississippi State University, State College, Mississippi.

During the last few years many young stands of oats planted early for grazing have been lost on account of Leaf Blotch (Helminthosporium avenae). For the same reason grain yields have also been low at many locations, particularly in the southern part of the State. Following a reinvestigation of this disease and its control by seed treatment with organic mercury compounds, a vigorous campaign was started during the Summer of 1960 to induce the growers to plant only treated seed. The results were very encouraging, since in many counties where very little planting with treated seed was done before, this past season most of the growers treated their seed, and little damage from Leaf Blotch has been reported thus far.

It was found through laboratory studies that 98 percent or better control may be achieved if thoroughly infested seed is treated with Ceresan M or Panogen at the rate of 1/2 oz. and 3/4 oz. per bushel, respectively, with or without a waiting period. An attempt is now being made to achieve a hundred percent control, every time, not only with naturally contaminated and infested seed but also with heavily infected seed. It is very important to obtain one hundred percent control if the effects of secondary infection are to be avoided in the field.

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

The 1960 harvested oat acreage in the State was 30 percent less than the 10-year average acreage of 1949-58, although the production was just 4 percent below the average. The average yield per acre harvested for grain, 49 bushels, is the highest yield ever recorded for the State.

Continuously low temperatures until late in March limited the vegetative development of the crop. Shorter than normal straw with little lodging marked the oat crop this year. A cool, moist, spring was conducive to high yields and high test weights.

In general, diseases were of only minor importance on the 1960 oat crop. Crown rust was almost non-existent in most parts of the State. Repeated efforts to establish crown rust in the nursery were unsuccessful. Plants infected with barley yellow dwarf were extremely scarce in contrast with the epiphytotic which occurred in 1959. Experiments designed to study this disease yielded no positive information. However, it appeared that the application of Thimet other than at emergence depressed the yield in the absence of disease.

The program for incorporating crown rust and stiff straw into agronomically desirable types continues. Rust readings obtained from Puerto Rico on a large number of advanced lines of this material gave evidence that one parental strain used for its high straw strength also appears to carry resistance to the Landhafer races of crown rust. Growth chamber testing of this strain, Anderson Selection (CI 4837) with a culture of race 290 produces a highly resistant reaction. Anderson Selection is very susceptible to the older races of rust but its red rust-proof-like characteristics warrants its inclusion in the breeding program for improved winter oats.

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*** MISSOURI ***

by J. M. Poehlman, G. E. Brown, Charles Hayward,
Arnold Matson, Thomas Wyllie, and Oscar Calvert
(Columbia) Carl Hayward (Pierce City)

Three developments in the Missouri program will be related.

1. Nodaway (C. I. 7272) a new, early, stiff strawed, strain with superior seed quality is being distributed in the spring of 1961. Nodaway originated from the cross (Columbia-Marion) x (Victoria-Hajira-Banner-Victory-Hajira-Roxton). It is the increase from a single F_2 plant. Although slightly variable in height and maturity, it is uniform in plant type, seed quality, and disease

resistance. Yields are equal to Macon and Mo. 0-205 in Missouri, but range of adaptation appears much narrower than 0-205. Grain is white, short, plump and heavy. Nodaway has the ABC genes for stem rust resistance; it is resistant to smut, moderately resistant to crown rust, and susceptible to yellow dwarf.

2. The resistance of C.I. 7448 (Mo. 04769, (Victoria-Hajira-Banner-Victory-Hajira-Ajax) x Mo. 0205[2]) to barley yellow dwarf was confirmed in a yellow dwarf nursery in the field in 1960. C.I. 7448 was one of the most resistant strains growing in the Missouri nursery during the 1959 natural epiphytotic of yellow dwarf.

3. Important advances in winter-hardiness are being made with selections coming from the "hardy x hardy" crosses received earlier from Mr. Coffman. Nine selections in the 1960 U.S.D.A. Uniform Winterhardiness Nursery averaged 45.5% to 58.5% survival at 11 selected locations where winter injury was greatest, in comparison with survivals of 32.4% for Wintok, previously the most hardy variety, and 25.7% for Dubois, presently the most widely grown commercial variety in Missouri.

Oats acreage in Missouri in 1960 was the smallest since 1869. Wet weather delayed or prevented planting, but a cool, wet season was favorable and yields were 4 bushels above average. Only trace amounts of crown and stem rusts and yellow dwarf were observed.

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*** NEBRASKA ***

by D. P. McGill (Lincoln)

The average yield of oats in Nebraska in 1960 was the highest recorded in the present century. The acreage planted was the smallest since 1887.

A small increase of Nemaha x Andrew-Landhafer, C. I. 7440, was made. A further increase by the Foundation Seed Division is planned for 1961.

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*** NEW HAMPSHIRE ***

by Lewroy J. Higgins
(Durham)

Slightly less than 1500 acres of oats were combined and threshed on 200 farms in New Hampshire according to the last published statistics. During the same period over 2,600 acres of oats were grown for forage on nearly 670 farms. No doubt in addition, many acres of oats were grown for pasturing and emergency crops alone and in mixtures in the Green Pasture Program. Even though the trend is for fewer, but better and larger farms in the State, the growing of oats for hay, pasture and silage other than for grain continues.

The yields per acre of oats grown in the U.S.D.A. Cooperative Nursery Trials have about doubled the State's average yields over the years. The average yields for the past few years in the Station plots follow:

	1957	1958	1959	1960
Forage Tons/A	4.2	2.5	2.8	3.0
Grain Bu/A	72.5	48.7	57.0	65.5

Nineteen hundred and sixty was a good oat year for the State. There was an increasing loss of grain due to attacks of birds, especially in small fields and plots. The damage to the new seedlings in the Station plots was so great that one replication was discontinued.

It is interesting to note that only two named varieties, Mo-0205 and Oneida, were in the ten leading selections in the 1960 trials. Thus such varieties as Garry, Rodney, Ajax and Clarion will be wholly replaced in the immediate years ahead.

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*** NEW JERSEY ***

by Steve Lund and R. H. Daines (New Brunswick)

Smog Injury of Oats in New Jersey

During the weekend of May 21-22, weather conditions in the New Brunswick area were such as to produce a condition quite similar to the famous Los Angeles "smog". The following Monday the spring oats in the area, most of which were planted during the week of April 11, were exhibiting symptoms of injury from this condition.

These symptoms varied from a loss of chlorophyll to a complete necrosis of leaf tissue. This was most pronounced on the portion of the leaf that was oriented

on a horizontal plane and, following the development of the necrotic phase, the leaves tended to bend sharply downward from this point.

The symptoms became gradually less conspicuous as the new leaves were formed and the plants appeared to recover although maturity was delayed somewhat.

Winter oats in the area exhibited slight chlorophyll loss but did not appear to be severely damaged. Spring barley also exhibited slight damage but winter barley in the same field showed no symptoms.

Readings made on the basis of damage to exposed leaf area showed a distinct varietal reaction to the disease. The lowest readings were obtained on the so-called "Bingham Selections" (C.I. 6740 x Imp. Garry) x /(Bonda x H-J)-SF x Mo. 0-205/. Others ranged from severe damage on /(Bonda x H-J)-SF/ x Marion (C.I. 7540) and Mo. 0-205 through moderate damage on Garry, Ajax and Clinton "59".

Damage appeared to be more prevalent in earlier maturing varieties although rather severe damage was found in all maturity groups. On the other hand, oats in the boot or heading stages were rather resistant to the damage as evidenced by the small amount of damage on winter oats. These lines were in the boot or heading stage when the smog was present.

The importance of this disease on the East Coast has not been determined. It appears that the stage of development of the oat plants when the particular fumes are present is a critical factor. However, it is conceivable that this condition might be more prevalent as more industrial plants and automobiles are operated in a particular area.

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*** NEW YORK ***

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

New York produced 29,432,000 bushels of oats from 566,000 harvested acres in 1960. The state average yield was 52.0 bushels per acre -- the fourth successive year of 50-plus yields. There appears to be a downward trend in acres planted to oats which is having some effect upon seed marketing.

The first sizable commercial sale of Oneida will be made to New York farmers this spring (1961). Oneida was described in preceding Newsletters. It is considered to be a supplement, not a replacement, for Garry providing the advantages of more even ripening and greater resistance in the field to black stem. Oneida is the first variety stemming from a new breeding program described

in the 1958 Newsletter. Second and third releases are described following. All three varieties were developed in cooperation with the USDA and other experiment stations. All are in 1961 Uniform Nurseries for observation.

TIOGA, C.I. 7524 (formerly Cornell 5217a1-2B-39)

This oat from the cross of C.I. 6589 (Cornell Garry Sel.5) x Goldwin-Clinton was increased in Arizona in the winter of 1959-1960 and further increased in New York during the 1960 season. It will be under seed increase in New York during 1961 and Certified Seed will be produced in 1962 with first commercial sale in any quantity for the spring of 1963. Tioga was described in last year's Newsletter. Tioga has the outstanding lodging resistance of the Cornell Garry Sel. 5 but is shorter. Farmers tell us that it has "sex appeal".

NIAGARA, C.I. 7528 (formerly Cornell 5220a2-2B-23)

Niagara is the third variety in the current series and is from the hybrid of C.I. 6589 x /Goldwin x Victori-Rainbow) x Branch/ made in 1952 at Ithaca. Niagara has a white, attractive, high quality kernel. Compared with Garry, our predominant variety, Niagara is about 2 days later in ripening, 2 inches shorter in height, with straw equal or probably superior in strength, and with the same stem rust protection (ABC). Niagara is smut resistant and has shown resistance to the crown rust races 202 and 216. The outstanding characteristics of Niagara are: good crop type, superior yield, disease resistance of a high order, and high quality grain.

Niagara has exceeded Garry in 12 out of 15 nurseries over a 5-year period. Its average yield in this series was 78.4 bushels per acre; that of Garry 73.4. The increased yield per acre is 5 bushels or about 7%. Niagara, in addition, has a higher per cent of groat (less hull) than Garry: 75.9 vs. 72.4%, and when this factor of higher quality is considered the groat production is approximately 12% more than Garry. Garry, however, shows a slightly heavier weight per bushel, 34.4 lbs. vs. 33.9 lbs. for Niagara based on 12 tests over a 4-year period. Niagara will go into Foundation Seed increase in the spring of 1961. First commercial sale of Certified seed will likely be the spring of 1964.

Breeders Seed of selections from other hybrids is being prepared at the Cornell station and announcements will be forthcoming as decisions on release are made through the College Seed Committee.

Change in Procedure for Growing Spring Oat F2

Due to an advantageous 10-fold increase in the amount of seed produced on the F1 plants resulting from growing the hybrids under highly favorable field conditions instead of in the greenhouse the field F2 nursery procedures have been modified to accommodate the larger populations. Seed is sown at a reduced rate, but not spaced, in as many rod rows as are required for each different

hybrid population. A blank row walkway is left between successive populations in the section or field plat. Alleys between rod row sections are 4 feet wide and a row of a susceptible variety of oats is planted down the center and later inoculated to serve as a rust spreader. Yearly alternations of stem rust races 7A and 8 are employed with the hybrid populations of oats chosen on the basis of suitable resistance factors in the parents. Inoculation with appropriate crown rust races is also made. During the growing season the bulk pppulations are severely rogued of susceptible plants and all readily visible undesirable types. Surviving plants are harvested by hybrid in bulk with standard power harvesting equipment and the seed processed and used for composite F3 plantings. This method was used in 1960 and appeared to be satisfactory as well as highly efficient. If it continues to work well we will probably discontinue space planting of the F2 except for genetic studies.

The use of rust spreader rows and yearly alternating races of crown and stem rust is a standard feature used in all stages of the oat breeding program. To date, however, the production of oats resistant to stem rust races has proven to be a simpler operation than those resistant to crown rust races. We are relatively more concerned at this time over the potential threat to our oat production from crown rust.

Several new selections continue to show very good field resistance to BYDV. Tentative station increases will be made in 1961 pending further evaluation of other factors.

Results from Regional (N.Y.) Variety Tests in 1960

The following are the results from 10 county and station tests in New York in 1960.

Entry	Yield bu./acre	Test weight lbs./bu.	Groat %	Yield groats lbs./acre
Niagara	76.2	34.1	70.96	1730
Oneida	69.1	34.6	72.97	1614
Sel. 5271-5*	71.3	33.8	70.57	1610
Garry	70.9	34.5	69.99	1588
Ajax	69.0	34.4	70.90	1565
Tioga	66.0	33.8	72.58	1533
Craig	66.0	34.2	71.42	1508
Mohawk	55.4	36.1	72.92	1293
Clintland 60	52.5	36.1	74.98	1260
Goodfield	52.0	39.2	75.32	1253

*BYDV resistant.

Tioga, while below Garry in this year's trials, has a 5 year yield record approximately 2 bushels per acre above Garry.

A Case History of the Plant Breeding Process

In the plant breeding system used at Cornell a Year Group designation is given to all selections of a crop the first year they enter the yield nurseries. Thereafter, with their check variety, they are treated as a group for comparisons and cumulative yearly data summarizations. The following is a case history of what happened to the 6,440 spring oat selections which were grown as head rows in 1955 and first entered the yield trials in 1956, thus the 1956 Group:

Year	No. grown	No. saved by selection
1955 (head rows-no yield)	6,440	2256
1956 (1st yield test)	2,256	505
1957	505	233
1958	233	97
1959	97	62
1960	62	27
1961 (projected)	27	3

This pattern of planned attrition is normal and is typical of other Year Groups with one exception -- two of the three final selections retained were good enough to become varieties (Tioga and Niagara). Usually several Year Groups must be evaluation to obtain even one variety. Several crosses were involved with this material.

The third selection saved is interesting because it illustrates a vital function in the plant breeding process--the isolation of lines outstanding in some characteristic which may be used as parents for further improvement. In this case the characteristic was yield. This particular selection is 5207a2-2B-23 from the cross of Branch x (C.I.6589 x Craig). Its average yield for 5 years was 92.5 bushels per acre which was 13.0 bushels per acre above Garry, our standard check. It exceeded Garry in every year. It is too early to know whether this oat will become a variety, however, it will figure heavily in future hybrids.

Winter Oats

Perhaps two items bear mentioning about winter oats: 1) the winter oat program here has "come to age" in that the approximate ten separate stages of a normal breeding program from the hybrid through final testing are now represented in the project. This places the project on essentially the same footing as the other grain projects and it may be expected each year in the future will feed a new group of selections into the yield trials. The project is now 11 years old, dating from the first crosses made in 1950; 2) the 1960 nurseries showed several promising hybrid populations from the standpoint of winter survival and the complex of good agronomic type. One hybrid in particular took our eye--this being from the cross of Pendek x (Dubois x Advance-Nysel). The good properties of Pendek as a parent were mentioned in the 1957 Newsletter. We have

used it extenxively for both spring and winter hybridization.

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Investigations on the Effect of Seed Source on Cold Resistance of Winter Oats

E. J. Kinbacher, CRD, ARS, USDA

The cold resistance of young winter oat seedlings presents a stimulating problem on the basic nature of cold resistance. Within a 24 hour period the cold resistance of the seedling changes drastically. However, the most important observation was that cold resistance of pre-emerged Dubois seedlings varied greatly with different sources of seeds. If this difference in hardiness among seed sources persists for a significant length of time after emergence, it will have a pronounced effect on our present cooperative screening for hardy winter oats.

In the fall of 1960, a cooperative study was initiated to study the effect of seed source on cold resistance. Dubois seed was increased at Aberdeen during the summer of 1960. The resulting seed increase was sown in the following states in the fall of 1960:

State	Cooperator
Arkansas	R. L. Thurman
Illinois	C. M. Brown
Kentucky	V. C. Finkner
Maryland	F. A. Coffman
Missouri	J. M. Poehlman
Oklahoma	B. C. Curtis
Virginia	T. M. Starling
Pennsylvania (2 locations)	H. G. Marshall
New York (2 locations)	N. F. Jensen

The seed increased at these locations will be returned to Ithaca for cold chamber screening and chemical analysis. Differences in cold resistance among the seed sources are expected until the plants are about two to three weeks old. At this time the endosperm reserves should be exhausted. The differences in hardiness must be due to nutrient reserves of the endosperm acquired from the "mother plants." If the variations in cold resistance persist long after the exhaustion of endosperm, this will be an extremely interesting physiological and genetic problem.

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*** NORTH CAROLINA ***

Carolee Oats

G. K. Middleton and T. T. Hebert (Raleigh)

Carolee (Letoria x C1-S.F., Sel.64) is a new medium early, short-strawed variety that has performed well in North Carolina during the past several years and was released to farmers in the fall of 1960.

In 12 tests conducted in Piedmont North Carolina during 1958-1960 its average production was 64.3 bushels per acre as compared to 57.5 for Arlington and 50.2 for Victorgrain 48-93. In the Coastal Plain region of the State these three varieties averaged in 8 tests 69.0, 66.7 and 45.4 bushels, respectively.

Carolee is a gray oat with good test weight. It is susceptible to soil borne mosaic and to most races of crown rust but has fair tolerance to BYD.

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*** OHIO ***

Oat Production and Research in Ohio

Dale A. Ray (Columbus)

1960 Production

The 65 million bushesl production in 1960 was the largest oat crop on record for Ohio since 1928. The small decline in acreage compared with 1959 was offset by an all-time record yield of 62 bushels per acre, the highest for any state in 1960. Although the spring oat seeding was delayed by an unseasonably wet, cold March and April, the crop was provided excellent moisture and temperature conditions for early-summer vegetative development and an extended period for grain filling and maturity. The absence of any damaging amounts of disease and the occurrence of favorable climatic conditions resulted in excellent yields of high quality oats. Relatively mild winter conditions permitted excellent survival and yield of winter oats in Ohio. Only the very winter-tender selections and varieties exhibited injury.

Variety Trials

Twenty spring oat varieties were compared in a farm drill-sown and combine-harvested trial of four replications at Columbus and Wooster. Ten of

the varieties were considered in a yield test at four additional state experiment farms. Garry, Goodfield, Clarion and Clintland 60 were consistently highest in yield, while the leading varieties in test weight were Tonka and Goodfield.

Dubois and Bronco winter oat varieties were compared at four locations in central and southern Ohio. The yields and test weights were high but similar for the two varieties at all locations.

Breeding and Related Studies

Selections from crosses designed to add factors for increased yield and grain quality with crown and stem rust and oat smut resistance make up the bulk of the breeding materials considered. Certain lines were increased for preliminary yield trials. Plant selections from several bulked progenies comprised an extensive program of plant-row evaluation and selection. Several selections from the winter oat hardy x hardy crosses provided by USDA workers give promise of considerable improvement in winter survival compared with available varieties.

Studies on spring oat variety comparisons for silage yield and quality, the effect of clipping Clintland oats at various stages of plant development on grain yield, plant characteristics and resultant alfalfa stand, and the production of soybeans in the same season following the harvest of oat silage were continued in 1960. Robert W. Miller and Mukand Singh completed studies for the M.S. degree with problems concerned with the influence of environmental factors on the chemical composition of spring and winter oat varieties, respectively.

Variety Recommendation

Clintland 60, Clintland and Clarion spring oat varieties are recommended for 1961 seeding in all regions of Ohio and Rodney is recommended for northern Ohio. Present indications are that Clintland 60 will replace the Clintland acreage rapidly. Goodfield will be recommended specifically for high fertility soils in Ohio for 1962 seeding.

Although available winter oat varieties lack sufficient winterhardiness for general recommendation, Dubois is acceptable for seeding in southern Ohio.

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*** OKLAHOMA ***

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

Winter Survival

The 1960 oat crop was unusual in several respects but perhaps the most unusual was the good winter survival, in view of the poor survival of the winter barley crop. Oats sustained little stand reduction from the abnormally low November temperatures while in the same areas barley stands were reduced 50% or more. Since winter oats grown in Oklahoma are normally more heavily damaged than winter barley from low temperatures, the reason for this reversal in response is not fully understood. In general both crops were in the 1-3 leaf stage at the time of the hard freezes. The barley appeared to be growing faster and was probably more tender than the oats which may partially account for the unusual behavior. Other than this no explanation is offered.

Oat Composite Cross

The oat composite cross mentioned in the Oklahoma report of the 1959 Oat Newsletter is now growing in the field as an F_2 generation. Sixty-three of the 66 planned crosses were composited as F_1 seed for this planting. If a good seed crop is realized some seed will be available for other experiment stations on a "first come-first serve" basis.

Promising Strains

This may be premature reporting but 3 unusually promising strains of winter oats have been selected from our breeding material. Two of the strains were selected from an Arlington X Wintok cross and appear to have the good straw of Arlington and short plant type, heavy tillering capacity and apparent winter-hardiness of Wintok. One of these has slender stems with yellow-grey, heavy test weight grain and the other has large stems and yellow seed. The other selection is from the cross Wintok X Victorgrain. It has good straw, good test weight yellow seed, excellent tillering capacity and resembles Victorgrain in plant type. Limited data indicate it has winterhardiness approaching that of Wintok.

Master's Theses

Two master's theses, one complete and one nearing completion, will report studies on oats as follows: (1) "Relative Hay Yielding Ability of Ten Varieties of Winter Oats and Analysis of Plant Characteristics Which Affect Yield and Quality of Oat Hay" (by-Dennis Peier) and (2) "Associations of the Major Plant Characters Which Contribute to Grain Yield in 5 Varieties of Winter Oats" (by-Floyd Bolton). Copies of these theses will be available for loan to interested parties.

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*** PENNSYLVANIA ***

Winter Oats

by Harold G. Marshall (U.S.D.A.-Pennsylvania)

There was essentially complete winter survival in oat nurseries grown at four locations in Pennsylvania during 1960. The winter was relatively mild until the last few days of February when temperatures dropped to unseasonably low levels that continued through most of March. Snow accumulation during this period was heavy at all locations. The only significant killing occurred in areas of a nursery located in Clearfield county, and this was mostly a result of snow mold caused by Typhula itoana Imai (Marshall, H. G. and R. D. Schein. Plant. Dis. Reptr. 44:895. 1960).

Although surrounding fields and nurseries of spring oats were heavily infecte with barley yellow dwarf virus, the numerous winter oat lines and varieties included in nursery tests were apparently unaffected.

Norline was added to the list of varieties recommended for use in south-eastern Pennsylvania during 1961. The new varieties C. I. Nos. 7480, 7499 and 7500 looked especially promising in Pennsylvania tests during 1960, and all appeared to possess good lodging resistance.

Hybridization Program

Numerous oat crosses were made during the year as part of the Pennsylvania program described in the 1959 Oat Newsletter. The second cycle of the multiple crossing and backcrossing programs was completed. A total of 3780 seeds were obtained from crossing efforts. The combined average seedset for the author and Mr. Barry A. Weaver (Laborer, U.S.D.A.) was 69% and 57% in the greenhouse and field, respectively. These results were obtained using the "wet bag" technique as described last year. A third cycle of intercrossing among certain hybrids is underway at the present time.

Limited interspecific crossing studies have been continued. Several hybrids have been obtained involving Avena longiglumis and three different subspecies of A. strigosa. Griffiths et al. (Jour. Ag. Sci. 52:189-199. 1959.) have pointed out the interest in such crosses for determination of genome relationships.

Winter Hardiness Studies

Mr. Gerald A. Porter will soon complete his M. S. thesis research concerned with certain aspects of the hardening process in winter oats. He has been determining the effects of various treatments during hardening on the survival of five varieties following freezing in a cold chamber. The factors that have

been varied during hardening are constant vs. alternating temperature, length of hardening period, and light intensity. He has also conducted freezing tests with field hardened material.

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*** SOUTH CAROLINA ***

by W. P. Byrd, G. C. Kingsland and E. B. Eskew

The major damage observed on oats in 1959-60 in the Piedmont area was caused by the Helminthosporiums. Considerable damage was noted on early plantings of Arlington and Victorgrain, however, the most damage was related to culm rotting and lodging between heading and maturity. Soil-borne mosaic was again evident bearing out the need for combined resistance to this disease and the Helminthosporiums for successful oat production, particularly in the Piedmont area of the Southeast.

Potential Variety

An experimental oat selection, Arlington x (Wintok x Clinton^2-Santa Fe): SC57-167, C.I. 7509, is being increased for possible release. Although no official action has been taken it is in the second year of increase and the name, Sumter, has been proposed. A sister line of C.I.'s 7413 and 7417, it was selected from a bulk hybrid sent to Clemson by Mr. F. A. Coffman. It has resistance to race 216 of crown rust, field resistance to smut, "chlorosis" and Victoria blight, and is intermediate between Arlington and Victorgrain 48-93 for soil-borne mosaic. Tests to date indicate that it is superior for both grain and forage production. The straw strength exceeds all other varieties and selections tested.

Recommended Varieties

The following oat varieties are recommended for planting in South Carolina for grain production:

Piedmont	Coastal Plain
Arlington	Arlington
Moregrain	Moregrain
Victorgrain 48-93	Suregrain
	Victorgrain 48-93

Also, Arlington and Moregrain are recommended as the best for grazing.

Personnel Change

Dr. G. C. Kingsland joined the staff of the Department of Botany and Plant Pathology as small grains pathologist on September 1, 1960.

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*** TENNESSEE ***

by N. I. Hancock (Knoxville)

Apparently there is considerable variation in the segregation for winter hardiness of the hexaploid Strigosa strains, spring types, crossed upon Forkedeer and LeConte, winter types. Low temperatures throughout December, 1960 at Knoxville resulted in practically no survival of F_2 plants from the crosses with C.I. No's 8057, 2895, and 3815 as against good survival from crosses with 7010, 7055, 7171 and 7172. Errors on account of pollination or emasculations were eliminated in the F_1 phenotypes since they were distinct as compared with the parents. All the F_1 backcrosses to the winter types showed high survival of plants. No backcrosses to spring types were made.

An oat variety named "Blount" was released to fill the needs of those farmers who use high rates of fertilizer or seed oats on bottom soils, or soils of high fertility in Tennessee. Blount is a dwarfy LeConte type which has a 5 year average of 85.8 bushels as against 79.2 for LeConte and 76.6 for Forkedeer in drill plot tests at 6 stations over the state. Blount is around 4" to 6" shorter than the other two varieties, and is of the same winter hardiness as LeConte. It is from the cross of Fulgrain St.6 x LeConte x Santa Fe.

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*** TEXAS ***

by I. M. Atkins and Paul E. Pawlisch (College Station)

Oat acreage seeded for the 1960 crop was estimated as 2,165,000 acres. Owing to considerable winterkilling and damage by drouth, as well as that grazed to maturity, only 1,105,000 acres were harvested. Total production was 28,730,000 bushels.

State yield trials were grown at 12 locations with very satisfactory results obtained. Several varieties grown under irrigation at Iowa Park, Bushland and Floydada and on fallowed land at Denton exceeded 100 bushels per

acre and are among the highest ever recorded in yield trials in Texas.

Diseases were much below normal in severity and were minor factors in production. Acreage of the new Suregrain and Moregrain varieties expanded rapidly. Three new irradiated Alamo strains produced good yields and one or more may be released to replace Alamo. These strains are resistant to crown rust races 216 and 290 and to Victoria blight. Radar I has produced well and foundation seed is being increased for release in 1961.

Mr. Dennis Peier joined the small grains section as a graduate research assistant September 1, 1960. Mr. Peier is working on the cytology of dwarf oats and progeny of dwarf x normal stature oats.

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by J. H. Gardenhire, Denton

The oat nursery was sown on land that had been fallowed for one year. Yields obtained were some of the best ever obtained at the station. Single plot yields ran as high as 133.8 bushels per acre. Victorgrain produced the highest average yield of 119.8 bushels per acre. Moregrain and Suregrain acreage have increased in the area. In 1959 the Red Rustproof types were in great demand. But in 1960 there seemed to be a trend back to the more hardy type oats.

Very little crown rust developed and this found only on the late maturing varieties. No stem rust was found in the nursery. The spring-sown nursery was damaged by corn leaf aphids and greenbugs. Also, red leaf caused considerable damage to the spring grain. Isolations were made by Dr. Lee Ashworth, College Station, from two plots that were thought to be seriously damaged by red leaf. The isolates were identified as Fusarium roseum, Pythium arrhenamanes, Rhizoctonia salani, and Curvularia sp. Mr. Charles Heald, also of College Station, found no parasitic-type nematodes from soil samples taken from the two plots.

A number of lines from the cross Russian 77 x (RRP x V-R x Ranger) have been tested for their reaction to greenbugs. Resistance, if present, is not clear cut as in barley.

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*** UTAH ***

by R. W. Woodward (ARS-Logan)

This year some new selections--Abd. 2773, C.I. 7588,[1] and Abd. 2784, C.I. 7574[1]-- were highest of any oat entries in yield. Of the named varieties, Weibulls, Park, Uton and Marne topped the list for yield. Until this year Park was the only one of these varieties ranking high on the list.

Oat growing in Utah appears to have reached an equilibrium for the present with much lower acreages than for spring wheat or barley. Its low acreage helps keep the price levels up slightly.

No diseases were noted in oats this year, but the yields ranged from 150 to 178 bushels per acre which is somewhat lower than obtained in good years.

[1](C.I. 6740 x Imp. Garry) x /(Bonda x Haj-Joan)-Santa Fe/-Mo.-205: One of the so-called "Bingham" strains.

*** VIRGINIA ***

T. M. Starling, C. W. Roane, J. L. Tramel, (Blacksburg) and H. M. Camper (Warsaw)

During the spring of 1960, halo blight was prevalent on certain varieties of fall planted oats. Many samples of oats infected with this disease were received at the Plant Disease Laboratory from farmers throughout the state. Most of these samples were of the varieties Arlington and Atlantic. Notes were recorded on prevalence of halo blight in fall oat varietal tests at six locations throughout the state. The disease completely killed the plants in spots in some of the nurseries. Varieties appearing to be most susceptible were Arlington, Atlantic, Suregrain, Bronco, Forkedeer and Lee. Victorgrain 48-93, Dubois and Carolee were resistant or highly tolerant to halo blight. While halo blight has been observed frequently in previous years, this was the most severe and wide-spread infection which the present workers have noted.

Victoria blight, which normally causes little damage to fall planted oats in Virginia, also was prevalent on susceptible varieties in the spring of 1960. Severe damage was caused in some tests and excess lodging was noted in others. Arlington, which was damaged by halo blight and Victoria blight, was dealt a hard blow in 1960.

The selection C. I. 7413, Arlington x (Wintok x Clinton^2 - Santa Fe) is being increased for release. This selection was developed by Mr. F. A. Coffman, and will be released jointly by the U.S.D.A. and the North Carolina and Virginia Agricultural Experiment Stations. This selection carries the Santa Fe resistance to crown rust and is resistant to Victoria blight. It has good bushel text weight and good straw strength, although it is slightly taller than Arlington.

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*** WASHINGTON ***

Summary of Annual Report

by C. S. Holton, Regional Smut Laboratory, Pullman

The routine identification of pathogenic races from field collections has been curtailed in favor of an effort to approach pathogenic homozygosity in known races. In one generation of selfing several of the races exhibited an apparent homozygous condition with respect to their respective host ranges. Several others displayed heterozygosity, thus pointing up the problem of maintaining stable differentiation patterns.

Four field collections made from Clinton-type varieties were moderately virulent on Clinton and the variety chosen to differentiate the so-called Clinton race. This reaction is distinct from any of the standard set of races, thus confirming the identification of a race of U. avenae that is specialized to the Clinton host germ plasm.

A "Victorgrain strain" of U. avenae submitted by S. J. Hadden (South Carolina) was non-pathogenic on all varieties, whether applied as spores or as sporidia in culture. Pathogenicity on a single host differential was exhibited by 3 different inoculum stocks.

Ten out of 35 varieties and hybrid selections of oats were smut-free in a test for resistance to six key races of loose smut. Thirteen of those tested reflected Clinton germplasm in their various degrees of susceptibility to the "Clinton" race.

Additional evidence of dominance of avirulence in hybrids between races of U. avenae was obtained from crosses between races 1, 2, and 3. There was mixed dominance of virulence and avirulence in hybrids between races 11 and 12.

The inheritance of specific virulence genes in simple recessive patterns of segregation and recombination was evident in the analysis of hybrids involving races 2,3,4, and 5 of U. avenae. In hybrids between races 6 and 7b, there was evidence of complementary genes for "total" avirulence.

Genotype analysis of F_2 segregates was confirmed by analysis in the F_3 and F_4, and also in backcrosses.

Inbreeding through two generations did not impair virulence of race A-5.

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*** WISCONSIN

H. L. Shands, L. G. Cruger and R. A. Forsberg

*** Wisconsin State Yields and Oat Variety Performance ***

The 1960 season in Wisconsin was late for planting, growing, and harvesting. Temperatures were lower than average. However, the state average yield of 47.0 bushels was near the average yield of the previous 10 years. Bushel weights were generally satisfactory since most varieties have medium or high bushel weights.

According to the Wisconsin Crop Reporting Service, the percentage acreages of the leading varieties in 1960 were as follows: Beedee, 27; Sauk, 14; Clintland, 11; Branch, 9; and Ajax, Garry and Minhafer, 6 each. Beedee probably will again lead in 1961, since it seems to be satisfactory for general use in Wisconsin.

Crown rust was prevalent in southern counties and reduced yields in Clintland (Clintland 60 also). There was early natural infection of crown rust in the nursery at Madison. The race of leaf rust was a type that attacks varieties that derive their resistance from Landhafer. Goodfield was attacked, but not as severely as Clintland and Clintland 60. Portage had less crown rust than any other commercially grown variety in Wisconsin in 1960. Volunteer oats in the fall of 1960 had less leaf rust than in the fall in 1959. In 1960 red leaf was quite minor in importance although aphids were observed on oats in early June.

Variety Performance

The Wisconsin Seed Certification Service provided yield reports for varieties certified in Wisconsin. Average yields on a non-paired basis are given in Table 1. Variety averages were close to those of 1959.

Table 1. Seed growers reports of non-paired yields of oat varieties in Wisconsin in 1960.

Variety	No. of Growers	Yield in Bu/A	Departure from 1959	Variety	No. of Growers	Yield in Bu/A	Departure from 1959
Ajax	14	42.7	-2.9	Garry	33	53.3	+ .9
Beedee	75	52.6	+ .7	Goodfield	101	48.9	+ .9
Branch	16	46.0	- .3	Minhafer	35	42.6	-6.1
Burnett	23	45.6	-4.0	Portage	111	52.6	--
Clintland 60	80	42.7	--	Sauk	24	51.2	+5.1

In 1960 Garry had .7 bushel advantage over Beedee and Portage. Clintland 60 was 4.1 bushels less than Clintland in 1959. Burnett and Minhafer dropped, while Sauk gained.

Dodge Variety Released

Dodge (C.I.7269) oats was bred cooperatively by workers of the Wisconsin Agricultural Experiment Station and the U. S. Department of Agriculture with financial support by the Quaker Oats Company. Foundation seed was distributed to growers of certified seed for the first time in 1961. Dodge was selected from the same series of crosses as was Goodfield, a variety it resembles in several respects. Performance data indicate that Dodge is intermediate in yield. Heading and ripening dates are early to midseason. Straw height is intermediate, or about the same as Clintland. Dodge resists lodging, but not as well as Goodfield. Hull color is yellow, and the grain has high test weight per bushel.

Dodge has moderately good leaf rust resistance being better than Goodfield, and much better than where the Landhafer gene is the only source of resistance. When tested artificially for smut, Dodge has an intermediate reaction. It is susceptible to red leaf and about like Goodfield for Septoria. Genes A and B condition stem rust reaction.

One of the main reasons for distributing Dodge is to provide Wisconsin farmers with better leaf rust resistance than available in Goodfield, yet with straw of good standability. Dodge probably will do well on highly fertile soils, but may not offer serious competition for Beedee, Portage, Garry and other similar varieties.

As with Portage and other recently distributed varieties from Wisconsin quite a number of workers in small grains helped in the development of Dodge. They are P. E. Pawlisch, Z. M. Arawinko, D. C. Hess, L. R. Barker, C. M. Brown, Steve Lund, D. C. Arny, L. S. Wood, A. L. Hooker, M. L. Kaufmann, A. R. Brown, R. W. Earhart, M. N. Grant, and E. A. Brickbauer. Branch Experiment Station personnel also assisted testing Dodge in the final phases.

Selections of current interest are C.I. 7453 and C.I. 7561.

Personnel items. Research associates in small grains are F. A. Forsberg and L. G. Cruger. D. W. Burrows from England is a graduate assistant. L. N. Barker accepted a position with Asgrow Seed Company and is located at Sun Prairie, Wisconsin.

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*** A Regional Nursery for Evaluating Promising Sources of Resistance to Septoria avena ***

by L. S. Wood (USDA, Madison)

Within the past 5 years many oat varieties and selections have been tested extensively in Wisconsin for resistance to leaf and stem infection by Septoria avenae. Over this period some of these have had low combined leaf and stem reactions As these lines represent some of the more promising sources of resistance, at least under Wisconsin conditions, several of the better ones were included in regional tests to determine if selections showing low levels of stem infection in Wisconsin would also show low levels of disease in other states. Also, this nursery may provide worthwhile information on certain aspects of the epidemiology of this disease.

In 1960, 38 entries were included in a regional nursery tested at 11 locations in the United States and at one location in Canada. Moderate to high levels of stem infection on the suceptible variety Clarion (CI 5647) were obtained at the 10 stations located in Illinois, Indiana, Iowa, North Dakota, New York, Michigan, Wisconsin, and Ottawa, Canada. Low levels of infection occured at the Minnesota and South Dakota stations. The average stem infection on Clarion for the 12 locations was 41% whereas Clintland 60 (CI 7234), a resistant check, averaged 13%. All of the entries included as promising sources of resistance had less than 10% stem infection based on the average ratings for the 12 locations. However, based on the reactions obtained in Wisconsin, New York, and Michigan, where the levels of infection were quite high, the following entries were somewhat better than the others: Swedish Select (CI 1090), Wolverine (CI 1591), Triumph (CI 1638), Miracle (CI 2173), Improved American (CI 2254), Scots Berlie (CD 983), Avena sativa (CI 5057), A. sativa (CD 4090), and A. sativa (CD 5022).

It is planned to continue this regional nursery for several years. A few additional entries could be added if any worker desired to have tolerant selections tested on a regional basis.

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V. NEW OAT VARIETIES

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C.I. NUMBERS ASSIGNED TO OATS DURING 1960[1]

by J. C. Craddock and F. A. Coffman
U.S.D.A.

Number	Designation	Source
7537	Nebr. 521047: R1 x Fg 2x Nh	U.S.D.A.
7538	Nebr. 492375: R1 x Fg 2x Nh	"
7539	Hj x Jt 2x Bda 3x SF 4x Mrn	"
7540	Hj x Jt 2x Bda 3x SF 4x Mrn	"
7541	Hj x Jt 2x Bda 3x SF 4x Os 5x C1d	"
7542	Hj x Jt 2x Bda 3x SF 4x Os 5x C1d	"
7543	Hj x 2x Bda 3x SF 4x Os 5x C1d	"
7544	Hj x Jt 2x Bda 3x SF 4x Os 5x Hj x Jt 2x Sac 3x Lh	"
7545	Hj x Jt 2x Bda 3x SF 4x Os 5x Park	"
7546	Hj x Jt 2x Bda 3x SF 4x 01 $5x^2$ Os	"
7547	Hj x Jt 2x Bda 3x SF 4x 01 5x Os	"
7548	Hj x Jt 2x Bda 3x SF 4x 01 5x Os	"
7549	Hj x Jt 2x Bda 3x SF 4x Os 5x C1d (ox Hj x Jt 2x Bda 3x SF 4x 01	"
7550*	PUTNAM 61: Purdue 5638G1.-5: Pum^4 x Mnt-313	Ind.
7551	Wis. X770-1: Vtra x Hy 2x Gy $3x^2$ Ajax	Wis.
7552	N. D. 55.3 A-1-53-1-1: Ajax x Rsm	N. D.
7553	N. D. 55.3 A-1-16-2-1: Ajax x Rsm	"
7554	Mich. 53-14-805: Gy x Ctn 2x Bvr 3x C1d	Mich.
7555	Iowa C649: Hj x Bn 2x Vtra 3x Btry x Hj 4x Rtn $5x^8$ C1d	Iowa
7556	Iowa 5063: Ctn x Gy	"
7557	RUSSELL: Ottawa 5055-46: Gy x Uk $2x^2$ Aw	Canada
7558	Minn. II-53-81: Hj x Jt 2x Mnd 3x Lh 4x And 5x Bn x Hj 2x Vtra 3x Trn 4x Bn x Hj 2x Vtra 3x Ajax	Minn.
7559	Ill. 57-1753: Hy x Vtra 2x Bcn 3x Mntn	Ill.
7560	Ill. 57-1754: Hy x Vtra 2x Bcn 3x Mntn	"
7561	Wis. X697-2: Hy x Vtra 2x Gy 3x R1 x Bond	Wis.
7562	Mich. 53-2-715: Gy x Ctn 2x Bvr 3x Wb 4x Cg	Mich.
7563	Iowa C648: Hj x Bn 2x Vtra 3x Vtry x Hj 4x Rtn $5x^2$ Ck $6x^5$ Bhm	Iowa
7564	Minn. II-53-75: Hj x Jt 2x Mnd 3x Lh 4x And 5x C1d	Minn.
7565	Minn. II-53-83: Hj x Jt 2x Mnd 3x Lh 4x And 5x Bn x Hj 2x Vtra 3x Trn 4x Bn x Hj 2x Vtra 3x Ajax	"
7566	S. D. B59-8: Hj x Bn 2x Vtra 3x Ajax 4x SF 5x Gy 6x Hj x Bn 2x Vtra 3x Ajax 4x SF 5x Gy	S. D.
7567	S. D. B59-13: Hj x Jt 2x Bda 3x SF 4x Wb	"

[1]The method used to indicate the pedigree is that proposed by Dr. G. A. Wiebe in this Newsletter. Varieties were abbreviated in accord with the procedures adopted by the National Wheat Improvement Committee and described in this Newsletter.

*Two C. I. numbers (7531 and 7550) were assigned to the same oat variety.

Number	Designation	Source
7568	S. D. B59-14: Hj x Jt 2x Bda 3x SF 4x Wb	S. D.
7569	S. D. B59-15: Hj x Jt 2x Bda 3x SF 4x Wb	"
7570	S. D. B59-16: Hj x Bn 2x Vtra 3x Btry x Hj 4x Rtn 5x Lh x^6 Ctn	"
7571	SF x^2 Ctn 2x Wtk 3x Gy 5x Hj x Jt 2x Bda 3x SF 4x Mo. 0-205	U.S.D.A.
7572	SF x^2 Ctn 2x Wtk 3x Gy 5x Hj x Jt 2x Bda 3x 4x Mo. 0-205	"
7573	SF x^2 Ctn 2x Wtk 3x Gy 5x Hj x Jt 2x Bda 3x SF 4x Mo. 0-205	"
7574	SF x^2 Ctn 2x Wtk 3x Gy 5x Hj x Jt 2x Bda 3x SF 4x Mo. 0-205	"
7575	SF x^2 Ctn 2x Wtk 3x Gy 5x Hj x Jt 2x Bda 3x SF 4x Mo. 0-205	"
7576	SF x^2 Ctn 2x Wtk 3x Gy 5x Hj x Jt 2x Bda 3x SF 4x Mo. 0-205	"
7577	SF x^2 Ctn 2x Wtk 3x Gy 5x Hj x Jt 2x Bda 3x SF 4x Mo. 0-205	"
7578	SF x^2 Ctn 2x Wtk 3x Gy 5x Hj x Jt 2x Bda 3x SF 4x Mo. 0-205	"
7579	SF x^2 Ctn 2x Wtk 3x Gy 5x Hj x Jt 2x Bda 3x SF 4x Mo. 0-205	"
7580	SF x^2 Ctn 2x Wtk 3x Gy 5x Hj x Jt 2x Bda 3x SF 4x Mo. 0-205	"
7581	SF x^2 Ctn 2x Wtk 3x Gy 5x Hj x Jt 2x Bda 3x SF 4x Mo. 0-205	"
7582	Hj x Jt 2x Bda 3x SF 4x Os 5x Cld	"
7583	Hj x Jt 2x Bda 3x SF 4x Os $5x^2$ Lh x^4 Ctn	"
7584	Hj x Jt 2x Bda 3x SF 4x Os $5x^2$ Lh x^4 Ctn	"
7585	Hj x Jt 2x Bond x Rb 3x SF 4x And x Lh	"
7586	SF x^2 Ctn 2x Wtk 3x Gy 4x Hj x Jt 2x Bda 3x SF	"
7587	SF x^2 Ctn 2x Wtk 3x Gy	"
7588	SF x^2 Ctn 2x Wtk 3x Gy 5x Hj x Jt 2x Bda 3x SF 4x Mo. 0-205	"
7589	SF x^2 Ctn 2x Wtk 3x Gy 5x Hj x Jt 2x Bda 3x SF 4x Mo. 0-205	"
7590	SF x^2 Ctn 2x Wtk 3x Gy 5x Hj x Jt 2x Bda 3x SF 4x Mo. 0-205	"
7591	SF x^2 Ctn 2x Wtk 3x Gy 5x Hj x Jt 2x Bda 3x SF 4x Mo. 0-205	"
7592	SF x^2 Ctn 2x Wtk 3x Gy 5x Hj x Jt 2x Bda 3x SF 4x Mo. 0-205	"
7593	SF x^2 Ctn 2x Wtk 3x Gy 5x Hj x Jt 2x Bda 3x SF 4x Mo. 0-205	"
7594	Hj x Jt 2x Mrn 3x Bond 4x Rb 5x SF 6x 01	"
7595	COLFAX: W. O. McCurdy & Sons Seed Co.: (Pedigree unknown)	Iowa
7596	GOLDCREST: W.O. McCurdy & Sons Seed Co.: (Pedigree unknown)	"
7597	GOLDFIELD: W.O. McCurdy & Sons Seed Co.: (Pedigree unknown)	"
7598	JEWELL: W. O. McCurdy & Sons Seed Co.: (Pedigree unknown)	"
7599	Mahaska: W. O. McCurdy & Sons Seed Co.: (Pedigree unknown)	"
7600	Belts. Sel. 4224: Lh x^4 Ctn 2x Bl 5x Hj x Jt 2x Bda 3x SF 4x Os	U.S.D.A.
7601	Belts. Sel. 480: Hj x Jt 2x SF 3x Bda 4x Vtg 5x Bl	"
7602	M. B. 59: (bulk seed from plants surviving winter)	Mass.
7603	EXCEL: Pedigree unknown	Okla.
7604	B.-1-2-57: Ns1 x Th : (Eastern States Farmer's Exchange)	Mass.
7605	Md. 141: Hj x Jt 2x Mnd 3x Lh 4x And 5x Alt 6x SF x^2 Ctn 2x Ltr	Md.
7606	Ab. 161: SF x^2 Ctn 2x Wtk 3x Alt	Idaho
7607	Belts. Sel. 113: SF x^2 Ctn 2x Wtk 3x Alt	U.S.D.A.
7608	Purdue 52122G1-74-3: Lh x^6 Ctn 2x Wtk	Ind.
7609	Purdue 52122G1-79-1: Lh x^6 Ctn 2x Wtk	"
7610	Purdue 52122G1-79-5: Lh x^6 Ctn 2x Wtk	"
7611	Purdue 517A2-121: Lh x^2 Dbs sib. 2x Dbs	"
7612	Purdue 5334A2-22: Lh x^6 Dbs 3x Lee x Vtra $2x^2$ Fdr	"

Number	Designation	Source
7613	Purdue RA473A2-67-1: Wtk x Ak 674 $2x^2$ C4611-4-1-4-2 3x R392A2-31-2	Ind.
7614	Purdue RA473A2-123-4: Wtk x Ak 674 $2x^2$ C4611-4-1-4-2 3x R392A2-31-2	"
7615	Purdue RA473A3-59-1: Wtk x Ak 674 $2x^2$ C4611-4-1-4-2 3x R392A2-31-2	"
7616	Purdue RA473A7-41-3: Wtk x Ak 674 $2x^2$ C4611-4-1-4-2 3x R392A2-31-2	"
7617	Purdue A5013A238-2: Lh x^2 Dbs 2x Ctn x HC	"
7618	Mo. 04897: Ctn x HC 2x Wtk	Mo.
7619	Mo. 04898: Ctn x HC 2x Wtk	"
7620	Mo. 04896: SF x^2 Cld 2x Atlt 3x Hj x Jt 2x Crn	"
7621	Ky 56-302: Tl-1 x Bnl	Ky.
7622	S. C. 57-1379: Early sel. from Bl	S. C.
7623	S. C. 58-332: SF x^2 Ctn 2x Wtk 3x Alt	"
7624	Md. 72: SF x^2 Ctn 2x Wtk 3x Alt	Md.
7625	Md. 80: SF x^2 Ctn 2x Wtk 3x Alt	"
7626	S. C. 59-10081-82: Sel. from Alt (off-type)	S. C.
7627	24-A27-2922: Wheeler's H. V. Rest.: Sel. from Alt	"
7628	12702-03: S.C. H. V. Rest.	"
7629	60-22: Resel. from Vtg x Fw 2x Alt x Dr 3x Ts	"
7630	60-246: Resel. from Vtg x Fw 2x Alt x Dr 3x Ts	"
7631	60-123: Resel. from Wgr x Sg 2x Ckr 56-21	"
7632	60-159: Resel. from Fgn-3 x Sg 2x Ckr 56-21	"
7633	60-178: Resel. from Fgn-3 x Sg 2x Ckr 56-21	"
7634	Md. 140: Hj x Jt 2x Mnd 3x Lh 4x And 5x Alt 6x SF x^3 Ctn 2x Ltr 3x Alt	Md.
7635	Md. 142: Hj x Jt 2x Mnd 3x Lh 4x And 5x Alt 6x SF x^3 Ctn 2x Ltr 3x Alt	"
7636	Md. 149: Hj x Jt 2x Mnd 3x Lh 4x And $5x^2$ Alt	"
7637	Fla. 538: SF x^2 Ctn 2x Wtk 3x Alt 4x Fr	Fla.
7638	N. D. 55.6 A-2-9-8: Bvr x Gy 2x Ctn 3x Wb	N. D.
7639	Purdue 5877: Hj x Jt 2x Mnd 3x Lh 4x And $5x^5$ Ctn 6x GA x^6 Ctn 2x Cld	Ind.
7640	N. D. 55.10 A-2-12-4: Vtra x Rl 2x Ctn 59	N. D.
7641	Fla. 657: Hj x Bn 2x Vtra 3x Ajax 4x SF 5x Gy 6x Dr	Fla.
7642	Coker 60-17: Bond x Fg $2x^2$ Vtg 3x Sg 4x Sg x^3 Fgn	S. C.
7643	N. D. 56.21 A-1-1-4-1: Hj x Bn 2x Vtra 3x Vtry 4x Ctn x Gy	N. D.
7644	Canada R. L. 2355: Hj x Bn 2x Vtra 3x Ajax 4x SF 5x Gy	Canada
7645	Alamo (Irradiated): Tex. 2286-3	Texas
7646	Miss. 55141-3: SF x^2 Ctn 2x Ts 3x Vtg	Miss.
7647	Lee x Vtra $2x^2$ Fdr 5x Hj x Jt 2x Bda 3x SF 4x Vtg	U.S.D.A.
7648	Alamo (Irradiated): Tex. 2276-2	Texas
7649	Alt 3x Wtk $2x^2$ Ctn 2x SF 4x Fll. (Irradiated)	U.S.D.A.
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