1966

OAT NEWSLETTER

Vol. 17

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April 1, 1967

Sponsored by the National Oat Conference

1966

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

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May 1, 1967

Sponsored by the National Oat Conference

Neal F. Jensen, Editor

ANNOUNCEMENTS

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

Available back issues - Back issues of all volumes since and including 1960 are available on request.

Variety descriptions - It would be helpful if you name or announce a new variety if, in addition to your account in the State report text, you would submit a separate description which could be included under the "New Varieties" we would like to make it as useful as possible.

PLEASE DO NOT CITE THE OAT NEWSLETTER IN PUBLISHED BIBLIOGRAPHIES

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

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

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

One suggestion which may help: if there is material in the Newsletter which is needed for an article, contact the author. If he is willing, cite him rather than the Newsletter. This can be handled by the phrase "personal communication". (Ed.--repeated from 1964).

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Executive Committee

Chairman - H. C. Murphy
*Past Chairman - J. E. Grafius
*Secretary - F. L. Patterson
*Editor Newsletter - N. F. Jensen

Representatives:

North Central Region - J. M. Poehlman, Dale A. Ray, H. L. Shands
North Eastern Region - Steve Lund, H. G. Marshall
Southern Region - P. G. Rothman, D. T. Sechler
Western Region - C. F. Konzak, F. C. Petr
Cereal Crops Research Branch - L. A. Tatum
Oat Investigations - H. C. Murphy

*Non-voting

DISTINGUISHED SERVICE TO OAT IMPROVEMENT AWARD

Those in attendance at the last meeting of the National Oat Conference voted unanimously "That the Chairman of the National Oat Conference appoint a committee to formulate a plan for conferring Honorary Life Membership in the Oat Conference upon persons who have made significant and outstanding contributions to furthering oats as an agricultural crop." A committee was duly appointed by the Chairman. Their report is given below.

Report of Committee to

"Formulate a Plan to Confer an Award for Distinguished Service to Oats"

The National Oat Conference shall confer the award of "Distinguished Service to Oat Improvement" upon persons in recognition of their outstanding research contributions and/or meritorious service toward making oats a successful agricultural crop species.

To guide the National Oat Conference in conferring this award, the following definitions and procedures are suggested:

1. The award shall be known as "Distinguished Service to Oat Improvement Award."

2. The recipient(s) of this award shall be nominated by a committee of 3 persons, and elected for the award

by a majority vote of the Executive Committee of the National Oat Conference. The members of the nominating committee shall be appointed by the chairman of the National Oat Conference. Their term of office shall be from date of appointment until the end of the following Oat Conference meeting. The committee shall include at least 2 persons who have served on the National Oat Conference Executive Committee.

3. No restriction shall be placed upon who may receive the award. However, as a general guide, the award should be presented to persons who have devoted a significant portion of their professional career and a significant number of years working with oats through research, extension or other professional activities.

   The number of recipients should not be limited, but in general, not more than one to three persons would be recognized at one National Oat Conference meeting.

4. The award shall be conferred at a meeting of the National Oat Conference. Manifestation of the award shall be denoted by the presentation of a suitable plaque or certificate to the recipient. A brief (not to exceed two typewritten pages) statement about the recipients should be printed in the volume of the Oat Newsletter, which is published immediately following the presentation.

5. The "nomination committees," with experience, may find that additional procedural details should be added.

Submitted by -

H. L. Shands
E. G. Heyne
K. J. Frey - Chairman

The Chairman of the National Oat Conference has requested that the above committee continue as a nominating committee for selecting nominees for the Distinguished Service to Oat Improvement Award. Nominations for this award, to be conferred at the next meeting of the National Oat Conference, should be submitted to Dr. K. J. Frey. The nomination should include a brief statement about the proposed recipient suitable for publishing in the Oat Newsletter.

A STANDARDIZED SYSTEM OF GENETIC NOMENCLATURE FOR OATS

H. C. Murphy, USDA

Acting as a committee of the National Oat Conference, M. D. Simons, F. J. Zillinsky, and N. F. Jensen have developed and published, "A standardized System of Nomenclature for Genes Governing Characters of Oats." (USDA, ARS 34-85. 1966). They list, describe, and give literature citations for 193 genes, or loci, reported to date. Copies of the publication are available on request from Oat Investigations, Crops Research Division, Beltsville, Maryland 20705.

It is proposed that in the future the National Oat Conference serve as an international center for assigning symbols to new genes in oats. As chairman of the Oat Conference, I am requesting that M. D. Simons (chairman), F. J. Zillinsky, and N. F. Jensen continue responsibility for assigning symbols to oat genes. I would urge all investigators to cooperate with this committee. The addresses of the members of the committee are listed in the Oat Newsletter.

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II. SPECIAL REPORTS

A TRIBUTE
DR. HARRY H. LOVE, 1880-1966

Friends and colleagues were saddened during the year by the death of Professor Harry H. Love on April 20, 1966. Dr. Love had been active and maintained close daily contact with the department until his hospitalization a year or so before. He was 86 years old.

Dr. Love's career spanned more than half a century: The period 1909-1949 is less than that but in actuality Dr. Love did not cease work on retirement but re-entered the international agriculture field with zest. During his professional career he kept Cornell as his home base and the interests of the Plant Breeding Department were always foremost in his mind. The department was like a family group to him and in later years for good reason because the post-WWII staff was recruited largely through his efforts while departmental chairman.

Dr. Love was a remarkable man in that he was able competently to operate in several different areas of endeavor and to leave marks of accomplishment in each. He was a teacher of genetics, plant breeding and statistics to undergraduate and graduate students; he personally guided and advised a large number of graduate students during their stay at Cornell. He was a scientist of note specializing in the genetics and breeding of the cereal grains; he was a dominant figure in the early work in these areas with wheat and oats. His accomplishments in plant breeding, which he particularly enjoyed, stand as a landmark in the Agricultural history of New York. With some crops, particularly winter wheat and winter barley, his varieties were significant commercial successes in Ontario, Canada, Michigan and the Atlantic states. Especially noteworthy were Yorkwin and Genesee wheats and Wong barley.

Dr. Love was the author of many scientific papers dealing with genetics, plant breeding and statistics. In addition, he wrote two books dealing with statistics and experimental design. Late in his professional career he took over administrative duties and immediately devoted full-time efforts to expanding and re-vitalizing the departmental staff which had been depleted by retirement and the influence of the several war years.

Notwithstanding these activities, Dr. Love will be remembered as a pioneer in international agricultural cooperation. The "granddaddy" of aid programs was the Cornell-Nanking cooperative project of the 1920-1930s in which Dr. Love played an important role. All told, he spent several years in China. He also visited and spent periods of time in Puerto Rico and Taiwan. Following retirement, in 1950, he and Mrs. Love went to Thailand at the request of the Thai government to direct a rice improvement project. The Thai government later awarded him its second highest medal in grateful appreciation for his efforts.

Dr. Love was a good friend and counsellor to many people over the years. His colleagues would add a final accolade: he was good company.

-- N. F. Jensen

A NEW ILLINOIS AGRICULTURAL EXPERIMENT STATION BULLETIN ON CROP MORPHOLOGY*

The title is: The Inflorescences of Maize, Wheat, Rye, Barley, and Oats. Ill. Agr. Expt. Sta. Bul. 721. 1966. by O. T. Bonnett.

This publication brings together papers by the author on the development of the inflorescences of the major cereal crops. The series was started in 1935 with a description of the development of the barley spike published in the Journal of Agricultural Research. There followed papers on the development of the wheat spike, oat panicle, the hood and supernumerary spike in barley, and the ear and tassel of sweet corn. Other publications by the author dealing with developmental morphology of cereal crops are listed in the literature citations that accompany each paper. The citations also include publications by others on the developmental morphology of the inflorescences of cereal grains.

The text has been revised and enlarged, and many illustrations have been added. Two new chapters have been written, one on the development of the rye spike and one comparing the developmental patterns of the different inflorescences.

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*Available on request from the Author.

TOWARDS INTERNATIONAL STANDARDIZATION IN CROP RESEARCH DATA RECORDING

By Calvin F. Konzak[1/], Bjorn Sigurbjornsson[2/], and Georges Delhove[3/]

Studies are now well advanced for tests of a system for computer storage, processing and retrieval of plant germ plasm records. The aim of these studies is to develop a model system for international, national and station records and for studies toward a central international record of world cultivars and useful breeding and genetic stocks. Such a system could serve a central function in an internationally coordinated programme for plant germ plasm exploration, conservation, evaluation and use.

The format for the records is divided into four sections to facilitate such use. This format is based on the use of punched cards, but should be adaptable to other equipment.

The first section of the record is designed for use as a master for other applications. The master record will identify accessions of each crop, by accession number, and by name. A uniform method of numbering accessions is recommended. This method uses letter codes to designate a hierarchal system of international, national and station accession series, as well as numbers to identify the specific accession. In its basic features the method is similar in many respects to methods already

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2/ Head, Plant Breeding and Genetics Section, Joint FAO/IAEA Division of Atomic Energy in Food and Agriculture, International Atomic Energy Agency, Vienna, Austria.

3/ Field Food Crops Branch, Plant Production and Protection Division, Food and Agriculture Organization of the United Nations, Rome, Italy.

in practice.

The second section of the format is for recording information on the station which maintains stocks of the accession and details of its origin, all known synonyms, as well as the complete pedigree of the accession, presented according to a standard method similar to that described by Wiebe (1960 Barley Newsletter).

The third section is for recording information describing the various attributes of the accession. As presently devised, the third section will accommodate sufficient information to describe the more important features of an accession and the purpose for which it is being maintained. This section is to be developed further for recording more complete descriptions of the more useful cultivars, induced mutants, breeding and genetic stocks.

A fourth section will be added later to record in greater detail the performance of individual accessions as demonstrated in different environments by agronomic trials, quality evaluations, and tests of their response to diseases and pests, etc.

As a first step, a form for the records and instructions for entering the input information on each accession have been drafted. These will be used in making test runs early in 1967 using computer programmes designed for the SELECT and ISR systems for storage and retrieval of the information. For these tests, priority has been given to studies using wheat data. These studies will be followed by tests on barley, oats, and rice. The results will be considered by the FAO-IAEA Working Group which, in December 1965, set up the project under the auspices of the Joint FAO/IAEA Division in cooperation with the FAO Division of Plant Production and Protection. Tests on the use of the master record in field experiment applications have also been initiated. Based on computer programmes and procedures now being applied in the States of Washington and Montana, U.S.A., field record books for recording data have been prepared for use by cooperators in several international field experiments. These trials include FAO/IAEA Coordinated Experiments on Rice Nutrition being conducted in 12 countries of Southeast Asia, FAO/IAEA/IRRI Cooperative Rice Mutant Yield Trials conducted in 8 countries, as well as in the FAO/IAEA Uniform Durum Wheat Mutant Trials conducted in 12 countries, under the FAO Near East Wheat and Barley Improvement and Production Project.

Acceptance of this standardized system by field workers, and the uniformity of results obtained from the studies conducted to date, have been encouraging. The second series of trials is now in progress.

Further information on the progress of these activities and sample copies of the test forms may be obtained by writing to the authors.

INTERNATIONAL PROGRAMMES ON THE USE OF RADIATION AND ISOTOPES IN PLANT BREEDING AND GENETICS RESEARCH

By Bjorn Sigurbjornsson[1/] and Calvin F. Konzak[2/]

In the fall of 1964 the Food and Agriculture Organization of the United Nations and the International Atomic Energy Agency joined forces for promoting international cooperation to foster the use of nuclear techniques in food and agriculture, by establishing a Joint FAO/IAEA Division located in Vienna.

Engated in every field of food and agricultural sciences, the Division has a Section dealing with Plant Breeding and Genetics. This Section has three primary fields of interest: a) to promote and coordinate research leading to the development of more effective methods of inducing and utilizing mutations, b) to foster cooperation between and render assistance to mutation workers engaged in breeding some of the world's major food crops, c) to arrange for systematic international testing of induced mutants in some major food crops, and to standardize and mechanize methods of recording and analyzing data in international trials and mutant collections.

In addition, the Section has technical responsibility for various projects of Technical Assistance to developing countries and technically supervises scientific meetings, training courses and publications in this field. In its work the Section cooperates with other related sections of the FAO as well as with such organizations as EUCARPIA and EURATOM.

A Laboratory Section has also been established at Seibersdorf near Vienna. This Section is primarily engaged in servicing the various international programmes by treating seeds with mutagens, doing basic research for development of new programmes and training fellows in mutation methods.

During the first two years of its operation, the Section, in accordance with its three primary interests, has developed the following programmes:

a) A Coordinated Programme of Research on the Production and Use of Induced Mutations in Plant Breeding. This programme

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2/ Special Advisor to the Plant Breeding and Genetics Section, Joint FAO/IAEA Division of Atomic Energy in Food and Agriculture, International Atomic Energy Agency, Vienna, Austria.

has 17 main participants working under agreement or contract with the IAEA and several associates in countries in Asia, Europe, and North and South America. Coordination is maintained at periodic meetings, the first having been held in Vienna in January 1966, and the second scheduled to be held also in Vienna, in September 1967. The proceedings and recommendations for coordination made at these meetings are published. This group, which is mainly engaged in cereal work (rice, wheat, barley, oats, maize), also serves as a body of advisors to the plant breeding and genetics programmes of the Joint Division and is in addition preparing a Manual on Mutation Breeding which is primarily intended for use in training courses and by plant breeders in developing countries.

A Neutron Seed Irradiation Programme is in the process of getting under way. Its primary objective is standardization of methods of exposing seeds to neutrons in reactors and of measuring and reporting dose. Under contract with the IAEA and in collaboration with FAO/IAEA staff, the Austrian Atomic Energy Research Organization has developed a seed irradiation facility (lead and baron pot with a revolving specimen capsule) for use in pool-type reactors. Recommendations for standardized methods of measuring and reporting of dose have been developed by groups of biology, chemistry and physics experts. Contracts have been concluded with several countries to install the irradiation facility and to carry our coordinated studies. The IAEA laboratory at Seibersdorf is perfecting a technique of using barley seedling growth as an indicator of biological response for comparing different reactors. The first coordinating meeting was held in Vienna in July 1966; a working group meeting was held in December 1966, and the second coordinating meeting is planned for October 1967. Other studies within this programme will include radiosensitivity to neutrons of crop species and use of neutrons for induction of useful mutations.

b) A coordinated Programme on the Use of Induced Mutations in Rice Breeding. There are nine participants in this programme, who hold research contracts with the IAEA. They are mostly in Southeast Asian countries; one in Latin America. This group cooperates closely with the International Rice Commission in Bangkok and the International Rice Research Institute in the Philippines. The first coordinating meeting was held in Bangkok in 1965 and the second in Manila in 1966. The proceedings and recommendations are reported to the IRC and published in the IRC Newsletter. The third meeting is scheduled to be held in Taipei in June 1967. Through the work of one of the participants a new mutant rice variety named "Rei Mei" has been released in Japan, excelling mainly in stem strength. Another line produced by him reaches maturity 50 days earlier than the mother variety. Several other promising mutant lines of rice have been produced by the other participants.

In cooperation with the Seibersdorf laboratory, research is being carried out in Africa and Latin America on induction of disease resistance in wheat with emphasis on <u>Septoria</u>.

Plans are being made to develop coordinated research programmes dealing with the use of induced mutation for improvement of protein-rich crops and to improve protein quality and quantity of grain crops.

c) Under the framework of the FAO Near East Wheat and Barley Improvement and Production Project and in cooperation with the Italian Nuclear Research Center at Casaccia, Uniform Regional Trials of durum wheat mutants and controls are conducted in a number of countries of Southern Europe, North Africa and the Near and Middle East. The mutants, developed by Dr. G. T. Scarascia, have shown excellent performance in all these trials, outyielding local and common controls.

Under the framework of the Coordinated Rice Mutation Breeding Programme and in cooperation with the International Rice Research Institute, Uniform Regional Trials of *indica* rice and observation plot tests of *japonica* rice have recently been conducted in a number of Southeast Asian countries. The results are not known but the trials will be continued.

In cooperation with the Plant Production and Protection Division of FAO and the International Biological Programme, work is being developed towards standardization of crop research records and mechanization of processing. Several study groups, led by C. F. Konzak, have met to discuss the development of standard record formats and procedures. The Joint Division's Uniform Regional Trials already make use of computer-printed field books under this system. Formats are being developed for recording mutant and other genetic stock collections for computer handling. Adaptation studies, led by K. W. Finlay, are being standardized under the IBP and FAO and the FAO hopes eventually to establish world-wide germ plasm collection records.

Other activities by the Joint Division and its predecessors in this field have included a Technical Meeting on the Use of Induced Mutations in Plant Breeding, held in cooperation with EUCARPIA in Rome 1964, a Symposium on the Use of Isotopes in Plant Nutrition and Physiology held in 1966, also in cooperation with EUCARPIA, and together with the organizers of the XIth Pacific Science Congress a Symposium on the Use of Isotopes and Radiation in Agriculture. During the first two years of this joint venture of FAO and IAEA, a number of international programmes has been established, which have fostered cooperation among scientists the world over. The resulting coordination in some of the fields dealt with, has already contributed to more rapid progress in the use of nuclear methods in agricultural research and has helped to place this technique in its proper perspective as an important and unique additional tool to further research towards more and better food.

NON-MERCURIAL FORMULATIONS REDUCE OAT SMUTS

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

In the 1963[1/] and 1964[2/] volumes a non-mercurial formulation, Chemagro 4497, was reported as an effective fungistat of the oat smuts. This formulation as well as the Chemagro compounds 2635, 4537 and 4649 is volatile and hence can kill the smut fungi by fume action alone.

In 1965 the seeds of 3 oat varieties- Anthony, States Pride and Vanguard -were treated with certain Chemagro, Hooker and Morton non-mercurials in comparison with 11 mercurial formulations.

Six distinct groups of non-mercurials were available in 1966 and representative formulations were applied to seeds of two smut-susceptible varieties. Each formulation was used at three dosage rates without resort to sticking agents. Results from the lowest effective dosage rates are included in Table 1. A few combinations of two basic compounds were also placed on oat seeds.

The volatile non-mercurial, Chemagro 4497, was more effective than the volatile mercurials, Ceresan L, Ortho LM and Panogen 15 in 1965 not in 1966. The substitution of Dexon, Difolatan or thiabendazole (TBZ) for one-half of the Chemagro 4497 dose did not materially reduce the fungitoxicity of the latter. The combinations were effective against a broad spectrum of cereal smut diseases. Chemagro 2635 while slightly inferior to compound 4497 in the reduction of artificially induced oat smuts adequately controlled smuts of field origin.

All of the non-volatile formulations with three exceptions eliminated, or satisfactorily reduced, smut of natural (field-inoculated) origin. On the basis of the data in Table 1 Morton EP 301 and 302, Omadine thiourea, thiabendazole and USR F-461 (Plantvax) are suggested for the treatment of smut-infected oat seeds. Difolatan, Hooker 1591, Morton EP compounds 305 and 308 and USR D-735 (Vitavax) are satisfactory for application to seeds of the smut-resistant varieties.

If _Fusarium_ _roseum_ (scab) either alone or with the smut fungi is seed-borne thiabendazole or a volatile mercurial is suggested as an effective seed treatment.

1/ Crosier, W. F. 1963. Seed treatments for oats. Oat Newsl. 14: 23-25.

2/ ______________. 1964. Non-mercurial formulations reduce oat smuts. Oat Newsl. 15: 44-45.

Table 1. - Reduction of oat smuts by seed treatments

Name or code designation of formulation placed on seeds	Percentage of oat panicles destroyed by smut fungi				
	In 1965			In 1966	
	Anthony	States Pride	Vanguard	States Pride	Vanguard
Chemagro 2635	5.5*	- *	0.1	0.6*	0.1*,0.0
Chemagro 4497	0.2	0.5	0.1	0.2	0.2,0.0
Ch. 4497 + Dexon	-	-	0.1	0.2	0.1,0.0
Difolatan	8.6	15.	0.7	1.2	1.6,0.0
Difolatan + Ch. 4497	-	-	-	0.2	0.1,0.0
Hooker 1591	3.1	2.8	0.2	0.2	0.8,0.1
Morton EP 301	1.4	0.8	0.1	0.7	0.9,0.0
Morton EP 302	1.1	0.6	0.1	0.6	0.5,0.0
Morton EP 305	3.4	1.4	0.7	0.9	0.2,0.0
Morton EP 308	-	-	-	1.8	0.1,0.1
O.M. thiourea	-	-	-	-	0.1,0.0
TBZ W-8	-	-	-	0.5	0.3,0.0
TBZ + Ch. 4497	-	-	-	1.0	- ,0.0
TBZ + Difolatan	-	-	-	0.3	0.2,0.0
USR D-735	-	-	-	1.2	0.0,0.0
USR F-461	-	-	-	0.6	0.1,0.0
Ceresan L**	3.6	2.5	0.2	0.1	0.1,0.0
Ortho LM**	3.4	2.6	0.7	0.1	0.2,0.0
Panogen 15**	3.9	2.1	0.3	0.1	0.1,0.0
Check	15.	24.	7.2	15.	10. ,1.9

* The seeds were agitated in a spore suspension of _Ustilago avenae_ and _U. kolleri_. The seeds in the other two lots were naturally inoculated and spores were not added.

** The active ingredients of these formulations are volatile organic mercurials. Results from eight other mercurials are not included in Table 1.

RACES OF OAT STEM RUST

D. M. Stewart and B. J. Roberts (USDA)
Cooperative Rust Laboratory, St. Paul, Minnesota

Race 6AF, with virulence for resistance conferred by genes A, B, D, E, and F, predominated in the 1966 survey for the second consecutive year. This race comprised 58% of 192 isolates identified from 162 rusted collections. In 1965, 6AF comprised 40% of the total. Race 6AFH, which can attack genes A, B, D, E, F, and H, and which was found for the first time near barberry in Centre County, Pennsylvania in 1965, was identified twice each from Iowa and Minnesota and once each from Pennsylvania and Texas in 1966. Race 6F, the most prevalent race in 1964 and second most prevalent in 1965, was again in second place in 1966, with 17% of the total isolates. Other races identified were 2, 6A, 6AH, 7AH, 13A, and 13AF, with the following isolated once only: 1, 5H, 6, 7AF, 8AF, 12A, 12AF, and 13F (Table 2).

Varieties used as differentials in 1966 are listed below.

Variety	Gene	Remarks
Minrus	D	
Richland	A	
Jostrain	E	
Rodney	B	
Eagle^2 x CI 4023	F	CI 8111
CI 7908	?	Resistant to 2A, 2F, 6F, 6AF, and 13F but susceptible to most other races.
CI 4023	BEF	
CI 7114	?	Resistant to 6AF
CI 7438	BF	
Saia	?	CI 7010
Clinton^2 x Ark 674	D + ?	CI 6643
Garry	AB	
Ada (CI 7144)	AD	
CI 5844	H	

Table 2. - Physiologic races of Puccinia graminis var. avenae identified from oats and grasses in the United States in 1966.

State	Race and numberof times identified										Total Iso.
	2	6A	6F	6AH	6AF	6AFH	7AH	13A	13AF	Other	
California	1	-	-	-	-	-	-	-	-	-	1
Illinois	-	-	1	-	2	-	1	-	1	2	7
Indiana	-	-	-	-	1	-	-	-	-	-	1
Iowa	7	-	16	-	33	2	-	-	-	1	59
Michigan	-	-	1	-	3	-	-	-	-	-	4
Minnesota	5	2	5	-	21	2	-	-	-	1	36
Mississippi	-	-	2	-	2	-	-	-	-	2	6
Missouri	-	-	1	-	2	-	-	-	-	1	4
Nebraska	-	-	-	-	1	-	-	-	-	-	1
New York	-	-	-	-	-	-	-	-	1	-	1
North Dakota	1	-	2	-	3	-	-	-	-	-	6
Pennsylvania	1	-	-	3	1	1	-	3	1	-	9
South Carolina	-	-	-	-	-	-	1	-	-	-	1
South Dakota	2	3	3	-	39	-	-	-	-	-	47
Texas	-	-	2	-	2	1	-	-	-	1	6
Wisconsin	1	-	-	-	2	-	-	-	-	-	3
Total isol.	17	5	33	3	112	6	2	3	3	8	192
Pct. of isol.	8.8	2.6	17.2	1.6	58.4	3.1	1.0	1.6	1.6	4.1	100

RUAKURA - SHOULD WE TAKE ANOTHER LOOK?

Franklin A. Coffman

Ruakura (P.I. 33644 : C.I. 701), C.I. 2025 is a variety remembered mainly because of its rust resistance. Stanton[1] stated it came to the United States from New Zealand in 1912. He quotes Archer[2], who indicated that in 1908, A. W. Green, Ruakura Farm of Instruction, New Zealand Department of Agriculture, made over 1000 selections from Algerian, Argentina, and Red Rust Proof with the hope of obtaining rust resistant oats. Ruakura resulted according to De Villiers and Sim[3], from oats received by Green, from Argentina.

Parker[4], 50 years ago, tested at Ithaca, New York, some 120 oat species and varieties in the seedling and adult stages with spores of both crown and stem rust. Only Ruakura among cultivated oats appeared to have resistance to both rusts in both stages. However, Parker apparently questioned the purity of the Ruakura (C.I. 701) he used, judged by footnotes to his table presenting data. Later, results of Levine and Smith[5] indicated Ruakura (C.I. 2025), presumably a different strain than that used by Parker, lacked resistance to any stem rust race, 1 to 10, inclusive.

In 1955, nearly 40 years after Parker, Simons and Murphy[6] reported Ruakura (C.I. 2025) had resistance to 62 of 112 crown rust races they identified. It was resistant to 5 races that attacked Victoria, 11 that attacked Bond, 2 to which both were susceptable. Ruakura was dropped as a "differential" and just what resistance it has to the many recently isolated races the writer does not know.

Reed, Griffiths and Briggs[7] conducted extensive tests of oats, inoculated with spores of both loose and covered smuts (separately). Smut races had not then been identified. Ruakura (C.I. 701) proved "intermediate" in reaction to both. Red Rustproof gave more positive reactions and Black Mesdag was resistant to both smuts, loose and covered, used.

1/ Stanton, T. R.; U.S.D.A. Tech. Bul. 1100 (1955).
2/ Archer, E.; Australia Inst. Sci. and Ind. Bul. 23 (1922).
3/ De Villiers, P. J. R. and Sim, J. T. R.; Union South Africa Department Agr. Sci. Bul. 92 (1930).
4/ Parker, John H.; U.S.D.A. Bul. 629 (1918).
5/ Levine, M. N. and Smith, D. C.; Jno. Agr. Res. Vol. 55, No. 10 (1937).
6/ Simons, M. D. and Murphy, H. C.; U.S.D.A. Tech. Bul. 1112 (1955).
7/ Reed, George M., Griffiths, Marion A. and Briggs, Fred N.; U.S.D.A. Dept. Bul. 1275 (1925).

Areas of origin of Ruakura and some other disease-resistant oats are apparently as follows:

Black Mesdag-	France, The Netherlands*
Bond-	Australia (Algeria x Sweden)
Fulghum-	(Red Rustproof) Geo., Spain?
Green Russian-	Russia?
Hajira-	So. Africa, Algeria
Joanette-	France
Landhafer-	Germany, So. America
Markton-	Oreg., Turkey
Navarro-	(Red Rustproof?) Texas, Spain?
Richland-	(Kherson) Iowa, Russia
Ruakura-	New Zealand, Argentina, Spain?
Santa Fe-	So. America
Victoria-	So. America
White Russian-	(White Tartar) Russia

Bond and Ruakura came from areas about 1,000 miles apart. Both seem to trace to South American oats indirectly although Bond apparently traces to Algerian oats. Reason exists for suspecting all of these oats trace to or are of A. Sterilis derivation. Oats of the White Russian type are supposed to have appeared originally in western Russia, or in eastern Hungary or Yugoslavia. Supposedly it appeared as an aberrant type, much as hull-ess oats sometimes appear.

*As to Black Mesdag, literature long ago indicated it came from the "Baltic region". That area has grown midseason oats so far as we have been able to determine, from the time of the earliest writers on oats in the European area. On our map we find a Balta (or Balfa) located some 125 to 150 miles to the northwest of Odessa and also Kherson (Cherson), in the noted grain-producing area to the north of the Black Sea in southwest Russia. We have long wondered, could "Baltic" have been a printers error in some old report? One needs only to be a little careless in writing that final a in Balta.

Because of its disease resistance Ruakura received some attention in oat crossing. In the early and mid 1920's, both T. R. Stanton and this writer used it in a few crosses. Resulting progeny were mostly in early generations when the depression came. That brought drastically reduced funds. Much research and field testing was curtailed. The situation remained until after World War II, or for almost 20 years in the U.S.D.A. as well as in some of the states. All Ruakura hybrids along with those from several other varieties were dropped and only the most promising breeding material, then, derivatives of Victoria, and to a less extent of Rainbow was continued in sizeable nurseries.

Tests conducted in a heat chamber[8,9] gave data of special interest on Ruakura from the standpoint of heat and thus pre-

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8/ Coffman, Franklin A.: A.S.A. Vol. 31, No. 9 (1939).
9/ ____________________: Agron. Jno. Vol. 49 (1957)

sumably winter resistance. Ten pots were planted; alternating in each pot 5 kernels of Ruakura with 5 of Fulghum (heat check). Germinations were high and resulting plants in the 5-leaf stage were exposed for 45 minutes to temperatures of 48½ - 52° C. Based on check surviving 100 pct., Ruakura survived some 148 pct. Thus Ruakura survived better than any other oat tested. Well known winter oats; Winter Turf, Lee, Hairy Culberson, Fulwin and Tech survived 112.2, 100.0, 122.4, 126.7 and 105.8 percent of Fulghum check, respectively. In Uniform Hardiness Nurseries10,11/, survivals of these oats on the basis of Fulghum's survival as 100.0 pct. were 129.2, 124.9, 139.1, 147.7 and 135.7 percent, respectively. Fulwin was grown for 26 years; the others 36 years. Frankly, the heat test of Ruakura was not extensive, but the results might well indicate the possibility for hardiness genes should no longer be ignored.

Bledsoe crossed Markton (spring) with Red Rustproof (winter) and obtained C.I. No's. 3430 and 3179. Grown for 7 and 5 years in Hardiness Nurseries they survived 103.1 and 97.4 percent, respectively, of Winter Turf (check). We do not know what Red Rustproof Bledsoe used as a parent, but Hastings and Appler are both from Georgia, where the crosses were made. Grown for 9 and 36 years in the regional Hardiness Nurseries these oats survived 92.3 and 75.6 percent of Turf. If we use data on Turf as a basis then C.I. No's. 3430 and 3179 survived 11.7 and 5.6 percent better than Hastings and 36.4 and 26.5 percent, respectively better than Appler. This clearly indicates Markton (spring) has genes for winter hardiness.

Still another reason exists for interest in Ruakura. It is a comparatively pubescent oat in the juvenile stage. The fact that pubescent seedling characters appear related to winter hardiness in oats was pointed out in 1962. This together with data from heat tests should not be overlooked.

It was recently learned that no seed of Parker's Ruakura, C.I. 701 is available in the World Oat Collection, but C.I. 2025 apparently is available.

On the basis of the information assembled, this writer believes another "look" at Ruakura is in order.

10/ Coffman, Franklin A.: Crops Res. U.S.D.A., ARS. 34-65 (1964).

11/ ____________________ : U.S.D.A. Tech. Bul. 1346 (1965).

OATS IN THE SOUTHERN STATES[1/]

Past, Present and Future

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The history of oats is poorly documented especially in the Southern States where, as agriculture developed, great plantations were built on the cash crops of cotton and tobacco. More information may be available if a thorough search were made.

Since Coffman[2/] quotes Galen (130-200 AD) as saying, "The literature on oats is replete with statements that oats require a cool climate for best production," one might ask why have we tried to grow oats under the relatively severe hazards of heat, cold, drouth, diseases and insects which beset the crop in the southern United States. A few reasons are (1) they had good feed value for work animals (an important early consideration on plantations), (2) they provided a well balanced grain ration and were used for hay, bundle feed, and winter pasture, (3) they were suitable for erosion control, green manure, weed control and for rotation with other crops.

Coffman quotes Gray and Thompson[3/] who wrote that the Jamestown, Virginia colonists grew oats in 1607 and that grain, probably including oats, was seeded (but not harvested) by Raleigh settlers in 1586.

Mason (1853)[4/] states that oats were brought to New England in 1602 by Captain Bartholemew Gosnold and grown on one of the small islands off the coast of Massachusetts. Stanton (1955)[5/] states that the variety Winter Turf was presumably brought to Virginia by the early colonists from England and has persisted to the present time. This then was the first variety of oats recorded.

1/ Prepared for the work-conference of Southern Small Grains Workers at Fayetteville, Arkansas, April 27-28, 1966. Thanks are due personnel in all states who contributed information and suggestions for this review. Opinions expressed are those of the writer and do not necessarily represent those of the entire group.

2/ Coffman, F. A. Oats and Oat Improvement. Agronomy Monograph Vol. 8, 1961.

3/ Gray, L. C. and Thompson, E. K. 1941. History of agriculture in the Southern States to 1860. Peter Smith, N. Y. Vol. I.

4/ Mason, Charles, 1853. Report of the Commission of Patents for the year 1853. Agr. Rpt. Oats 158-159. Quoted by Coffman[2/].

5/ Stanton, T. R. (1955). Oat identification and classification USDA Tech. Bul. 1100.

Acreages

Statistics are recorded for most crops starting about 1875. Earlier records are available for some states. The harvested acreages for the 13 Southern States (Oklahoma from 1905) from 1875 to 1965 are given in Table 3, along with seeded acreages since 1945. Table 4 gives the average annual yield per acre for the same period. The general trend was for acreages to increase up to 1915. Part of this was due to the gradual increase of land under cultivation as the states were settled. There are exceptions to this trend, i.e. Virginia grew 600,000 acres in 1874 but the acreage has declined to a low of 53,000 acres in 1965. Many states show a peak of acreage about 1945 and another about 1955. The harvested acreages have declined drastically since 1955 and in some states since 1945.

Seeded acreages, as well as harvested acreages, are available since 1945. Seeded acreages are much larger than the acreage harvested, the difference increasing nearly every year. Hazards of winter killing, drouth, insects and diseases, all influence this spread, but a major factor is the increased use of oats exclusively for winter pasture, green-chop feeding, silage, haylage and hay.

Total production of oats has not changed as much as acreages because of increased yield per acre, Table 4. Especially since 1945, yield per acre has increased greatly, being in many years, twice that produced before 1925. Improvement of varieties, greater tolerance or resistance to the hazards of production, and improved cultural practices probably account for much of this increased yield per acre.

What are the reasons for this rapid decline in oat acreage that is occurring throughout the United States? Not all reasons are apparent but a few are (1) the relatively low value in terms of returns per acre, (2) increased production costs, (3) less importance as a feed grain, (4) large increases in per acre yields of corn and sorghum as a result of use of hybrids, (5) inability to push oat yields higher with fertilizer because of lodging problems, (6) serious hazards of production i.e. diseases, winterkilling and drouth, and (7) possible failure to provide varieties capable of responding to better farm practices.

What then are the problems facing research people and growers of oats in the Southern States? What can we do to make oats competitive with other crops and how should we go about it?

Varieties

Brief records of oat culture in the South indicate that oats were not a satisfactory crop until the Red Rustproof type became established after the Civil War. Undoubtedly most oats brought to the Southern states were spring types from the

Table 3. Harvested Acreages of Oats in 13 Southern States, 1875-1965

	1875	1885	1895	1905	1915	1925	1935	1945	1950	1955	1960	1965
						(000 omitted)						
Alabama	128	402	350	192	600	131	97	251	113	170	114	45
Arkansas	45	251	327	192	375	261	161	304	180	460	134	88
Florida	10	54	40	30	61	13	8	45	16	32	25	20
Georgia	491	710	461	233	905	413	378	695	477	461	196	125
Kentucky	311	492	506	224	210	247	65	88	99	90	33	41
Louisiana	-	37	38	28	120	30	50	131	48	124	58	28
Mississippi	48	355	132	90	250	85	43	480	172	401	160	79
North Carolina	261	599	507	204	350	258	240	375	410	460	241	137
Oklahoma	-	-	-	294	1,400	1,140	1,433	1,104	532	704	425	253
South Carolina	76	414	289	188	525	378	449	714	647	551	274	144
Tennessee	307	620	455	151	357	221	77	245	239	236	125	58
Texas	118	512	704	914	1,250	1,091	1,670	1,837	1,324	1,348	1,197	895
Virginia	484	621	459	176	225	271	82	142	139	146	92	53
Totals	2,279	5,067	4,268	2,916	6,628	4,539	4,753	6,411	4,396	5,183	3,074	1,166
						Seeded Acreage						
Alabama								318	283	651	418	231
Arkansas								512	321	767	254	112
Florida								415	123	188	182	98
Georgia								895	815	1,059	424	260
Kentucky								125	170	261	90	123
Louisiana								198	148	205	128	70
Mississippi								563	356	802	400	164
North Carolina								489	506	700	375	216
Oklahoma								1,220	1,204	1,400	723	407
South Carolina								800	758	1,028	562	286
Tennessee								348	325	595	339	185
Texas								2,078	1,849	2,580	2,053	1,899
Virginia								174	196	255	144	115
Totals								8,135	7,054	10,491	6,092	4,166

Table 4. Average yield of oats, bushels per acre, in 13 Southern States, 1875-1965

	1875	1885	1895	1905	1915	1925	1935	1945	1950	1955	1960	1965
Alabama	14.1	12.2	14.9	16.5	19.0	17.0	19.0	26.0	27.0	26.0	32.0	34.0
Arkansas	20.5	21.1	25.4	20.3	27.0	16.0	17.0	27.0	25.0	36.0	45.0	52.0
Florida	13.5	9.7	10.2	12.0	20.0	14.0	14.0	20.0	25.0	24.0	30.0	37.0
Georgia	11.6	9.0	14.5	15.1	19.5	17.0	19.0	25.5	26.0	25.0	35.0	43.0
Kentucky	22.0	20.8	26.2	24.5	26.0	21.0	16.0	25.0	24.0	29.0	37.0	38.0
Louisiana	-	11.4	15.0	16.0	25.0	21.0	22.5	28.0	28.0	33.0	35.0	29.0
Mississippi	16.3	11.2	15.7	18.5	21.5	19.0	20.0	31.0	29.0	30.0	49.0	41.0
North Carolina	13.5	7.5	15.1	15.3	23.0	19.0	21.5	27.5	35.5	33.0	34.0	42.0
Oklahoma	-	-	-	33.0	27.0	23.0	25.0	19.0	16.0	17.0	29.0	35.0
South Carolina	14.5	8.5	15.2	16.3	19.0	19.0	23.5	26.5	28.0	27.5	30.5	36.0
Tennessee	17.6	17.3	22.5	20.2	24.5	22.0	14.0	26.0	26.0	29.0	33.5	39.0
Texas	31.0	27.8	20.7	31.4	35.5	12.3	23.0	22.5	15.0	17.5	26.0	25.0
Virginia	15.8	13.9	17.7	17.8	25.0	21.5	20.0	28.0	33.0	38.0	40.0	43.0
Average	15.9	14.2	17.7	19.8	24.0	18.6	19.6	33.2	26.0	28.0	35.1	38.2

northern states or from northern Europe. Stanton[5] records the introduction of Black Mesdag about 1870, and Black Bell, Culberson, Tech and a few others from 1900-1910. However, there appears to be few records between the "supposed" arrival of Winter Turf with the early colonists of the 1600's and about 1870 when the Red Rustproof type became widely adopted. The Burt oat was selected from Red Rustproof by a Georgia farmer in 1878. Selections of Burt made after 1900 became important spring varieties but Burt itself was not widely grown in the Southern states.

The Red Rustproof oats apparently "took the South by storm" about 1875 and continued as the predominant variety until the 1940's. Their tolerance to rusts (as compared to northern spring types), to drouth and heat, their value as a grazing crop, and wide adaptation to fall and spring seeding resulted in continued expansion until it was estimated that they were grown on 6 million acres in 1919. Plant breeding efforts in the form of pure line selections provided nearly every state with named strains of Red Rustproof. Among the more important were Ferguson 71 and 922, Nortex and New Nortex, Hastings 100-bushel, Alabama Red Rustproof, Appler Rustproof, Bancroft, Terruf, California Red Rustproof, Tifton 14 and others.

The Fulghum oat, selected by a Georgia farmer in 1897, also contributed greatly to oat culture in the South. A number of pure line strains were selected from Fulghum; the most extensively grown was Kanota, which was used as a spring-sown oat in mid-western states and California. From what probably was a natural hybrid of Fulghum with some unknown strain, came the Winter Fulghum strains. These played a major part in extending northward the fall-sown oat belt. Among these should be mentioned Pentagon, Fulwin, Tennex, Forkedeer and more recently the Ballard strains. From crosses to these hardy types came the varieties Dubois, Norline, Arkwin, LeConte, Wintok, Norwin and Cimarron.

The next important changes in varieties was the development of Bond and Victoria derivatives. Immediately after the discovery of resistance to crown rust in Bond and Victoria about 1930, these were crossed to many southern oat varieties. During the 1940-50 period, a large number of crown rust resistant varieties were released and soon replaced much of the acreage seeded to Red Rustproof strains. Contrary to experience in the Corn Belt, the Victoria resistance was effective for nearly 15 years. However, by 1950, races 213-216, which attacks Victoria derivatives, were increasing. These crown rust races, plus damage by Victoria blight, made it necessary to abandon these varieties by the mid-1950's. Victoria blight became a limiting factor in Florida and other humid areas earlier than this.

Landhafer, Santa Fe and Trispernia were next used as sources of crown rust resistance. A relatively few varieties, with resistance from these sources, were released and their useful life was short due to increase of crown rust races 264, 276, 290, 293, 294, 295 and more recently races 326 and 327. The Landhafer derivatives were useful only a few years. Santa Fe derivatives were useful slightly longer, perhaps owing to their distribution in areas where crown rust is less frequently a major disease. Suregrain and Moregrain, Trispernia derivatives, developed by the Coker Seed Company, were highly successful commercially and are still widely grown. Ora, a Moregrain derivative recently distributed from Arkansas, also is widely grown. However, races 264, 276, 295, 326 and 327 are now attacking these varieties. Alamo-X (Texas) and Florad (Florida) were developed by irradiation of parent varieties but neither were useful very long. Florida 500, a Florad derivative, is now the only resistant commercial variety available. A list of varieties, arranged by groups, is given in Table 5.

Spring-sown oats have almost been driven out of production in the 13 Southern States by the development of cold tolerant varieties. Oklahoma, and northern Texas, for example, have changed from more than 50% spring-sown oats before 1950 to 90% fall-sown oats. Spring sown oats have been replaced by hybrid corn, grain sorghum or soybeans as cash crops in the more northern areas. Kentucky and Virginia each grew nearly 500,000 acres of spring-sown oats as early as 1875 but now grow less than 50,000 acres.

Table 5. Major oat varieties, introduced or developed for the south.

Variety	Year	State	Source
Common Winter Oats:			
Winter Turf	1700's	Va.	Introduced from England
Culberson	-	-	Sel. from RRP
Hairy Culberson	1906	Tenn.	Sel. from Culberson
Dwarf Culberson	1906	Tenn.	do.
Tech	1908	Va.	Culberson Sel.
Lee	1916	USDA	Winter Turf x Aurora
Wintok	1946	Okla.	H. Culberson x Fulghum 2500
Cimarron	1955	Okla.	Composite Cross
Norwin	1966	Texas	Colo-Wtk x HJ-Atl-Cl-SF
Red Rustproof strains or derivatives:			
Ferguson 71[6/]	1916	Texas	RRP Sel.
Ferguson 922[6/]	1926	do.	do.
Nortex	1926	do.	do.
New Nortex	1936	do.	do.
Ala. RRP	1930	Alabama	do.
Appler RRP	-	Georgia	do.
Hastings 100 Bu.[7/]	1907	do.	do.
Terruf	1938	do.	do.
Tifton 14		do.	do.
California Red	-	Calif.	do.
Delta Red	-	Mississippi	do.
Nortex 107[8/]	1950	do.	do.

Variety	Year	State	Source
Ferguson 560	1956	Arkansas	do.
Fulghum strains:			
Fulghum	1912	Georgia	RRP Sel. (by grower)
Navarro	1921	Texas	Fulghum Sel. (A.M. Ferguson[6])
Kanota	1916	Kansas	Fulghum Sel.
Frazier	1926	Texas	do.
Columbia	1920	Missouri	do.
Cokers No. 4[9]	1930	S. C.	do.
Franklin	1922	Ohio	do.
Fulgrain	1936	do.	Big Boy x Navarro
Pentagon	1920	USDA	Winter type Fulghum Sel.
Fulwin	1930	Tenn.	do.
Tennex	1930	Tenn.	do.
Forkedeer		Tenn.	do.
Ballard	1961	Ky.	Pentagon Sel.
Lemont	1944	N. C.	Lee x Fulghum
Victoria derivatives, red oats:			
Ranger	1940	Texas	Nortex x Victoria
Rustler	1940	do.	do.
Fultex	1940	do.	Fulghum x Victoria
Victorgrain[9]	1940	S. C.	Victorgrain x Fulghum
Fulgrain St. 4[9]	1940	S. C.	Fulgrain x Victoria
Verde	1943	Texas	RRP x VR
Carolina Red[10]	1944	N. C.	Nortex x Victoria
Quincy Red	1940	Florida	Kanota x Victoria
Midsouth	1955	Miss.	Victorgrain der.
Victoria derivatives, common oats:			
Letoria	1942	N. C.	Lee x Victoria
Lelina	1942	N. C.	do.
Lenoir	1942	N. C.	do.
Levic	1941	Ga.	do.
Lega	1941	Ga.	do.
Leroy	1943	Ga.	do.
Stanton[9]	1941	S. C.	do.
DeSoto	1942	Ark.	do.
Florilee	1943	Fla.	do.
Marmac[10]	1945	N. C.	do.
Traveler	1944	Ark.	Victoria x Custis
Quincy Gray	1940	Fla.	Victoria-Norton x RRP
Mustang	1949	Texas	Fulwin x Lee-Vtra
Bronco	1956	Texas	do.
Arlington	1952	USDA, VA., Ga., N. C.	do.
Atlantic	1952	do.	do.
Coy	1954	USDA	do.
Norline	1960	Ind.	Lee-Vtra x Forkedeer
Alamo	1956	Texas	Fulg-Victa x VHB

Variety	Year	State	Source
Bond derivatives:			
Florida 167	1942	Fla.	Bond x Fulghum
Camellia	1942	La.	Bond x Alber
Taggart	1949	Ark.	Fulghum x Bond
Delair	1949	Miss.	Fulghum x Bond
Arkwin	1952	Ark.	Tenn 1922 x Bond-Iogold
Southland	1950	Fla.	D69-Bond x Fultex
Dubois	1952	Ind.	Clinton x Forkedeer
LeConte	1955	Tenn.	Tennex x Bond
Blount	1960	Tenn.	LeConte x Fg 6
Landhafer derivatives:			
Floriland	1952	Fla.	Fla. 167 x Landhafer
Sunland	1954	Fla.	Fulghum x Landhafer
Radar I	1958	Ga.	Vg x BRHJ-Lh
Radar II	1958	Ga.	do.
Florad	1962	Fla.	Irrad. Floriland
Houston	1963	Texas	FLV-RRP-VR x BRHJ-Lh
Santa Fe derivatives:			
Seminole	1953	Fla.	Appler x Cl^2-SF
Carolee	1962	N. C.	Letoria x Cl^2-SF
Roanoke	1962	USDA, Va., N. C.	Arl. x (Wtk-Cl^2-SF)
Fairfax	1962	Ga.	do.
Sumter	1962	S. C.	do.
Jefferson	1965	Ga.	do.
Trispernia derivatives:			
Suregrain[9/]	1956	S. C.	Arl-Del x Trispernia
Moregrain[9/]	1956	S. C.	Arl-Del-Tris x BF-Vtg
Ora	1962	Ark.	LVF-Bda x Lh x Moregrain
Miscellaneous:			
Alber	1938	La.	Intro. from Uruguay
Alamo-X	1961	Texas	Irrad. Alamo
Florad	1960	Fla.	Irrad. Floriland
Florida 500	1964	Fla.	Florad x C.I. 7403

6/ By Ferguson Seed Farms, Sherman, Texas.
7/ Hasting Seed Co., Atlanta, Ga.
8/ Stoneville Pedigree Seed Company.
9/ Coker Pedigreed Seed Company, Hartsville, S. C.
10/ Marett Seed Company.

Winterkilling or Injury

Cold tolerance was cited by all states as a major factor in oat acreage changes, variety choices and value of the crop. Cold tolerance has a different meaning in nearly every state and even in different parts of the same state. Survival after long periods of low temperatures is winter-hardiness to the northern breeders and growers. Progress obtained in such varieties as Wintok, Cimarron, Dubois, Norline, the Winter Fulghums, Nysel, Mustang, Bronco and others has meant much to the marginal area where oats once were a very hazardous fall-sown crop. However, needs for greater hardiness never seems to end because, once you satisfy one group, then growers located even farther north also want to grow winter oats.

To the growers in the Gulf Coast from Florida to South Texas, winter-hardiness means tolerance and quick recovery from very sudden drops in temperature. Cold fronts may drop the temperature from the 70-80° F range to the 10-20° F range in less than 24 hours. Temperatures at Beeville, Texas in 1962, for example, dropped from 72° F on January 9 to 12° F on January 12, accompanied by a 40 mile wind. Even farther north this can happen. At Denton, Texas in 1943, temperatures dropped from 76° F on January 16 to 4° F on January 19. This in turn was followed on the 23rd with a temperature of 89° F and on the 25th it again dropped to 17° F.

Early work of introduction, selection and hybridization by USDA workers provided the first hardy oat varieties. Among these are Winter Turf, the Culberson strains, Lee, Bicknell, Aurora and Winter Fulghum strains.

The outstanding early work of the Tennessee station of selecting from Winter Fulghum the hardy strains which later became the varieties Fulwin, Tennex, Forkedeer was a turning point in the development of winter-type oats. Later, the selection of Wintok and Cimarron in Oklahoma was a second plateau of success. A third is the development of combinations of cold tolerance with some degree of disease resistance in such varieties as Dubois, Norline, Mustang, Bronco, Arlington, Atlantic, Coy, LeConte, Nysel, Norwin and others. Additional advances appear to have been made in cold tolerance in certain Kentucky strains but their full value awaits further work.

All gradations of hardiness are required for the wide range of conditions in the South. Combined with cold tolerance, the grower wants the maximum in forage production for his livestock. We have not attained our goals in these combined characteristics. Basic work needs to be done to combine maximum forage production with adequate hardiness for each area. These characteristics must then be combined with desirable attributes of disease resistance, maximum yield and high grain quality.

Diseases

Diseases constitute a major hazard of production because of the long growing period of fall-sown oats under a relatively mild and humid climate. As with other hazards, the importance of diseases varies with the location but all cooperating states referred to diseases as a factor in the production of oats.

Rusts were undoubtedly a major factor in the slow establishment of oats in the Southern States prior to the growing of Red Rustproof oats. The Red Rustproof strains provided a type especially suited to the South (in spite of their faults) where their rust tolerance combined with other characteristics were responsible for the expansion of acreage and widespread use of oats as grain, hay and forage crops. As an example of this spread, the acreage in Texas during 1865-75 was 40-100,000 acres but by 1900 it had increased to nearly 1 million acres and to 2 million by 1920. This was, of course, in part due to settlement of the State. Crown rust is by far the most important disease, in fact, stem rust was not even mentioned by cooperators sending in reports. The great and seemingly almost insurmountable problem with the rusts is the rapid change in race prevalence as illustrated for Texas conditions in Table 6.

Prior to 1938, stem rust races in Texas were 2 and 5. About 1940 race 8-10 became important, followed by increase of race 7 and by race 7A in 1956. Since 1956, new biotypes of old races have just about wiped out all field resistance to stem rust in oats and we find ourselves now turning to wild relatives for sources of new resistance. Such rapid changes make it nearly impossible to protect the crop from this hazard without present personnel and facilities.

Crown rust has presented an equally difficult problem. Fall seeding of oats for pasture has considerable influence on fall establishment of crown rust and overwintering of the disease. The use of Bond and Victoria, the first real sources of high resistance to crown rust, throughout the country, provided a fertile and wonderful host range for races which could attack these varieties. As a consequence, the 201-212 group increased and soon "took out" the Bond derivatives from 1946-50. This was followed by race 213-216 group which "took out" the Victoria derivatives a few years later. As has frequently occurred, the new races developed first in the eastern states, then moved into the Corn Belt, and from there moved southward into the Mexico-Texas-Corn Belt "puccinia trail". The collapse of the Victoria varieties did not come in Texas until the very wet season of 1957 and 1958. In fact they still are used in the drier parts of the State. We must give credit to the Victoria gene for considerable protection from crown rust to oats in the South from about 1940 to 1958, undoubtedly a very substantial saving to growers.

Very rapid changes in races have plagued us since 1955. Landhafer and Santa Fe derivatives, few in number, never really

Table 6. Races of crown and stem rust identified from Texas collections+

	Crown rust races (Figures are % of total)												
	202	203	213	216	264	276	279	290	294	295	326	327	Others
1952	51	13	19	4									13
1953	59	13	9	2									17
1954	56	8	8	10									18
1955	72	9	4	-									15
1956	26	6	28	20			7						13
1957	13	4	16	59	4		1	3					0
1958	6	3	19	70			2						0
1959			6	80	3	3		3	5				0
1960	4	13	7	64				9	3				0
1961		13	2	66				6	3	5	3		2
1962	2	8	6	67	10	2				2	2		1
1963	28	7	5	23	5			5		7	20		0
1964	4		21	17	5	4		8		6	28	6	0
1965	2		30	12	5	2		2		3	34	5	5

	Stem rust races (Figures are % of total)									
	2	2+5	5	6	6AF	6F	7	7A	8	Others
1940-50	All were races 2, 5 or 8									
1951	19		8				46		27	0
1952	58		11				15		16	0
1953	48						48		4	0
1954	27		2				54	2	15	0
1955	29		29				42			0
1956	28		24				42	4	4	0
1957	28		12	2			36	11	11	0
1958	17						66	17		0
1959	No Report									
1960	36		27	18			10		9	
1961	7			21			14		7	51
1962		25		42			8			25
1963		8		24	4	52	4	4		4
1964	6		17		11	56				19
1965			8		17	67				8

+Prepared by R. A. Kilpatrick, Pathologist, USDA, College Station, Texas.

became well established in the South. The very fine resistance of Suregrain and Moregrain, Coker derivatives of Trispernia; and more recently, in Ora (Ark.) was very effective. We must all pay high tribute to Sam Hadden and the Coker Seed Company for their outstanding breeding accomplishment as well as their earlier accomplishments in the development of the Victorgrain and Fulgrain strains, which were so widely adapted and grown for many years. However, experience in 1965 and 1966 indicate that these varieties may soon be eliminated from commercial production. During both seasons, Florida 500 was the only commercial variety resistant to a new group of 213 (biotypes) 285, 294, 326, 327 now prevalent in Texas. Alamo-X, a Texas variety developed by irradiation, had a happy, prosperous but very short life of 3 years because of its very high susceptibility to races 294 and 326.

Other diseases have been serious problems in more local areas. The Victoria blight problem was not as serious in fall-sown grain, especially in more northern areas of the South as it was in the spring-sown oat areas of the Corn Belt. During warm spring seasons where spring oats were seeded late, on wet soils, and in the southern part of the South this disease has been important many years. Likewise, culm rot and other Helminthosporium species have caused problems in more limited areas. Southland in Florida was soon eliminated from production by culm rot. South Carolina, North Carolina, Georgia and Florida have experienced serious losses from oat soil borne mosaic but crop rotation and resistant varieties have given fairly effective control. Pythium species have caused poor stands of oats in Florida in some seasons.

Barley yellow dwarf was mentioned as increasing in importance by nearly every state. Most states have not yet devoted much time to research on this problem. Because of the mild winters in the South, aphids are usually present over a period of many months. Just why the disease has not been of greater importance in the South is not known. In a number of instances in Texas where yellow dwarf was prevalent in nurseries it has appeared to the writer that many of our Fulghum and Red Rustproof derivatives may have considerable tolerance. However, one cooperator expressed the opinion that the Red Rustproof strains were very susceptible.

One cooperator expressed the opinion that control of diseases may have been given too much priority in the breeding programs of the South. It was suggested that we should give increased attention to yield potentials, especially with reference to improved agronomic types with greater straw strength, grain quality and other characters to make the crop more useful and competitive.

Forage Uses of Oats

Oats have been used as winter pasture in the Southern States for many years. A continued trend toward this utilization of the crop is evident in the fact that since 1955 only half the acreage seeded was harvested for 1965 only 1,166,000 acres out of 4,166,000 seeded acres were harvested. Many hazards also contribute to these differences but much of it is due to grazing to muturity, use for green-chop, silage, haylage or hay etc.

A few states use oats principally as a grain crop. Virginia, Kentucky and North Carolina mentioned this fact but most states graze, at least to some extent, the fall-sown oats. Florida estimates that 76% of the acreage is sown exclusively for pasture, Oklahoma 55% and Texas 35%. Interest in the South in oats as a crop now greatly depends upon the returns from grazing. After severe winterkilling occurred throughout the South in 1962 and 1963, interest in oats declined and growers tended to use wheat, rye or to abandon seeding of small grains for pasture. Rusts and other diseases also greatly influence sale of seed for oat pasture.

It is the opinion of the writer and many others that too little attention has been given to management practices which might serve to increase the value of oats for forage and to methods of selecting lines superior in forage production. Most emphasis in breeding programs is on grain production. We know very little about how to select for forage values such as total, seasonal, sustained production, recovery, survival, quality etc. Tests at our McGregor, Texas station show that stocking rate, one phase of management, is more important than variety or growth habit in producing maximum animal gain/acre from oat pasture. Fertilizers applied to oats will double and triple forage production even with natural rainfall. Where irrigation is possible, even greater responses may be found.

Improvement of Plant Characteristics

The oat crop is probably the least well adapted to modern mechanization of any cereal. The straw not only is weak but "papery" in texture so that it often collapses in a few days after the crop ripens. Lodging was cited as a major problem by every state and a few mentioned shattering in the same sentence. Some progress has been made in varieties such as LeConte, Blount, Houston, Suregrain, Moregrain and Ora, but much further improvement is needed.

Grain quality has been neglected in many programs. Again, the Coker Company has set an enviable pace in their varieties Suregrain, Moregrain, Victorgrain and Fulgrain. However, we know little about possible differences in varieties for protein content, protein components, oil content, hull percentage etc.

Components of yield offer a possibility of improving the crop and making it more useful. Why does one variety yield more than another? What are the yield limitations and potentials? What about the roots of the plant-extent, rate of establishment, relationships to forage or grain production, effect of diseases on root growth, etc.? What type of leaves are most efficient - what about width, length, position, total area, efficiency of leaf area, effect on grain and forage production, etc.? All these factors are of interest and of potential value. None of these factors has been studied in oats. An example from rice can be cited: The rice people have found important differences and limitations of leaf characters on yield. A wide leaf variety, for example, may develop such a canopy of shade that only the top leaves "work" efficiently and the lower leaves are shaded so they have little photosynthetic activity.

Work in Progress

Oat research activity has declined considerably in recent years. It is a well known fact that a number of States have reduced oat programs to very limiting testing programs. Among Southern States, this is true in Alabama, South Carolina (exclusive of Coker Seed Company) and Louisiana. Limited programs with emphasis largely on one hazard or field of interest are characteristic of Tennessee, Kentucky, Georgia, Oklahoma and Virginia. Other states have one or more research people assigned to oat research but usually with other responsibilities as well. A brief summary of work in progress and needs as expressed by cooperators is listed below.

Alabama: Performance testing only: Needs include greater hardiness and forage improvement.

Arkansas: General program in progress; emphasis is on greater hardiness, better straw stability, yield and disease resistance.

Florida: General program in progress; two locations; emphasis on forage improvement, management, survival and recovery from low temperature, disease resistance.

Georgia: General program, 2 locations plus species work on new sources of rust resistance at Tifton. Needs include aphid control work, emphasis on forage improvement, cold tolerance.

Kentucky: Limited program, emphasis on hardiness studies.

Mississippi: Disease control, cold tolerance, BYD of increasing importance.

North Carolina: Limited general program, plan to spend more time on lodging resistance, grain

North Carolina: (continued) quality, yield components and potentials.

Oklahoma: Reducing program, need better straw and shatter resistance, forage and grain improvement, hardiness.

South Carolina: Limited cereal program, emphasis on oats.

Tennessee: Performance trials, need BYD resistance, hardiness and forage evaluation, better straw and grain quality.

Texas: General program; need hardiness, disease resistance, straw strength, better forage type, grain quality.

Commercial companies: No attempt is made to enumerate the commercial companies who have contributed to oat improvement during the past 100 years. Coker Pedigreed Seed Company has had an extensive program for many years and have contributed a number of varieties grown extensively (See Table 5). Others could be listed.

Both the State and Federal agencies probably face a reduction in funds and personnel to devote to oat research if the present reduction in acreage of oats continues in the future. Suggestions were that a more efficient division of the work load may be possible. The wide adaptation of Red Rustproof in the past and of such varieties as Victorgrain, Suregrain, Moregrain and others demonstrate that varieties can be developed for relatively large areas and with characteristics making them suitable for several purposes. If the trend of U. S. efforts to feed the World continues, then oats is a major food grain and we cannot let them be forced out of production by other grains. Furthermore, oats provide a succulent, nutritious, and palatable winter forage which no other small grain can equal at a season when permanent or temporary grasses and forages of other types are largely dormant.

USDA Contributions To The Research Program

The U. S. Department of Agriculture can best serve as regional coordinator of rather limited yield or performance trials, disease nurseries and hardiness tests. Because of more limited facilities at the several state stations, it may be desirable to reduce regional trials back to a single southern nursery and insist that cooperating states contribute only strains that give evidence of real advances in certain characteristics and wide adaptation.

Furthermore, the USDA should continue to search for superior germ plasm in World and Domestic sources; maintain germ plasm seed supplies for breeders; keep abreast of new races or biotypes of threatening diseases or insects, and transfer this superior germ plasm to selected, widely adapted varieties. Crosses transferring this germ plasm could be released to cooperating states after the first or second generation or the germ plasm itself may be made available to the states.

OAT PRODUCTION BY STATES--1966

Top 10 states, respectively, in total production, acreages planted, and acreages harvested, with yields per acre*
(Ranked by total production)

	Total production (1000 bu.)	Acreage planted (1000 acres)	Acreage harvested (1000 acres)	Yield per acre (bu.)
Minnesota	138,291	3,206(1)	2,974(1)	46.5
Iowa	101,707	2,641(3)	1,919(4)	53.0
Wisconsin	101,230	2,020(5)	1,910(5)	53.0
North Dakota	80,196	2,146(4)	1,956(3)	41.0
South Dakota	75,504	2,642(2)	2,288(2)	33.0
Illinois	54,420	1,203(7)	907(6)	60.0
Ohio	32,742	707(9)	642(7)	51.0
Michigan	24,772	612(10)	563(10)	44.0
Nebraska	23,680	721(8)	592(9)	40.0
New York	23,550	(527)	(471)	50.0
Texas	(17,640)	1,634(6)	630(8)	28.0

*Data from U.S.D.A. "Crop Production--1966 Annual Summary".

OBSERVATIONS ON RELATIVE RATES OF PROGRESS IN CEREAL BREEDING

By N. F. Jensen

A breeder working with several cereal crops is in a favorable position to assess relative rates of progress in variety development. One feeling or observation I have is that it is more difficult to raise the productivity of oats than of either winter wheat or barley and the visible potential for exploitation to higher productivity levels is much greater in these two crops than in oats. In our wheat and barley projects at Cornell we have experimental lines significantly more productive than our newest releases. These lines are not rare but rather numerous and come from several and varied genetic backgrounds. Furthermore, we are able to see with wheat and barley many variables involved in interactions within the environment that show promise of higher productivity through alteration, for example, plot spacing, fertilizer adjustments and so forth. This is not so evident with oats.

If we look at wheat in New York we see, for example, that the 1966 state average was 42 bushels per acre while it was only 50 for oats which has 25% hull and a 32 pound bushel. It took about 14 years to develop a variety, Orbit, clearly superior to Garry and the margin of superiority considering yield alone is on the average only about 3 bushels per acre or 4 percent. We have nothing in sight better than Orbit. But in wheat our newest variety, Yorkstar, is about 4-5 bushels or 10 percent better over-all than Avon or Genesee and yet we readily see superior lines in the breeding program. In winter barley tests, too, dozens of our new selections out-perform Hudson.

It could be, of course, that we are in a "doldrum" period with oats and hopefully approaching a new breakthrough. I could see the oat yield ceiling lifting if we were able to develop winter hardiness sufficient for areas this far north but this will not come soon. Somehow we must develop for our spring oat fields a different type of oat plant, one that responds in a different manner. Otherwise I am pessimistic about the rate of growth in productivity from present research lines. Orbit was worth 14 years effort but I don't think the conventional system has many dramatic surprises for us in the next 14 years.

Lacking the knowledge of exactly what we need for the future we are gambling, nevertheless, on what amounts to a major move in our breeding program with virtual abandonment of much of the present breeding material in the early generation pipelines. The central objective involves concentration on breeding towards conversion to the "super stiffies and shorties", such as our Egdolon series, and running a dual program of combining these with (1) prolific or bushy types and (2) upright leaved types. Initial crosses in this program have been facilitated by the availability of a first environmental growth chamber as of May, 1966. Routine variability in parental characteristics in the new crosses will provide a range of segregants overlapping previous objective types. In this sense there is small risk involved and it may be that the principal significance of our move lies in the firm decision to abandon many existing hybrid populations and rapidly substitute the newer developing hybrid populations.

Other promising research approaches to raise productivity would seem to be in the area of exploiting the characteristics of small-seeded oats. Oats such as Goodfield and Tyler produce dramatically higher kernel numbers per acre than other types. Apparently seed size is partly compensated for by numbers, however, if the relationship is not absolute seed size might be increased without loss of numbers. In this connection the Scottish tight sorghum-like panicle with its exceptional numbers of flowers becomes of interest. Small kernels on cluster-head panicles set on top of Egdolon straw would make an attractive plant type. Have the possibilities of improved naked oats been thoroughly explored? Some years ago Paul Rothman published an interesting account of extreme vigor arising from a Marvellous x Black Mesdag cross. The prospect of higher yields from higher plant populations able to more efficiently use light (e.g., through better leaf size and placement) has not been sufficiently researched. The effect of variety on plant populations can be extreme: for example, I think it possible that a farmer could plant fields of Orbit and Goodfield or Tyler at the same drill setting and have almost twice as many plants of the latter varieties. In cases like these our research and farm drills are introducing a significant variable into variety development and testing for I know no way of equalizing planting rates when dealing with large numbers of strains in a pressure program. An interesting aspect of this is that the same testing program can produce both large and small seeded types with high productivity and yet the biological systems that produce these equivalently high total yields must be vastly different. Higher populations per acre suggest that the spacing between rows must also be looked into.

I do not have a pat answer to the problem of the slow increase in oat productivity but the situation suggests that we explore different approaches. In wheat, for example, the single move to semi-dwarf lodging resistant types has dramatically opened up opportunities for higher yield and in the process destroyed some long-held beliefs, e.g., that productivity and height were positively correlated. An important happening with wheat was that as the height type was changed there occurred unexpected other type changes, notably higher tillering. Something similar could happen in oats.

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III. CONTRIBUTIONS FROM OTHER COUNTRIES

AUSTRALIA

<u>Winter grazing oats in New South Wales</u>....by P. M. Guerin (Richmond)

The latest trend is towards high seeding (160 lb. per acre) rates and heavy nitrogen applications with irrigation, as well as lighter nitrogen applications under dryland conditions. As all Australian varieties to date have been developed under dryland farming, a considerable amount of testing work will be required of the breeding material, and of seeding rates, to determine the best combinations for high grazing productivity over the period from May to November.

Under dryland conditions over a wide range of conditions, from the cool temperate climate at Glen Innes to the warm temperate climate of the Northern Coastal Plain (this is not a coastal climate as it is on the eastern side of a continent), Klein 69B oats and possibly Berger - both introductions from Argentine - are the highest producers of long season grazing. The new variety Mugga is a more specialized type for the cool temperate Northern Tablelands region but could become important under irrigation provided the crop is frequently grazed. Frequent grazing in these areas appears to control the development of crown rust and although Klein 69B and Berger are both crown rust resistant, their high productivity is probably in no way associated with this resistance, as they have been just as successful in cold winters at Glen Innes, where crown rust is never present in grazing trials.

New material with genes from Garry, in other words, winter line x spring line crosses, has in recent years outyielded Klein 69B over a number of trials all over the northern half of the state. Frost resistance of these new lines in some cases exceeds that of Klein 69B and, and as in the case of Mugga oats, this can only be explained by transgressive segregation.

Further information about Mugga and Bundy, two new releases, may be found under "New Oat Varieties".

Varietal differences in Septoria infection recorded under field conditions in Western Australia....by J. L. McMullan, Plant Breeder, Western Australian Department of Agriculture

A high level of infection with Septoria avenae in susceptible oat varieties was experienced at the Wongan Hills Research Station in 1966. The development of the fungus was extensive on the leaves and stems of susceptible varieties with straw break just above the second node below the panicle being quite frequent.

The opportunity was taken to assess a small collection of 36 varieties for their field reaction to this organism.

The following varieties were observed to have extremely little or no development of Septoria:

LARRAIN
SAIA
TRISPERNIA

The following varieties were observed to have only a slight development of Septoria:

BONDVIC
JOSTRAIN
NEWTON
MILFORD
SANTA FE
VICTORIA
VICTORY

CANADA

Contribution from Canada Department of Agriculture Research Station, Winnipeg, Manitoba....by J. W. Martens, G. Fleischmann and R. I. H. McKenzie

The oat crop in the Prairie Provinces of Western Canada was excellent in 1966. Yields of about 48 bushels per acre resulted in a crop of 253 million bushels produced on 5,340,000 acres. Problems were few with rust and drought having little influence on yields. Lodging of heavy stands did occur and this points out the need for better straw strength in our oat varieties.

High yields in experimental plots were obtained at many locations in Western Canada during 1966. The highest yields noted were for the stiff strawed Dutch variety Pendek which yielded 176 and 155 bushels per acre at Kelvington and Melfort in North-eastern Saskatchewan. This variety showed no indication of lodging at these yield levels according to H. R. Ballantyne, the oat Breeder at the Melfort Experimental Farm.

In 1966 two new oat varieties were licensed. Sioux (RL 2796) and Kelsey (I.H. 5880-3-3-1) are both fully described elsewhere in the newsletter.

A fantastic increase of seed of Kelsey was obtained during the past two years. In 1965 less than a bushel of seed planted at the Research Station, Morden, Manitoba produced 53 bushels of cleaned seed. This seed was then turned over to A. B. Masson at the Research Station, Regina, Saskatchewan. He sent 29 bushels to R. Platte a seed grower at Nipawin, Sask. who planted it on 74 acres (13 lbs per acre) and obtained 6700 bushels of clean seed. The remaining 24 bushels of Kelsey was sown on 93 acres (9 lbs per acre) at the Experimental Farm, Indian Head, Sask. Only 79 acres could be harvested and 5025 bushels of uncleaned grain were obtained. This amounted to a 230 fold increase at Nipawin and a 246 fold increase at Indian Head. A total of over 11,000 bushels of seed was obtained from less than 1 bushel in 2 years.

Stem rust of oats did not cause any significant crop losses in Western Canada in 1966. Stem rust was first found July 28th and its subsequent development was relatively slow. However, in Manitoba and adjacent areas in Saskatchewan some losses occurred in a few late fields that had moderately severe infections by the end of August. Race C10 (6AF) of stem rust, a race that can attack all commercial oat varieties grown in Canada, has become the predominant race (80% of all isolates) in Western Canada in 1966. Most of the remaining isolates from this area were identified as C3 (7A) or C5 (6F). In Ontario and Quebec race C9 (6A) predominated (66% of all isolates) and most of the remaining collections were races C6 (8A-10A) or C8 (4A). Unlike Western Canada, the race frequency pattern in Eastern Canada has changed relatively little since 1958 when race C9 and closely related races first became predominant. Race C20 (6AFH), a widely virulent race that can attack varieties carrying any of the six identified resistance genes was found for the first time in Canada in 1966. This race which was found once in each of Saskatchewan, Manitoba and Ontario can attack one of the advanced breeding lines resistant to race C10. If the present race distribution continues, and there are good reasons to believe that it will, Canada will have no effective stem rust resistance in the field for some time to come.

The trend towards crown rust virulence on the oat varieties Landhafer and Santa Fe appears to have been reversed in 1966. Less than one-quarter of the crown rust isolates identified from Western Canada attacked these two differentials this year, whereas over half the cultures from the west were virulent on Landhafer and Santa Fe in 1964 and 1965. In previous years a few crown rust biotypes comprised the bulk of isolates identified from the west, but no race isolated in the west this year constituted as much as ten percent of the total population. Both these phenomena may result from the crown rust population developing in the absence of selection pressure from host varieties with effective resistance.

Crown rust intensity in southern Manitoba was lighter in 1966 than in any year since 1961, and it did not exceed 25 percent at the end of the growing season. Consequently yield losses were negligible except in late sown fields of the Red River Valley of Manitoba where slight to moderate losses resulted.

<u>Chemotherapy of oat stem and leaf rusts with oxathiin systemic fungicides</u>....by L. V. Edgington and E. Reinbergs, Ontario Agricultural College, Guelph, Ontario

The compounds D735 (2,3-dihydro-5-carbox-anilido-6-methyl-1,4-oxathiin) and F461 (2,3-dihydro-5-carboxanilido-6-methyl-1,4-oxathiin-4,4-dioxide) were tested as chemotherapeutants for oat rust diseases caused by <u>Puccinia graminus triticii</u> and <u>Puccinia coronata</u>. Russell oats was treated with 0, 1, 2, 4 and 8 lbs. of 75% F461 per 100 lbs. of seed and inoculated with rust spores at 30 and 45 days after planting. Oat leaf rust was controlled by the 2-lb-rate at 30 days but required the 4-lb-rate for control at 45 days. Oat stem rust was partially controlled by 2 lbs and effectively controlled by the 4 and 8-lb-rates when inoculated at 30 days after planting. No significant control was obtained when inoculations were made 45 days after planting. Five percent granular formulations of F461 and D735 were incorporated into soil at rates of 0, 1, 3, 5, 7.5, and 10 lbs of active chemical per acre. Three lb per acre of F461 gave effective control of oat leaf rust while five lb per acre were required to control stem rust. D735 was not therapeutic for either stem or leaf rust. No phytotoxicity developed in any of the treatments. While D735 is 3-4 times as toxic as F461 to urediospores, only the latter compound is effective as a therapeutant for rusts when soil or seed treatments are employed.

<u>Ottawa Research Station</u>....by F. J. Zillinsky

A month of hot dry weather during late June and early July reduced crop yield prospects somewhat but farm yields were near normal for eastern Ontario. Diseases were not serious although stem rust and Septoria developed to some extent late in the season.

Serious damage to replicated tests of oats and barley resulted from an application of 2½ oz. of Banvel D and 6 oz. of MCP in 16 gallons of water per acre at Ottawa. Oats were more seriously affected than barley and wheat although damage was observed among these crops as well. A marked differential affect of the herbicides was observed among varieties. The broader leafed, vigorous varieties were generally more seriously damaged. The major affects of the herbicide application was distortion of stems and lodging early in the season, reduction in plant height, sterility, and poor root development. Seed harvested had reduced germination rate. Extensive diversity in reaction to diseases has been observed among the oat species <u>A. sterilis</u> and <u>A. barbata</u> collected in the Mediterranean Region. It appears that collections from Sicily and Italy are more likely to contain strains with resistance to crown and stem rust than the drier areas of North Africa. The most fruitful source of resistance to crown rust appears to be found among collections from Israel.

NEW ZEALAND

Contribution from G. M. Wright,
Crop Research Division, Christchurch

A new milling oat, Mapua, has been released (description under "New Varieties").

Crown rust has been found in one North Island area on the resistant variety Onward 63 (see 1963 Newsletter). Onward 63 has resistance from the original Garry variety, but neither Garry nor Victoria was infected in this area. There was little rust in the South Island last season: a very light infection developed at the Crop Research Division during the ripening period, and a sample from late tillers of another previously resistant hybrid line was increased and used for a glasshouse test in the following spring.

This showed seedling susceptibility in the hybrid, and in its resistant parent Victoria x Richland x 2 Algerian, and also in Onward 63, a Victoria x ^{4}Onward selection, and a third previously resistant derivative of Onward. Victoria and the original Garry gave a resistant reaction.

In the present season there is little rust, and none has been reported on Onward 63 or the other resistant hybrid.

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IV. CONTRIBUTIONS FROM THE UNITED STATES: USDA AND STATES

ARIZONA

Mesa oats is competitive in forage production and quality1/...
by R. K. Thompson, A. D. Day and W. F. McCaughey2/

"Mesa", a new combination forage and grain oat variety, has been developed and released for use in the irrigated areas of Arizona.3/

1/ Contribution from the Arizona Agricultural Experiment Station, The University of Arizona, Tucson, Arizona.

2/ Research Associate in Agronomy, Agronomist, and Agricultural Biochemist, Arizona Agricultural Experiment Station, The University of Arizona, Tucson, Arizona.

3/ Thompson, R. K. 1966. Mesa, new oat for southern Arizona. Progressive Agriculture in Arizona 18:(3)6-7.

An experiment was conducted at Mesa, Arizona in 1965 to study the simulated pasture production of Mesa and Markton oats as a source of protein and D. L. N. (Digestible Laboratory Nutrients). The experimental design was a 4 x 4 Latin Square. D. L. N. is a laboratory estimate of T. D. N. (Total Digestible Nutrients). The oats were planted in October and the pasture forage was harvested at the jointing stage of growth. Seven harvests were made throughout the winter pasture season (December, 1964 through April, 1965), and were recorded for each harvest. A total yield of 12 to 14 tons per acre of forage was obtained from oats throughout the pasture season. At harvest, the forage was analyzed for total protein and D. L. N. (Table 7). The total protein and D. L. N. production of Mesa oats exceeded those of the forage variety Markton, when grown for pasture forage.

A study was made at Mesa, Arizona for three years (1964, 1965, and 1966) to observe the production of oat hay as a source of protein and D. L. N. The oats were planted in late October in a Randomized Block Experiment with four replications, and the hay was harvested at the heading-stage of plant growth in March of the following year. At harvest, oven-dry hay yields were recorded and the forage was analyzed for total protein and D. L. N. (Table 8). Oats produced from 4 to 6 tons per acre of oven-dry hay. When grown for hay, Mesa oats produced essentially the same amounts of total protein and D. L. N. as the forage variety Markton.

Table 7. Total protein and D. L. N. (Digestible Laboratory Nutrients) percentages and production of pasture forage from Mesa and Markton Oats grown at Mesa, Arizona in 1965.

	Total protein		D. L. N.	
Entry	%	Pounds/acre	%	Pounds/acre
Mesa	17	966	59	3274
Markton	18	885	61	2916

Table 8. Average total protein and D. L. N. (Digestible Laboratory Nutrients) percentages and production of hay from Mesa, and Markton Oats grown at Mesa, Arizona in 1964, 1965, and 1966.

	Total protein		D. L. N.	
Entry	%	Pounds/acre	%	Pounds/acre
Mesa	6	610	52	5620
Markton	5	560	49	5800

ARKANSAS

by J. P. Jones (Fayetteville)

One hundred and twelve thousand acres of oats were planted during the 1965-66 season with 72,000 acres harvested with a 50 bushel per acre average. The most widely planted varieties were Moregrain and Ora.

Nora (CI 8163), a sister line of Ora was released in April 1966. This variety is more cold tolerant than Ora and Arkwin and was developed for use in the northern upland area of Arkansas.

The small grains breeding program suffered a severe loss due to the untimely death of Dr. R. L. Thurman in June 1966. Dr. Thurman's position has been filled by Dr. R. L. Smith, a recent Iowa State University graduate.

CALIFORNIA

by C. A. Suneson (Dovis)

With the release of "Rapida" in 1966-67, California will have a quicker cereal crop--15 days earlier than any oat in the World Collection. This unique oat has two A. fatua selections and "Palestine" as parents. Registration is pending.

FLORIDA

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

Oat acreage was down slightly for the 1965-66 crop as compared to 1964-65, but yield was up by 2 bushels with an average yield of 40 bushels per acre reported by the Crop Reporting Service. Acreage seeded in the fall of 1966 should be up considerably, however, because of favorable conditions for early seeding for grazing. Approximately 80% of the oat acreage is seeded with the intention of grazing it out completely or turning it under for green manure.

Disease problems during the 1965-66 crop season were less severe than normal probably due to rather low winter temperatures and low rainfall late in the season. Crown rust was building up in early December but was checked by low January temperatures and did little damage in either nursery or commercial plantings. Helminthosporium avenae, however, caused considerable leaf spotting during the winter and spring months. Soil-borne mosaic virus destroyed much of the oat nursery at Quincy but has not been identified as a severe problem in commercial fields.

No crown rust was found on Florida 500 in 1965 and the variety is rather resistant to soil-borne virus under Florida conditions. Helmonthospirium avenae did cause considerable spotting of leaves in some fields. A reselection from Florida 500 with greater uniformity of maturity, higher test weight, and higher yield of grain and forage than the original variety was selected for preliminary increase in the fall of 1966. Final consideration for release will be made during 1967.

Conditions have been very favorable for good growth of small grain up to mid-January, 1967, and grazing has been plentiful. Crown rust has been present since early December and could soon build up to epidemic proportions on susceptible material if not checked by cool weather.

GEORGIA

by Darrell D. Morey (Tifton)

Weather conditions have been favorable for small grains in South Georgia since planting time. Aphids caused considerable damage to early planted oats, but they are now making good growth. Some small areas of BYDV are evident in oat fields in South Georgia. Crown rust was found on volunteer oats at Tifton in late November, 1966. If weather conditions continue favorably small grain diseases could cause severe losses to susceptible varieties.

We will continue to breed for crown rust resistance in oats using Avena sterilis selections from Israel as resistant parents. Backcross and early generation plants appear promising for resistance to crown rust.

Dr. R. H. Littrell has joined the Plant Pathology staff at the Coastal Plain Experiment Station, Tifton, Georgia. He will devote full time to small grain diseases in the Coastal Plain area.

IDAHO

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

Freezing temperatures occurred frequently up until panicle emergence in much of southern Idaho in 1966. Yields were probably reduced by this, but floret sterility was not as frequently encountered in oats as in wheat and barley. No diseases were reported and the usual late natural incidence of race 8 of stem rust was absent.

Breeding for yield, straw strength and grain quality is being continued at the Aberdeen Branch Experiment Station. A breeding program to improve protein content has been initiated. Protein analysis of the progeny of several crosses is in progress. Protein quality evaluation is planned for 20 varieties of diverse origin.

Many selections in the testing program are much superior to currently recommended varieties in kernel weight. Some lines with superior kernel weight also have a satisfactory test weight and progress is being made to increase the yield levels of high kernel weight types.

Cayuse has performed well under both dryland and irrigated conditions, and Idaho is joining Washington in release of this short-strawed, high yielding variety. A full description is given elsewhere in the Newsletter. AuSable continues to have the highest test weight in the variety trials while Orbit is one of the few varieties with high kernel weight combined with excellent yield potential.

Bingham (C.I. 7588) released to certified growers in 1966 will be available to commercial growers in substantial quantities in 1967. The impact of breeding for resistance to lodging is evident in commercial fields as well as in experimental plots in the highly fertile irrigated Snake River plain. Only a few old check varieties in yield tests lodge readily and mechanical harvest of lodged oats in test plots is no longer a major problem.

ILLINOIS

by C. M. Brown, H. Jedlinski, W. O. Scott,
D. W. Graffis and M. C. Shurtleff (Urbana)

For most Illinois oat growers, 1966 was a good year. There was a severe outbreak of barley yellow-dwarf in central and southern Illinois that caused reductions in yields in those areas. However, most of the Illinois oat acreage is in northern Illinois where little damage was reported. The latter part of the season was very dry and very hot but most of the oat varieties were sufficiently far along so that the damage was not severe. The Illinois Cooperative Crops Reporting Service reports that 1966 state average oat yield was 60 bushels per acre, which is the highest yield on record for Illinois. The Illinois oat acreage was reported at 937,000 acres which represents a slight increase over the 1965 crop.

Newton continued to be the most common oat variety planted in Illinois for the seventh consecutive year, but its percent of the total acreage has shown a decline in recent years. Newton comprised 29 percent of the acreage in 1966. Garland, in second place, showed a sharp increase over the previous year and comprised 21 percent of the acreage. Goodfield ranked third with 8 percent and Clintland fourth with 6 percent. The percentage acreage of several varieties in Illinois in recent years is as follows:

	Percent of Total Acreage Planted					
Variety	1961	1962	1963	1964	1965	1966
Brave	-	-	-	-	-	3
Clintland	18	12	10	7	7	6
Clintland 60	2	6	6	8	6	4
Clintland 64	-	-	-	-	1	2
Garland	-	-	-	3	13	21
Goodfield	4	10	9	12	8	8
Minhafer	9	5	5	3	2	1
Nemaha	10	11	10	8	6	5
Newton	42	41	42	39	37	29
Putnam 61	-	-	-	2	2	1
Shield	1	2	2	3	2	2
Others	13	13	16	15	16	18

The Disease Situation

Severe outbreaks of barley yellow-dwarf virus disease were observed in oats, wheat and barley. The visual observations were supported by a number of virus recoveries from the above named hosts and grasses. Although the outbreaks were primarily limited to central and southern parts of the state, they were the worst since 1959. The new variety Jaycee showed a high degree of tolerance to the strains of BYD that occurred in Illinois. Other diseases didn't present any serious problem with the exception of smut. Since farmers and seedsmen in Illinois are treating less oat seed now than in the past, new races of smut are building up very rapidly. It was not an unusual occurrence to see large fields, up to 50 acres, with 30-50% of oat plants infected with smut.

INDIANA

by F. L. Patterson, J. F. Schafer, R. M. Caldwell, L. E. Compton, J. J. Roberts, Henry Shands, B. C. Clifford and M. J. Bitzer (Breeding, Pathology and Genetics, R. K. Stivers and O. W. Luetkemeier (Varietal Testing), M. L. Swearingin and W. D. Reiss (Extension (Lafayette)

The 1966 Season

The crop was seeded early (late March and early April) and did well in April and May but was hurt by the very dry June. Test weights were low for many varieties. A moderate epidemic of BYD virus occurred in field plots at Lafayette. Nursery plots were protected from the aphid vectors by a dimethoate spray. Lodging from stem breakage before ripening was severe on many varieties in 1966. The average state yield was estimated at 52 bu/A (the same as in 1965) on 360,000 acres (vs 336,000 in 1965). Little crown rust and stem rust developed. Losses from diseases were generally low, except where yellow dwarf developed.

Oat varieties

The recommended varieties and the certified seed acreages for each are given in the following table. Newer varieties made up most of the certified acreage. Clintford and Tyler were in the first year of certification.

Variety	First season of commercial production	Certified seed acres in Indiana
Newton	1957	97
Goodfield (Wis.)	1960	37
Putnam 61	1962	88
Garland (Wis.)	1964	15
Clintland 64	1965	1081
Tippecanoe	1966	1383
Clintford	1967	892
Tyler	1967	600
Norline (Winter)	1961	84
Total		4277

The new varieties Tyler and Clintford were described in Research Progress Reports (see Compton et al. and Schafer et al. in publications). The 1966 recommendation and performance records in oats were published by Stivers et al. as Research Bulletin 827.

New releases

Jaycee, C.I. 7991, developed in Illinois, is being distributed to seed growers in Indiana in February 1967. About 2000 bushels are available for distribution. Its performance was outstanding in field plots at Lafayette under a moderate epidemic of BYD.

Diana, see New Varieties Section.

Research

The research on mature plant resistance of oats to crown rust was summarized in a paper presented at the Indiana Academy of Sciences by B. C. Clifford and J. F. Schafer (see publications). Resistance was related to the age of leaf at the time of infection, older leaves being more resistant. Resistance developed earlier at low average post-inoculation temperatures. Low night temperatures are believed important in conditioning resistance in the field.

Further research on the effects of temperature on the expression of mature plant tissue resistance of oats to crown rust was summarized by B. C. Clifford and J. F. Schafer in a paper presented at the annual meetings of the American Phytopathological Society (see publications). Resistance of La-Industria (C.I. 4508), Purdue 6035A1-4-3 (Johnson derivative), and Purdue 5993B2-1-1-1 (C.I. 4795 derivative) to race 294 were related to age of tissue. The age at which a tissue developed resistance was modified by temperature. Resistance was higher in the field than in the greenhouse. Night temperatures were lower in the field and may be important in conditioning mature tissue resistance.

Research on the genetics of resistance to stem rust in the complex A-D-F region was summarized by F. L. Patterson and S. K. Gilbert (see publications). With genes A, D and F closely linked or pseudo-alleles, genetic tests to prove identity of resistance were based on susceptible plants. With a low occurrence of susceptibles one cannot rule out cytological irregularities as the cause of the origin of susceptibles with this approach.

IOWA

by K. J. Frey and Staff (Ames)

Multiline varieties

For several years we have been developing lines of oats that are isogenic for crown rust reaction for use in multiline oat varieties. A sizeable number of these were tested (as individual lines) for agronomic performance and rust reaction in 1966. Grain production of each line is either equal to or better than its respective recurrent parent. We have characterized the reaction of each line to 6 current races of crown rust and additional races will be used in a 1967 test.

Two multiline varieties (tentatively designated Multiline E68 and Multiline M68) have been formulated and constructed. Multiline E68 with 10 isogenic lines and Multiline M68 with 8 are entered in the Early and Midseason Uniform Oat Nurseries in 1967. Release decision on the multiline varieties has not been made, but a small quantity of foundation seed is being produced in 1967. The recurrent parent varieties for Multiline E68 and Multiline M68 are C.I. 7970 and C.I. 7555, both of which have been tested in one or more of the Uniform Oat Nurseries.

Oat diseases in Iowa

Combined losses from all oat diseases in Iowa in 1966 were estimated at 7.5%. Actual yield was estimated at 53 bu/A. The estimated potential yield without disease was thus only 4 bu/A greater than the actual yield. This made the seventh consecutive year that oat diseases have been relatively unimportant in the state.

Blue dwarf and crown rust are the only two diseases that warrant special mention. Blue dwarf was more prevalent in 1966 than it has been since 1957. Plants with the easily identifiable acute stage of blue dwarf were counted in drilled fields where they ranged as high as 13% in number. But because adjacent plants compensate in part for blue dwarf plants, we did not feel justified in estimating total losses from blue dwarf at higher than about 2%. One suspects, however, that if the plants that had been infected at a later stage of growth could have been identified, and their yields taken, state-wide losses from blue dwarf might have been estimated higher.

Crown rust was widespread in Central and Eastern Iowa but did not become heavy until the plants approached maturity. Consequently, only trace reductions in yield were estimated from this disease. The last severe crown rust epiphytotic in Iowa was in 1957, when it caused yield reductions estimated at 12%. In that year 5,235,000 A of oats were harvested for grain; in 1966, 1,919,000 A. Probably the more spacious arrangement of fields making up 1.9 million acres resulted in less damage from the air-borne rust pathogens than did that of the 5.2 million acres in 1957, other things being equal. It is quite conceivable that had the acreage in 1966 equaled that in 1957 in size and arrangement, crown rust might have intensified enough more rapidly to at least have equaled the 1957 yield reduction. Doubtless those farmers who continue to grow oats receive some benefit from the reduced acreage, and this is reflected in the increased yields per acre. The mean yield for the more or less average period 1949-58 was 37.5 bu/A; in 1957 it was 37 bu/A; in 1966, 53.

KANSAS

by E. G. Heyne and James R. Lofgren (Manhattan)

The oat acreage continues to decline. Kansas farmers are growing more soybeans in the eastern part of the state where oats are grown and are sowing wheat after soybeans in the fall. The 1966 oat production was the lowest since 1871; 6,020,000 bushels produced on 215,000 acres. There is some interest in winter oats but there is no variety that is hardy enough to be a certain crop for any part of the state. Thus the oats still being grown is nearly all of the spring type. The varieties recommended are Andrew, Mo. 0-205, Minhafer, Neal and Tonka spring varieties and Arkwin and Cimarron winter varieties.

The 1966 season for spring oats was another poor growing season, which further discouraged oat production. It was dry at seeding time and the drought continued through the season. Performance nurseries were abandoned because of BYDV, poor stands, tornado and drought. Inconclusive data were obtained from remaining tests. Neither rust developed soon enough to damage spring oats.

On the other hand the winter oat nurseries were the best ever grown in Kansas since winter oats nursery studies were started in 1950. There was only trace of killing at Parsons and Hutchinson and yields of over 80 bushels per acre occurred in the southeastern Kansas nursery at Parsons. Wintok oats survived the winter at Manhattan but was thinned to a 50% stand by a late spring freeze in March and again in April.

Breeding work is restricted to growing of several bulk hybrids of both spring and winter oats. No selections were made in 1966.

KANSAS

by Earl D. Hansing (Manhattan)

Oat seed treatment

Experiments conducted in 1966 demonstrated for the first time that Vitavax 75 (75% 2,3-dihydro-5-carboxanilido-6-methyl-1,4-oxathiin) would control oat smut. The average smutted panicles obtained for 2 dates of planting from seed that was not treated was 34%. Vitavax 75 at both 1.33 and 2.67 ounces per bushel gave complete control of smut. The 1, 4-oxathiin fungicide is systemic and translocated in the transpiration steam (xylem) to the site of the Pathogen.

Methyl and ethyl mercurial fungicides gave better control of smut than a phenyl mercury. The average for 6 methyl and ethyl mercurial fungicides at their recommended rates was 0.3% while that for 3.5% phenylmercuric ammonium acetate at 1 ounce per bushel was 5.5% smutted panicles.

MICHIGAN

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

This year marks the 4th consecutive season of drought stress for the spring sown small grains.

Yields range from very poor to excellent depending upon location. The drought stress was most severe in the upper part of the lower peninsula.

As the result of the drought, foliar diseases have not been important. Nevertheless, resistance to leaf and stem rust are an important part of the breeding program. The first yield tests were conducted on backcross material using Coachman and AuSable as recurrent parents. These lines have added resistance to race complexes 6, 7, 8 and 13 of stem rust and 292, 286 of leaf rust. The resistances were incorporated by using a sponge imprint method developed by Dr. Moore of the University of Minnesota. Each plant was inoculated with 6 races simultaneously. We felt the method worked very well.

MINNESOTA

by Roger Kleese, Olin Smith, M. D. Moore and Deon Stuthman (St. Paul)

Avena sterilis x *A. sativa* F_3s in a buckthorn plot

F_3 progenies from the crosses P.I. 267989 x Garland, P.I. 267989 x Lodi, and Wahl#2 x Garland were grown in the 1966 buckthorn plot where they were subjected to heavy inoculation with crown rust from the buckthorn and from rust spreader rows. The latter had been heavily inoculated with crown rust races 326, 264, 276, 290 and 293. There were approximately 1400 hills, each derived from a single unselected F_2 plant. The parents were characterized as follows:

Parent	Species	Type	Rust in '66 buckthorn plot
P.I. 267989	sterilis	Wild	HR-R
Wahl#2	"	"	MR-MS
Garland	sativa	Adapted commercial	S
Lodi	"	" "	MS-S

Although Garland and Lodi are susceptible in the buckthorn plot they are known to have some genes for resistance to certain races of crown rust.

Among the segregates in the 3 crosses resistance to crown rust ranged from near immunity to complete susceptibility. Segregation for rust resistance and botanical characters appeared to be random. It was surprising and gratifying to find quite good agronomic types that were also highly resistant. The P.I. 267989 x Garland populations had more agronomically desirable resistant plants than did either of the other 2 populations. The Wahl#2 x Garland had the fewest. Degrees of resistance were a little higher in the two P.I. 267989 crosses than in the Wahl#2 cross.

Seven lines relatively uniform in agronomic appearance and crown rust resistance, and several individual F_3 panicles were selected for crossing purposes and further field evaluation.

Oat varieties

The recommended varieties for 1967 planting are Garland, Lodi, Tippecanoe and Minhafer. There is no variety-acreage survey available for the past 3 crop seasons but it is evident that the first 3 varieties are predominant. Lodi is rapidly replacing the acreage previously occupied by Rodney and Garry. Certification records indicate that there is considerable interest in Orbit and some interest in Tyler, Clintford, and Brave. Minhafer is little grown but is kept on the recommended list because of a small degree of field resistance that it seems to have to crown and stem rust, including race 6AF of the latter.

Personnel items

Roger Kleese left the oat project October 15, but will remain at this station and work in biochemical genetics. Deon Stuthman replaces him as full-time oat breeder. Dr. B. J. Roberts left the Cooperative Rust Laboratory here to work with the Rockefeller Foundation on wheat rusts in Mexico.

MISSOURI

by J. M. Poehlman, George Berger, Anson Elliott
and Shu-Ten Tseng (Columbia)

Missouri oat acreage increased from 339,000 acres in 1965 to 410,000 acres in 1966 and the harvested yield of 40.0 bushels is the highest on record. Oats were favored by below normal mean temperatures in May and June and, while precipitation was also below normal, it was well distributed.

A heavy barley yellow dwarf virus infestation was present in the nursery at Columbia. Damage to the oats was the most severe since 1959 when a heavy epidemic was widespread in the Midwest. Yields in the nursery were closely related to observed damage by BYDV. A negative correlation of -0.76 was obtained between estimates of observed damage and harvested yields for 264 strains. Mo. 04935(C17805); Jaycee; Mo.-205; Mo. 04978, Nodaway selection; Andrew and Garry all showed considerable tolerance to BYDV. Clintland 64, Clintford, O'Brien, Tyler, Dawn, Holden, and Macon were susceptible. Varieties with tolerance in the 1959 epidemic were generally tolerant to the BYDV present in 1966. Many highly tolerant selections were observed from crosses between strains selected for resistance or tolerance in 1959. The results observed encourage the belief that there are many strains with a high degree of resistance or tolerance, and that continued selection of high yielding strains in years with mild epidemics will lead to progress in breeding for BYDV resistance.

The winter oat strains Mo. 04831 (C.I. 7495) from the cross Cimarron 4x Hajira x Joanette 3x Atlantic 2x Clinton^2 x State Fe and Mo. 04834 (C.I. 7490) from the cross, Nysel x Hairy Culberson, have been named Dade and Hickory, respectively, and released as parental varieties. Hardiness records of these strains in the winter hardiness nursery have been superior to all other strains tested in the U.S.D.A. Cooperative Uniform Winter Hardiness Nursery.

NEW YORK

by N. F. Jensen, G. C. Kent, W. Pardee, W. Rochow and J. N. Rutger (Ithaca)

Orbit

Orbit appears well on the way to becoming established as the dominant variety in New York. Information gathered from different sources showed it to be about 5 bushels or 8 percent more productive than Garry in 1966:

Kind and number of tests and source	Yield in bu. per acre Orbit	Garry	Advantage bu/acre
5 N.Y. tests - Rutger	53.2	52.7	0.5
8 N.Y. tests - Kingma	58.0	56.0	2.0
17 USDA tests - Murphy	75.7	68.0	7.7
9 Penn. tests - Pifer	58.2	54.0	4.2
39 tests total - weighted average	65.2	60.3	

Egdolon Series

The Egdolon (no-lodge) series, two selections of which were distributed to breeders in 1966 are serving as the foundation for a new series of hybrids in the project. These oats have shown unusually strong strong.

Disease Condition of Oat Seedstocks in New York State, 1965 and 1966 Crops....by W. F. Crosier and E. C. Waters (Cornell University, Geneva)

Samples of oat lots being processed for sale or submitted by farmers for their own plantings were examined in both the dry and germinating forms. As was reported in 1964 only the scab fungus, Fusarium roseum, seriously injured seedlings in the germinator. Several isolates when grown on culture media and incorporated into sterilized soil reduced stands by 13 to 32 percent.

As shown in Table 9, F. roseum was present in the cleaned seedstocks of every variety but Oneida. Seeds of this variety were infected by F. roseum in 1964. The highest percentages of infected seeds of any variety were 3.2 in 1964, 2.8 in 1965 and 0.9 in 1966.

A mercury treatment reduced scab infections. In 1965 only 2.3% of the treated samples yielded F. roseum in comparison to 6.1 of the untreated. Values for the 1966 samples were 4.4 and 12.1%.

Stains of the black stem fungus, Septoria avenae, were visible on seeds of every variety. At least 80% of the seeds of 2 samples of Oneida had been infected by this fungus.

Alternaria tenuis was, as usual, present in every untreated seed lot and occasionally in poorly treated lots. Another fungus of doubtful pathogenicity, Epicoccum purpurascens, was also limited to the lightly- and non-treated samples.

The pattern of treatment coloration varied from mostly dark red in a few lots to very light red in others. As indicated in Table 10, a few samples in both 1965 and 1966 exhibited mercury poisoning during germination. There was no correlation between average coloration and chemical injury. Very dark red seeds in any sample, however, often germinated abnormally.

Table 9. Signs or symptoms of fungal diseases of oats in seed being processed for planting

Name of variety	Percent of total samples	Percent of samples of each variety in each group: Treated samples with stated percent of Septoria-discolored seeds					Samples with Fusarium roseum	
		0-1	2-10	11-25	26-50	51+	Treated	Not treated
1965 Crop Seed								
Clintland	2	0	75	0	0	25	25	-
Garry	26	2	70	17	9	2	5	14
Niagara	12	9	51	19	9	12	4	15
Oneida	3	14	29	0	28	29	0	0
Orbit	20	21	33	18	21	7	0	21
Putnam	1	0	85	15	0	0	0	-
Rodney	5	0	84	6	10	0	0	40
Russell	12	28	58	3	5	6	5	11
Tioga	14	3	62	24	4	7	0	14
Others	5	19	59	0	22	0	0	11
1966 Crop Seed								
Clintland	3	25	50	25	0	0	0	0
Garry	22	14	57	7	11	11	4	17
Niagara	12	16	42	26	16	0	5	-
Oneida	1	0	0	25	50	25	0	-
Orbit	29	8	30	27	18	17	4	10
Rodney	4	0	65	35	0	0	0	0
Russell	17	10	21	31	22	16	11	14
Tioga	8	0	70	11	11	8	0	28
Others	4	0	65	13	22	0	0	0

Table 10. Influence of visible treatment pattern upon chemical injury and fungal growth

Color group	No. of samples at injury level (%) of: 0	0.5	1	2	3	4-6	No. of samples with: *A. tenuis*	*Fusarium*	*Epicoccum*
					1965 Crop Seed				
Dark red	4	0	0	0	0	0	0	0	0
Dark to light	22	5	0	1	0	0	2	2	0
Dark to none	27	3	1	0	0	1	0	0	0
Moderate	8	0	0	0	0	1	0	0	0
Mod. to light	18	2	1	3	0	0	0	0	0
Mod. to none	35	2	0	0	1	0	0	0	0
Light	18	1	0	0	0	0	3	2	1
Light to none	8	0	0	0	0	0	0	0	0
Non-red	9	0	0	0	0	0	0	0	0
Not treated	78	-	-	-	-	-	78	13	35
					1966 Crop Seed				
Dark red	3	2	1	1	0	0	0	0	0
Dark to light	23	11	1	1	2	0	0	2	0
Dark to none	11	2	3	0	0	1	3	2	0
Moderate	3	0	0	0	0	0	0	0	0
Mod. to light	7	1	0	3	0	0	0	0	0
Mod. to none	11	1	0	0	0	0	2	0	0
Light	3	1	0	1	0	0	0	0	0
Light to none	5	1	0	0	0	0	0	0	0
Non-red	8	0	1	0	0	0	3	1	1
Not treated	41	-	-	-	-	-	41	4	19

NORTH CAROLINA

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

Conditions in North Carolina were very favorable for small grain production. Oat acreage increased by over 8 percent; and the state average yield of 48 bushels per acre was 5 bushels per acre above the previous record.

Stiff Straw Nursery

Probably the prime objective in oat breeding at North Carolina is the development of stiff-strawed, nitrogen responsive lines which can be managed to produce in a yield and profit range which will be competitive with other feed grains.

A Uniform Stiff-strawed Nursery was proposed by Dr. Jensen in the 1957 Newsletter and was again suggested, by C. F. Murphy, in the 1965 Newsletter. While North Carolina does not represent an ideal location for such a nursery (particularly for spring oats), an informal stiff-strawed nursery is being established. Several breeding programs have been contacted and have made lines available for this nursery, and other lines have been chosen from the World Collection. This nursery will become a standard part of our program and in future years, we plan to routinely evaluate these lines for straw strength and nitrogen response, and to utilize this material for studies relating straw strength to tillering and seeding rates, root development, greenhouse lodging estimates, etc.

This nursery will have to be maintained at a workable size, but we hope to keep it current and are anxious to include any lines of unusual straw strength which any breeder may wish to submit. Proper credits will be given with any data which may be published and cooperators will, of course, receive copies of data obtained from the nursery.

It is hoped, however, that a formal cooperative nursery of this type can be established at some future time.

NORTH DAKOTA

by David C. Ebeltoft (Fargo)

Production

1966 proved to be another good year for the production of oats in North Dakota. Though weather, no doubt, was the most important factor we feel that better management is playing an important part also. It appears that farmers are more aware that oats can bring good returns, in eastern North Dakota at least, if given proper consideration. Much more attention is given to selecting the suitable varieties for early and late planting.

The U.S.D.A. preliminary estimates shows 1,956,000 acres of oats harvested in North Dakota in 1966. This is below 1965, but above the 1960-64 average. The average yield was 41.0 bushels per acre. This figure is also above the 1960-64 average yield.

Losses due to disease were small. Stem and crown rust did little damage except on late seeded fields.

Seed Increase and Allocations

The Seed Stocks Project increased substantial quantities of Dawn, Wyndmere, Harmon and Tyler. Orbit was completely hailed out. The increase, for 1967 planting, was allocated in November.

OHIO

by Dale A. Ray (Columbus)

1966 Production

Although soil moisture and weather conditions were excellent for early seeding of oats in Ohio, heading and maturity were nearly a week later than the normal schedule for the crop. The cool, wet conditions that prevailed in April and May were responsible for the delay in plant development. Barley yellow dwarf was evident in localized areas but was not a serious factor in yield reduction. Oat disease generally were light in occurence.

Acreage and production of oats for 1966 were slightly less than for 1965. The state-average yield of 51.0 bushels per acre was 5 bushels below the yield for the preceding year but was one of the top figures reported in the United States. Bushels weights generally were reduced by the adverse conditions that prevailed prior to maturation.

Oat Varieties

Considerable increase in the acreage of Garland was noted. Garland and Clintland 60 now are the leading oat varieties in the State. Clintford was added in recommendation for 1967 with supporting performance data from recent state-wide yield trials.

Spring oat varieties recommended in Ohio for 1967 are Brave, Clintford, Clintland 60, Garland and Goodfield for grain production and Rodney for forage purposes.

Oat Improvement Studies

Selections made from bulked-hybrid populations were screened in extensive head-row plantings for uniformity in early maturity and for superiority in straw strength. Although the incidence of crown and stem rust infection was light, the parentage of the crosses included several combinations of factors for ruse resistance. Some advanced lines of Clintland maturity appeared promising for yield and kernel quality in preliminary yield nurseries. Nine of these materials has been evaluated sufficiently for release as improved varieties.

Work with winter oat improvement has been concentrated in search among selections for increased winter survival. Several promising lines were increased for consideration in yield nurseries.

OKLAHOMA

by C. L. Moore, E. L. Smith, E. A. Wood, Jr., H. C. Young, Jr. and T. Kucharek (Stillwater)

Production

Oat production continued its decline as five million bushels (16% less than 1965) were produced on 156,000 acres. The harvested acreage represents about half of the planted acreage since the crop is utilized for forage as well as grain production. The major yield depressing factor in the 1966 crop year was an extensive spring drought; however, much of the decrease in production resulted from a decrease in harvested acres.

C.I. 8183

A Wintok Early Sel. X LeConte selection, C.I. 8183, has performed exceptionally well in tests in Oklahoma. The strain outperformed Cimarron, the leading variety in the State, by six bushels per acre in grain yield and two pounds per bushel in test weight in experiment station tests. Its straw strength is superior to any of the winterhardy varieties currently grown in the State and its winter hardiness approaches that of Wintok. C.I. 8183 has been entered in the

Uniform Northern Oat Nursery and the Uniform Oat Winterhardiness Nursery in crop years of 1966 and 1967.

Straw Strength

Measurements of straw strength using the snap test and cL_r methods were made in three F_3 populations of winter oats. Genotypic correlations showed high association of these two measurements (.86 to .90). Using these measurements as a criterion of straw strength, negative associations appear to exist between straw strength and tiller number but either nonsignificant or positive values resulted from correlations between straw strength and seed per panicle, seed weight and yield. These data do not support the idea that a genetic barrier may exist between stiff straw and high yield and test weight.

Greenbug Resistance

A spring-type oat selection, P.I. 186270, from the World Collection was obtained from the Texas Agricultural Experiment Station at Denton and found to have a high degree of resistance to the greenbug. In addition to its resistance to the "old field" strain, it shows resistance to all new collections which have been able to attack DS28A resistance in wheat. Previous to this discovery, no oat line had been found with any degree of resistance to these new collections. Preliminary studies also indicated a high degree of antibiosis associated with reduced fecundity and size of adults on P.I. 186270.

Personnel

Dr. A. M. Schlehuber left the Small Grains section April 1, 1966, to accept a foreign service appointment with I.R.I. Research, Inc. of New York City. He is to organize and direct a wheat breeding program in Rio Grande do Sul, a southern state in Brazil.

Dr. B. R. Jackson also left the Small Grains section to accept a foreign service position with the Rockefeller Foundation effective August 1, 1966. He is stationed in Bangkok, Thailand, and will coordinate the rice breeding and improvement program for that country.

Dr. E. L. Smith, formerly with the University of Illinois, joined the small grains program as wheat breeder in June, 1966.

Dr. Lewis Edwards, of North Dakota State University, will join the small grains program in March, 1967.

PENNSYLVANIA

by H. G. Marshall, E. C. Pifer,
and M. R. Henninger (University Park)

Conditions were generally unfavorable for oat production during 1966 because of severe drought. The oat acreage continued to decline and was estimated at only 500,000 acres. The average yield was the lowest since 1952 at 34 bushels per acre. These figures are based on spring oats since no estimates are made for winter oats. However, occasional fields of winter oats were grown in southern Pennsylvania, and for the first time in several years, winterkilling was not severe. Winter oat yields were also reduced by the drought, but losses were less severe than for spring oats because of an early maturity advantage. When averaged over all tests and varieties grown in central and southern Pennsylvania, winter oats outyielded spring oats by 24 bushels per acre. Unfortunately, winter oats still are not a dependable crop in the state because of insufficient winter hardiness.

Winter Oats

Breeding and testing was continued in a program to develop varieties with improved winter hardiness and straw strength. As indicated above, winter survival was good for the first time in several years, and nurseries were harvested at 3 locations. The average yield over all varieties in advanced tests was 56 bushels per acre, and this demonstrated the tendency for winter oats to better utilize the seasonal distribution of rainfall and escape the full brunt of summer heat and drought.

A satisfactory winter oat variety for Pennsylvania must have a combination of winter hardiness above that presently known in oats and straw strength above that common to the most winter-hardy varieties presently available. Numerous selections from the early cycles of a multiple crossing program have been screened, and our results show that we presently have several selections with outstanding lodging resistance, kernel type, and yield. The Norline check in advanced and preliminary rod row tests averaged 53.5 bushels per acre over all tests and locations during 1966, and this was below the average yield over all experimental varieties. Several lines exceeded the yield of Norline by more than 20 bushels per acre. Since these lines are in the Norline class for winter survival, there is little question but what stiff straw can be combined with the best level of winter hardiness presently available. However, it still must be demonstrated that the needed large boost for winter hardiness can be obtained by hybridization of presently available cultivated varieties. Past improvement as a result of transgressive segregation has been impressive, but there must eventually be a limit to this progress unless new genetic diversity for winter hardiness is found.

Because of the need for genetic diversity, we are currently conducting studies with collections of A. fatua, A. sterilis, and A. byzantina. Collections are being evaluated in controlled freezing tests both per se and in test crosses.

Oats are of importance in Pennsylvania both for grain and for green chop or silage. If winter varieties with sufficient winter hardiness were available, they could be expected to produce higher yields of forage than spring oats, and could be removed from the land at an earlier date. Yields of up to 15 tons green and 5 tons dry weight per acre were obtained by mid-June (milk to soft-dough stage) in southeastern Pennsylvania in spite of the droughty conditions of 1966.

Spring Oats

Spring oat nurseries were grown at 5 locations in Pennsylvania during 1966. Moisture was adequate during the early growing season, but drought during June and July severly reduced yields and test weights. The consequences of the drought were especially severe in central and southern areas of the state. Early maturing varieties outyielded the later varieties in nearly every case. The average yields over all varieties in the USDA Uniform Mid-season and Uniform Early Oat Nurseries were only 29.0 and 38.2 bushels per acre, respectively. Very little differentiation between varieties was possible under the adverse conditions. The current recommended varieties for Pennsylvania are Garry, Pennfield, Clintland 64, Clintland 60, Clinton 59, Orbit and Russell.

Dr. Robert P. Pfeifer is in Turkey on a 6 month sabbatical leave as a Fulbright lecturer at Ataturk University. During his absence, the spring oat program is in the care of Mr. Melvin R. Henninger, a graduate student on the small grains breeding project.

SOUTH CAROLINA

by Doyce Graham, Jr., E. B. Eskew,
and G. C. Kingsland (Clemson)

South Carolina oat acreage in 1966 was down 9% from 1965. Reported average yield was 39 bushels per acre.

A limited amount of seed from bulk oat hybrids in F_5-F_6 generation will be available upon request for fall, 1967 planting. There are about 148 bulks of varied but mostly winter types adapted to the southeast.

Mr. Jimmy Palmer is doing a Ph.D. thesis problem in oats dealing with resistance to soil-borne mosaic in Saia.

Mr. Doyce Graham, Jr. is now responsible for oat breeding. He will complete Ph.D. requirements at Purdue University in June, 1967. Former oat breeder, Dr. W. P. Byrd, is now Head of the Experimental Statistics Department at Clemson.

SOUTH DAKOTA

by R. S. Albrechtsen and V. D. Peterson (Brookings)

1966 Season and Production

1966 was a midiocre to poor year for oat production in most of South Dakota. Seeding was accomplished on schedule in most of the eastern and southern counties, but was delayed by wet weather in the northern and western parts of the state. Moisture shortages during June and extremely high temperatures in early July reduced yields and lowered test weights. July rains came too late to significantly benefit most of the crop.

Oats continue to accupy a good portion of the small grain acreage in South Dakota. An estimated 2,288,000 acres of oats were harvested in the state in 1966 and yielded an average of 33 bushels per acre. The acreage was below that of 1965 and the previous 5-year average and yield per acre was considerably lower than either previous period.

Crop losses from disease were small. Stem rust was present but became established too late to do extensive damage. Crown rust infection was very light in general.

Seed Increase and Distribution

The South Dakota Foundation Seed Stock Division participated in the increase of Jaycee, Holden, Dawn and Wyndmere in 1966. Seed of these varieties will be released to County Crop Improvement Associations who will redistribute to qualified growers of their association.

Personnel Item

Mr. Yung-Yen Yeh completed the requirements for the M.S. degree in Plant Breeding on an assistantship supported by a grant from the Quaker Oat Company.

TENNESSEE

by C. O. Qualset, C. R. Graves, Gary Elder,
W. W. Stanley, H. E. Reed (Knoxville)

Production

Winter oat acreage in Tennessee continues to decrease: 150,000 acres were planted in 1965 which is about 55% less than the amount planted in 1959. Grain yields have been steadily increasing and the 1966 statewide yield was a record 44 bushels per acre. Only 30% of the oats planted were harvested for grain; the remainder is used for hay or silage.

Varieties

Forkedeer, in production since the 1930's, is still the most widely used variety in Tennessee. Blount was released in 1960 and has not been widely accepted. Yield data for the past 11 years indicate that Blount has exceeded Forkedeer in grain yield 45 times in 56 experiments for an overall superiority of 15%. Hay production data also indicate about 13% superiority for Blount. Blount is a stiff-strawed variety that can be grown with rather high fertility with little lodging. The winter hardiness of Blount and Forkedeer is about the same in Tennessee. It may be noteworthy that Forkedeer has been in production for about 30 years without succumbing to a serious disease problem.

Barley Yellow Dwarf Virus

BYDV is the most serious disease of oats in Tennessee. Early fall planting results in greater losses than late planting. In 1966 uniform fall forage harvest resulted in an increase of BYDV incidence as indicated by the following data:

	Disease score*		Percent damage	
Variety	Fall harvest	Not harvested	Fall harvest	Not harvested
Blount	5.0	2.1	34	6
LeConte	6.2	5.2	45	35
Forkedeer	7.6	7.2	68	64

* 0 = none, 10 = severe; symptom expression in most severely damaged areas.

The reaction of Blount is particularly interested since it appears to have some tolerant to BYDV. Fall forage harvest greatly increased both the score and the amount of damage for Blount.

BYDV reactions have been recorded for two years on a number of varieties and experimental lines. Tolerance is indicated in some lines and varieties, but if the disease incidence was high all varieties showed considerable damage. Below are given average BYDV scores for several varieties and lines:

Variety	No. of Expts.	Score*
Tenn. 62-233	3	2.47
" 61-222	3	3.00
" 62-232	3	3.27
" 61-264	3	3.47
" 60-32	6	3.48
" 61-216	4	3.55
Blount	13	3.56
Carolee	2	4.10
LeConte	3	4.90
Ora	6	5.00
Norline	6	5.22
Forkedeer	12	5.38
Dubois	7	7.27
Coker 62-42	2	7.75

* 0 = none, 10 = severe.

TEXAS

I. M. Atkins, M. E. McDaniel, R. A. Kilpatrick (USDA), Robert W. Toler (College Station), K. B. Porter, Norris Daniels (Bushland), J. H. Gardenhire (Denton), K. A. Lahr (Chillicothe), M. J. Norris (McGregor), and Lucas Reyes (Beeville). Departments of Soil and Crop Sciences, Plant Sciences and Entomology and Texas Substations 1, 5, 6, 12, 18, 23 and USGPRS

The seeded acreage of oats for 1966 was estimated at 2,114,000 acres, up 6% from 1965, but below the 1956-65 average of 2,239,000 acres. Production was 22,148,000 bushels or 28.0 bushels per acre for 1,102,000 harvested acres. Severe spring drought caused widespread abandonment or use of the crop exclusively for forage. Winterkilling was only a minor factor in production. Abnormally heavy rains in May, near maturity, caused some damage to the crop.

Performance trials were grown at 9 locations with fairly good results. Maximum yields of 68-142 bushels per acre were produced at Etter and low yields of 6-29 bushels were produced at Chillicothe under extreme drought. The Arkansas variety Ora produced well in tests and on farms and foundation seed was released to growers. Our new variety Norwin produced well in tests and approximately 600 bushels of foundation seed were released.

Diseases were not of major importance except in South Texas where the rusts reduced the winter grazing period and barley yellow dwarf was frequently found in fields. During 1965-66, a total of 1,381 oat strains were tested for seedling reaction to two races of stem rust (6F and 6AF) and three races of crown rust (264,294,326). The use of 3 growth chambers permitted summer testing of seedlings to rust. Without these, greenhouse temperatures are too high to carry out an effective rust screening program during the summer in Texas.

At Denton, foliage burn by toxophene sprays was observed in 1965. A test of commercial toxophene 60, toxophene 90 plus solvent and toxophene 90 plus emulsifier was set up on a toxophene susceptible variety. The oats were damaged equally by each of these three sprays.

Several oat varieties were clipped at Denton on December 1, January 1, and March 1 to determine the amount of forage produced and the effect of clipping on yield. Alamo X produced 1400 pounds of air dry matter with 55% of the total being produced by December 1. Ora produced 1012 pounds with only 44.5% of the total produced by December 1. Norwin produced 1157 pounds with 48.7% produced by December 1. Grain yields of the clipped plots were reduced in all instances.

Mr. Norris Daniels is retesting the World Oat Collection for greenbug resistance, as a sideline of the regular work, and will attempt to save and obtain seed from single resistant plants observed in any strain. Transfer of resistance from Russian 77 to adapted varieties is making slow but good progress.

Additional ferel oats were collected in Texas and Mexico. During a visit to the Mennonite settlement near Chihuahua, Mexico, no wild types were found in their summer crop. As pointed out by Western (1960 Newsletter) the Burt oats grown in this area are extremely uniform and pure. One grower stated that the entire crop of that area was the progeny of 30 seeds obtained by his father from a brother in Texas in the early 1930's. A search in adobe bricks from an abandoned church, built before 1600, near Saltillo, Mexico failed to disclose any kernels of oats but numerous grains of barley and a few of wheat were found.

Dr. Robert Tolar, Pathologist, a graduate of North Carolina State University and formerly employed by the United States Department of Agriculture at Tifton, Georgia, joined the Plant Sciences Department at TAMU to do research on virus diseases of the cereal crops.

OATS FOR WINTER GRAZING IN THE TEXAS RICE BELT

by J. P. Craigmiles, R. H. Brown and J. R. Wood
Rice-Pasture Research and Extension Center
Beaumont, Texas

The limited acreage of oats planted in the Texas Gulf Coast Rice Belt is used almost exclusively for grazing, with only a very small acreage in the western area being harvested for grain.

Several factors make out production hazardous in this 270 frostfree day-growing season. Some of these are: (1) Droughty conditions at planting jeopardize chances of obtaining good stands; (2) Excessive moisture and poor drainage during the winter drown out stands; (3) Rapid drops in temperature frequently cause winter killing; and (4) Epiphytotics of crown rust late in the season further reduce yield and quality of forage.

None the less, forage is scarce during the winter months of December, January and February, and cattle usually lose weight during this season. In an effort to alleviate this situation, several studies were initiated, using small grains under simulated grazing conditions. Clipping trials, evaluating small grain species and varieties alone and in combination with ryegrass and clover, are in the third year (Oat Newsletter 16:103-104. 1966). The effect of rates and split application of nitrogen on oats is also under investigation at Beaumont. Two years' results comparing oats, wheat, barley, and rye in clipping trials show that oats produced the most total forage (2931 pounds dry matter per acre), followed by barley (2824 pounds), rye (2749 pounds) and wheat (2649 pounds).

Oats made the highest early forage yields of any of the small grain species tested. Alamo X averaged 1800 pounds of dry matter per acre by February. The addition of ryegrass increased total forage production and extended the grazing season.

Indications are that oats for grazing need a second application of nitrogen in February for good spring production. Splitting the nitrogen, half at planting and half in February, gave better production than other regimes of applying nitrogen.

Three years' results from these studies will be critically examined upon the completion of this year's tests.

WISCONSIN

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

Wisconsin State Oat Yields

The state average oat yield in Wisconsin in 1966 was 53 bushels per acre which is an 8-bushel drop from that of 1965. Wisconsin had a rather dry spell from mid-June to July 10. Had it not been for cool weather, yields would have been still lower. There was considerable variability in yields within Wisconsin because the southwestern part of the state had much better than average yields while other sections had prolonged dry periods reducing plant height to about two-thirds and grain yields to a slightly lesser extent. Diseases were somewhat less prevalent in 1966 than in 1965. Oat acreage in Wisconsin has gradually decreased to 1,910,000 acres. This is a 13% drop during the 5-year period. There continues to be sporadic interest in oats as a green chop crop, especially when there is serious lodging or a shortage of silage material.

Two New Oat Varieties Distributed

Seeds of Holden and Portal were released by the Wisconsin Agricultural Experiment Station to growers of certified seed for the first time in the spring of 1967 (See New Varieties Section).

Personnel Items

P. A. Salm joined the DeKalb Agricultural Association and is working primarily with wheat at Wichita, Kansas. D. M. Wesenberg, J. J. Schreck and Paul Sun are continuing their graduate studies. Miss Frances Wang, and Mr. Max Swinburn of Texas Tech became small grains graduate assistants May 4, 1966, and February 1, 1967, respectively.

Dr. I. Nishiyama joined the Wisconsin group April 20, 1965, and he continued various cytogenetical observations concerning monosomics as well as Wisconsin material derived from wide crosses and interspecific combinations. Dr. Nishiyama's appointment has been extended until July 31, 1967.

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V. NEW OAT VARIETIES

a) Alphabetical List:

Name	C.I. No.	Origin or releasing station
Arlington 23	7890	South Carolina
Bruce	7888	South Carolina
Bundy	8101	N.S.W., Australia
Chihuahua	--	Mexico
Cuauhtemoc	--	Mexico
Dade		Missouri
Diana	7921	Indiana and USDA
Hickory		Missouri
Holden	7978	Wisconsin
Jaycee	7971	Illinois
Kelsey	--	Canada
(M128)	--	Western Australia
Mapua	--	New Zealand
Mesa	8277	Arizona
Mugga	8100	N.S.W., Australia
Nina	--	Sweden
Nora	8163	Arkansas
O'Brien	8174	Iowa and USDA
Otsuku	--	Hokkaido, Japan
Portal	8040	Wisconsin
Rapida	8303	California and USDA
Sioux	--	Canada
Sumter 3	7886	South Carolina

b) Description:

Arlington 23:

Arlington 23 (C. I. 7890) was developed by W. P. Byrd as a reselection from Arlington (Lee-Victoria) x Fulwin and released in the fall of 1965. Arlington 23 originated from a planting of head rows of Arlington which were for production of breeders seed. It was one of several head rows which survived a severe epiphytotic of "culm rot." Its most important advantage is its resistance to the *Helminthosporuim* including *H. victoriae* and culm rot strains. It is superior to Arlington in soil-borne mosaic resistance while susceptible to prevalent races of crown rust and smuts. Muturity and height are the same as Arlington. This variety is an excellent forage oat since it has the potential of Arlington without the disease hazards. Arlington 23 was first tested in the regional nurseries in the fall, 1962.

Bruce:

The pedigree of Bruce (C. I. 7888) is Arlington x Delair 2x Trispernia 3x Arlington. The cross was made for Clemson by W. H. Chapman at the North Florida Experiment Station at Quincy, Florida in 1956. The initial F_2 and subsequent selections were made by W. P. Byrd at Clemson. Bruce has good resistance to soil-borne mosaic that exceeds all presently available varieties except Arlington 23. It has given good resistance to prevailing races of crown rust, Victoria blight, and culm rot. Muturity is early and equal to Sumter. Height is 4-5 inches shorter than Arlington 23. Bruce was tested in 1960-61 at Clemson in preliminary yield test and in the South Carolina Variety Test in 1961-62. It was first entered in the Uniform Central Area Oat Nursery in 1962-63. Seed was available for the first time in the fall, 1966.

Bundy:

This has the C. I. No. 8101 in the U.S.D.A. World Collection. It is a new dual-purpose grazing and grain mid-season variety developed by the New South Wales Department of Agriculture. It was outstanding during the 1957 drought season for grain production following moderate grazing at Tamworth, centre of the region of the North-west Slopes and Plains, for which it is recommended as a replacement for Belar. It has the Abd genotype for stem rust resistance and is resistant to smuts and BYDV. The parentage consists of Victoria, Richland, Burke, Fulghum and Winter Fulghum. It is susceptible to crown rust. The groat is well covered and can produce good millable grain. For full description, see Agric. Gaz. N.S.W. 76, Part II, November 1965 (Reprints available from P. Guerin).

Chihuahua and Cuauhtemoc:

Two new oat varieties have been developed both of them came from the cross AB-177 CI-7149 x Putnam 61 CI-7531. Both are a little bit early than the parents with more agronomic characteristics like AB-177. These varieties are specific for the North part of Mexico and specially for the Northwest of Chihuahua State.

The cross was made in Chapingo Mexico and the segregating generations were selected up in the central part of Mexico and North West of Chihuahua.

Variety name	Pedigree	Height	Heading date days	P.coro nata	Yield kg/ha
Cuauhtemoc	I-15-5R-3R-1c	1.35m	85	Tr	2900
Chihuahua	I-15-11c-1R-2C	100	83	5MR	2976
AB-177	CI-7149	110	88	20S	2823

I am including AB-177 to give a point of comparison. AB-177 is better than Putnam 61 when grown under rain fall conditions in the north part of Mexico.

Dade:

(See under MISSOURI -- Section IV, page 50)

Diana:

Diana, C.I. 7921, spring oats, developed by the Purdue University Agricultural Experiment Station and A.R.S., United States Department of Agriculture, was released in June 1966 in germplasm amounts in the United States and in Brazil. The variety was tested in the International Rust Nursery and performed very well in south eastern Brazil.

Diana has the P.I. 174544-3 type of adult plant resistance to crown rust and AB genes for stem rust resistance. It has good straw strength, good test weight, and a yield level similar to Clintland 64 but not as high as Clintford. Therefore, we do not propose the release of Diana in Indiana at this time.

The pedigree of Diana, C.I. 7921 (Purdue 5912RB1-3-2), is Roxton 3x Victoria 2x Hahira x Banner 4x Ajax 3x Victoria 2x Hajira x Banner 5x Clinton x Bond 2x P.I. 174544-3 6x Clintland 3x Clinton 2x Ark. 674 2x Milford.

Germplasm amounts of seed are available to bona fide plant breeders from the Department of Botany and Plant Pathology, Purdue University, Lafayette, Indiana 47907. A breeders seed lot will be established.

Hickory:

(See under MISSOURI -- Section IV, page 50)

Holden:

Holden, C.I. 7978, was named after the late Professor E. D. Holden who had an active interest in the Wisconsin Crop Improvement Association for more than 40 years.

Holden was selected from the same series of crosses as were Goodfield, Dodge, and Garland. The first cross, Hawkeye x Victoria, was made in 1935; the second cross, Garry x Hawkeye-Victoria, was made in 1947; and the final cross, Clintland x (Garry-Hawkeye-Victoria) was made in 1952. After growing two generations each year in 1953 and 1954, and making plant selections for various agronomic characteristics and disease reactions through 1958, Holden was placed in the rod row tests at

Madison in 1960 and in the Experimental Farm mursery trials in 1962.

Yield has been about 5 bushels per acre greater than for Garland, but less than for Lodi. Hull color, kernels and bushel weight resemble those of Garland. Straw height is about an inch taller than Garland with lodging reaction about equal. Heading and ripening are about a day later than Garland.

Disease responses of Holden and Garland are quite similar. They are resistant to older races of crown rust, but are intermediate to susceptible to newer races. Both have AB genes for resistance to stem rust, including races 7, 7A, and 8. Both are resistant to the smuts, but susceptible to red leaf.

Jaycee:

Jaycee, C.I. 7971, was selected at Urbana, Illinois in 1960 from the F_5 generation of the cross Clintland 3 x Garry 2 x Hawkeye x Victoria 4 x Putnam. The final cross that led to the development of Jaycee was made in 1956. Putnam was the male parent while an unnamed selection obtained from Wisconsin, was the female parent. Seed will be distributed to certified seed growers in 1967.

Test data indicate that Jaycee is a relatively high yielding variety that is well adapted for growing in Illinois. It is earlier maturing and shorter strawed than other varieties currently recommended in Illinois. The kernels are medium to large and plump in appearance with slightly thicker hulls than some other varieties grown in Illinois. Straw strength is good and its short straw and early maturity should add to its lodging resistance. Jaycee has a high degree of tolerance to Barley Yellow Dwarf, being superior to any other variety currently grown in Illinois. It is resistant to Races 6, 7, 7A and 8 of stem rust and races 203 and 216 of crown rust, but susceptible to Landhafer attacking races of crown rust. Jaycee has shown resistance to races of smut that have appeared in Illinois in recent years.

Kelsey:

Kelsey was developed cooperatively by the Canada Department of Agriculture Rust Area Project Group at Indian Head, Saskatchewan and Winnipeg, Manitoba. Kelsey, a sister selection of Harmon, originated from a cross between Rodney and O.T. 604, a weak strawed but high yielding strain from the cross [(Victoria x (Hajira x Banner))] x Roxton x Beacon. Kelsey appears similar to Rodney and Harmon in the field but has smaller kernels, is slightly shorter and about a day earlier in maturity. It has stem rust and smut resistance equal to Garry, Harmon and Russell and has some tolerance to crown rust and yellow dwarf. Kelsey has produced extremely high yields in some tests in Manitoba. This variety also appears to have a higher energy content as livestock feed than any of our present Canadian commercial oat varieties.

M128:

Tentative new oat variety for Western Australia ....
by J. L. McMullan, Plant Breeder, Western Australian Department of Agriculture

The Western Australian Department of Agriculture expects to release seed of a new grain oat variety to farmers in Western Australia for the 1967 season. Now known as M128, it was produced at the Merredin Research Station from the cross Kent x Ballidu. It is a moderately tall variety with good straw strength under West Australian conditions. In the 1965 Statewide variety trials its average yield was 47.4 bushels per acre, the next highest yielding variety being Avon with a yield of 44.6 bushels.

Outstanding features of this variety are:

(1) a very good bushel weight
-1965 mean 42.6 lbs. with Avon 38.1 lbs.

(2) an extremely high kernel weight
-1965 mean 36 mgm per kernel with Avon 28 mgm

(3) a high degree of resistance to shedding

(4) a high level of field resistance to B.Y.D.V.

In one trial in the 1966 season, the results of which are just coming to hand, M128 had a yield of 113 bushels per acre.

Mapua:

A new variety of milling oat, Mapua, bred at the Crop Research Division, D.S.I.R., New Zealand, averaged 112 bushels per acre (over five crops) in its first year of release. It was selected from a cross, Milford x Forward, made in 1953.

Mapua is a large-grained white oat, with a rather small equilateral panicle, short straw, and resistance to lodging and straw break. It is immune to oat mosaic, and is higher-yielding and more tolerant of BYDV than any other variety being grown commercially in New Zealand.

Mesa:

(See under ARIZONA -- Section IV, page 38)

Mugga:

This has the C.I. No. 8100 in the U.S.D.A. World Collection. It is a new dual-purpose grazing and grain late variety developed by the New South Wales Department of Agriculture. It has the distinction of being the most frost resistant Australian oat variety with hardiness comparable to that of the winter wheat variety Winglen. It may be useful for crossing with the American winter oats and Novosadsky II. Its hardiness results from transgressive segregation as the parentage, which consists of Victoria, Richland, Boppy and Belar, contains only rather frost susceptible lines. Boppy resulted from an Algerian x Ligowo cross. Mugga has the Abd genotype for stem rust resistance, and is resistant to all races of smut in New South Wales (including 1 race which now attacks Acacia--the variety it will replace) and is tolerant to BYDV. It is susceptible to crown rust. The groat is well covered, and if sufficiently vernalized by growing in suitable areas, Mugga can produce good millable grain. For full description see Agric. Gaz. N.S.W. Vol. 77, Part II, November, 1966 (Reprints should be available from P. Guerin).

Nina:

Weibull's original Nina oats....by N. O. Hagberth, Weibullsholm

Nina was developed at Weibullsholm Plant Breeding Institute, Landskrona, Sweden, from a cross between the Danish variety Abed's Palu and Weibull's Saxo. Palu has very good standing ability but it yields only moderately well, and Saxo is a rather weakstrawed but very high yielding variety. From the cross, which was made in 1953 and followed by plant selections in $F_2 - F_5$, we have obtained several promising strains with better straw than Palu and higher yield than Saxo. One of these, Nina (WW 16414), will be marketed in 1967.

Tested in official trials since 1961, Nina on an average has given the same yield as the Swedish standard variety Sun II. Under good and fertile soil conditions Nina as a rule yields very well and on an average of our trials at Weibullsholm it has outyielded Sun II by no less than 13% (21 trials, 1960-1966).

Nina has a rather short straw and the straw strength is excellent. In the trials at Weibullsholm the following results were obtained:

Sun II	5
Candor	6
Nina	8

(Scale 1-10, where 10 means no lodging).

Nina has ripened on an average at the same time as Sun II.

Nina possesses satisfactory quality of grain. The test weight is slightly above that of Sun II and as regards kernel content and 1000-grain weight, Nina is about equal to Sun II.

Nina seems to be best adapted to humid and fertile areas in the southern and western parts of Sweden.

Nora:

Nora (Arkansas 3-74-H3, C.I. 8163) is a sister line of Ora (C.I. 7976) being derived from the same cross of (Lee x Victoria, 2 x Fulwin, 3 x Bonda, 4 x Landhafer) x Moregrain. Nora has shown excellent performance in tests in Arkansas and the southern states. Nora is very similar to Ora in yield, date of maturity, height, seed size, lodging and disease resistance. The variety is more winter hardy than Ora which is the primary reason for its release.

O'Brien:

The Iowa Agricultural Experiment Station in cooperation with the Crops Research Division, United States Department of Agriculture is releasing the oat strain C.I. 8174 under the name, O'Brien. This is a tall, early to midseason variety that originated from the cross R.L. 2105 x Clintland. It has been tested in the Early and Midseason Uniform Oat Nurseries. O'Brien may have a somewhat small zone of adaptation. About 1800 bushels of it were planted on certified acreage in 1967.

Otsuku:

by T. Kumagai and S. Tabata, Hokkaido National Agricultural Experiment Station, Sapporo

The new variety Otsuku was developed at Sapporo in cooperation with the Hokkaido Local Agricultural Experiment Stations. Its main feature is its superior lodging resistance over current commercial varieties grown in Hokkaido. It is derived from a cross between Honami and Zenshin, both of the most commonly grown oat varieties. The cross was made in 1956 and the selection work was begun in 1959. The pedigree method was in use. Otsuku is a white oat with erect habit and dark color in leaves and spreading panicle. Compared to Zenshin, awns are somewhat longer, and the test weight weighs slightly lighter and the hull percentage is 3 percent lower, the times of heading and maturity are about two and three days later, respectively, belonging to midseason-late maturing variety. The variety excels in straw yield and lodging resistance. The ratio of culm weight to total plant weight is higher. The superior standing ability is probably due to the higher distribution of dry matter in culm. Otsuku has a good lodging record in many places in Hokkaido. The relative score obtained from the lodging trial at Sapporo, 1964, is shown below.

Otsuku	4
Zenshin	65
Honami	23

It is susceptible to crown rust. The grain yield is similar to Honami and somewhat lower to Zenshin. There is a tendency for increasing yield rather in drill planting than in common planting with 50 cm. spacing between rows.

The value as a feed-stuff seems to be similar to Zenshin and Honami. It is expected to be best suited for the cultivation in Soya, the northern part of Hokkaido, and Konsen, the northeastern part, and the other districts, where the climates are so cool and humid that severe lodging has often occurred. The varieties has outyielded Zenshin and Honami in the districts and is expected to replace all the common cultivated oat varieties there.

Portal:

Portal, C.I. 8040, was selected from two main crosses, the first being P.I. 174544 x Clintland made in 1952 after observing that P.I. 174544 was resistant to leaf and stem rust in a special test in 1951. Selections from this cross that were resistant to race 264 in a leaf rust test in Puerto Rico in 1958 were panicle selected and sent to Madison by H. C. Murphy of the U.S.D.A. Later the same year at Madison, one of these selections was crossed to a selection later to be named Garland. Thus, the second cross was (P.I. 174544 x Clintland) x Garland.

The average yield of Portal in tests at Wisconsin experiment stations since 1962 exceeds that of Garland by 2.6 bushels per acre but is several bushels less than that of Lodi. Bushel weight is a little less than for Garland and straw a little less strong. Hull color is yellow. Portal is a little taller and somewhat more irregular in height than Garland, with heading and ripening a little later.

Disease reactions. Portal is resistant to smuts, but is susceptible to red leaf. Portal has the AB genes for resistance to stem rust, including races 7, 7A, and 8. One reason for distributing Portal is its resistance to race 264 of crown rust that appeared important in the late 50's. However, there are still newer races that may attack Portal, but not as severely as they do Garland and its sister varieties. Portal was resistant to current races of leaf rust in southern Brazil in 1966.

Areas of adaptation in Wisconsin may be wider for Holden and Portal than for Garland.

The interest and counsel of Dr. H. C. Murphy and Mr. D. E. Western of the Quaker Oats Company during the development of Portal are acknowledged. Several central staff members, graduate students, and Experimental Farm staff assisted in the development of Portal oats.

Rapida:

(See under CALIFORNIA -- Section IV, page 40)

Sioux:

Sioux was developed from a cross made at Winnipeg in 1953 by J. N. Welsh between Garry and Rex. Sioux is about 4 inches shorter than Garry and a day earlier in maturity. It has stem rust and smut resistance equal to Garry but is very susceptible to crown rust. The kernel type of Sioux is very similar to Garry but with a lower hull percentage. Sioux has yielded very well over a wide area in the Prairie Provinces but appears best adapted to the drier areas in Western Saskatchewan and Southern Alberta. It has also yielded extremely well in the irrigated yield trial at Lethbridge, Alberta. Good yields in Manitoba have been obtained but because of its susceptibility to crown rust it doesn't appear to be equal to Kelsey.

Sumter 3:

Sumter 3 (C.I. 7886) was released for fall, 1966 planting. It is a pure line selection from Sumter, Arlington 3x Wintook 2x Clinton^2 x Santa Fe. The selection was made from head rows of Sumter in 1959 by W. P. Byrd. Testing in South Carolina official Variety Test was begun in 1960-61. It was entered in Uniform Central Area Oat Nursery in 1962-63. Sumter 3 has disease reactions of its parent variety, Sumter, in that it is resistant to H. victoriae, crown rust races 203, 216, and 294, halo blight, and culm rot.

A two year average of mosaic rating of Sumter 3 was 5.0 percent compared with 0.0 percent for Arlington. Its maturity, height, and straw are like Sumter. Test weight is about two pounds per bushel heavier than Sumter.

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VI. GERMPLASM MAINTENANCE

Small Grain Collections Considered Open Stock

by L. A. Tatum, CCRB, CR, ARS, U.S. Department of Agriculture, Beltsville, Md.

In the 1964 Barley, Oat, and Wheat Newsletters, it was proposed that we would not maintain germ plasm in the Small Grain Collections of the Crops Research Division with restrictions on distribution. This is in line with Crops Research Division policy that all items of these collections should be "open" stock. Current practice is to assign C.I. members only to strains having "open" stock status.

In an attempt to get our Collections in order, we have asked experiment stations to review lists of entries that have previously been given C.I. numbers and indicate which should not have "open" stock status.

Our plan is that, in the future, only material available for general distribution will be stored in our collections.

The Value of a C.I. Or P.I. Number In Publications

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

To assure identification and availability of seed, an oat variety, selection, or species mentioned in a publication should be designated by a C.I. or P.I. number. If a C.I. number has not been assigned, one may be obtained by submitting a 15-gram sample of seed and the history of the line to the Samll Grain Collection, Crops Research Division, Beltsville, Maryland 20705.

Since other agencies seldom maintain seed of selections (other than those of current interest), C.I. numbers should be requested for all oat varieties and selections referred to in publications. Using a variety name (without a C.I. or P.I. number) is no guarantee that a later investigator will be able to obtain seed with the same germ plasm. It is not uncommon for a variety name to be used for several different genotypes. For example, there are more than 50 "Fulghum" entries representing several different genotypes in the World Oat Collection. One may see an oat selection designated in a publication only by the parents of the cross from which it was selected, e.g., Lee x Victoria. Such identification is of little value. All entries assigned a C.I. number will automatically become 'open stock' and will be available for general distribution. Unless a C.I. or P.I. number is assigned the USDA Small Grain Collection will not maintain seed.

The World Gene Bank

Your contributions to the World Gene Bank during the year have been appreciated. Solicitation of seeds for this bank is being continued. All contributions of seed from F_1 and F_2 plants surplus to your needs are welcome.

Limited amounts of seed are available for distribution.

<u>USDA Small Grain Collection</u>

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

The USDA oat collection had an inventory of 8,233 entries at the close of 1966. There are 6,309 entries with cereal investigation (C.I.) numbers and 1,924 entries with plant introduction (P.I.) numbers. During the year, 39 varieties of *Avena sativa* were received from foreign sources. The Avena species collection accessioned 767 samples of *Avena sterilis* from Israel.

Domestic sources contributed 37 varieties of oats that are either named or selections that have been declared open stock. These new C.I. numbers are listed (Table 11, page 77).

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Table 11. C. I. Numbers assigned in 1966 ...... by J. C. Craddock

C.I. Number	Name or Designation	Pedigree	Origin and/or Source
8265	ELGIN	Bd x Rb 2x Hj x Jt 3x Lh 4x Vtra 2x Hj x Bnr 3X Colo	Iowa
8266	BARNES	Col x Ctn 2x Lh 3x SF x Mo 0-200	Iowa
8267	GOODYIELD	Ctn x SF 2x Mo 0-200 3x Ajax	Iowa
8268	YALE	Vtra 2x Hj x Bnr 3x Colo 4x Ajax x Ctn	Iowa
8269	TAYLOR	Bd x Rb 2x Hj x Jt 3x Lh 4x Vtra 2x Hj x Bnr 3x Colo	Iowa
8270	PETERSON 100	Clinton, Trispernia, Clinton, Ajax, Clinton	Iowa
8271	GOODCREST	Columbia x Clinton 2x Santa Fe 3x Gopher	Iowa
8272	M3018	Ajax 2x Ctn x SF 3x Mo 0-200 4x Nmh 3x Ctn 2x Bne x Car	Iowa
8273	Iowa X103	Bonkee ^{6}x Ceirch du Bach	Iowa
8274	TRITON	Andrew x Clintland	Iowa
8275	APOLLO	Bd x Rb 2x Hj x Jt 3x Lh 4x Vtra 2x Hj x Bnr 3x Colo	Iowa
8276	CODY-HVR	Victoria x Richland 2x Bannock	Pennsylvania
8277	MESA	Kanota x <u>Avena</u> <u>fatua</u>	Arizona
8278			Australia
8279			Australia
8280	Ky. 64-10653	CI 4897 x Dubois	Kentucky
8281		Clinton ^{2}x Ark. 674	Minnesota
8282	Amarela Sel.		Maryland
8283	Amarela Sel.		Maryland
8284	Kyto Sel.		Maryland
8285	Kyto Sel.		Maryland
8286	Kyto Sel. 2		Colombia
8287	Rodney Sel.		Maryland
8290	Tifton 5719 (D-11-M19)	Selected from PI 282732, D-11, from Israel	Georgia
8291	Tifton 5737-1	Selected from PI 287213, D-103, from Israel	Georgia
8292	Tifton 5720 (D-12-M-20)	Selected from PI 282733, D-12, from Israel	Georgia
8293	Tifton 5755-1	Selected from PI 282740, D-27, from Israel	Georgia
8294	Tifton 5755-2	Selected from PI 282740, D-27, from Israel	Georgia
8295	Tifton 5735-1	Selected from PI 287211, D-94, from Israel	Georgia
8296	Tifton 5740-1	Selected from PI 287216, D-108, from Israel	Georgia
8297	Tifton 5740-2	Selected from PI 287216, D-108, from Israel	Georgia
8298	Tifton 5747-1	Selected from PI 287223, D-133, from Israel	Georgia
8299	Tifton 5747-2	Selected from PI 287223, D-133, from Israel	Georgia
8300	Tifton 5748-1	Selected from PI 287224, D-135, from Israel	Georgia
8301	Tifton 5751-1	Selected from PI 287228, D-143, from Israel	Georgia
8302	Tifton 5751-2	Selected from PI 287228, D-143, from Israel	Georgia
8303	RAPIDA	<u>A</u>. <u>fatua</u> x Palestine (mono) ^{2}2x <u>A</u>. <u>fatua</u>	California

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