ANNUAL REPORT OF COOPERATIVE REGIONAL PROJECTS
Supported by Allotments of the Regional Research Fund,
Hatch Act, as Amended August 11, 1955
January 1 to December 31, 1976

1. PROJECT: NORTH CENTRAL REGIONAL PROJECT NC-7
NC-7 "New Plants" - The Introduction, Multiplication, Preservation and Evaluation of New Plants for Industrial and Agricultural Utilization.

2. COOPERATING AGENCIES AND PRINCIPAL LEADERS:

Administrative Adviser	R. W. Hougas, Wisconsin
Regional Coordinator	W. H. Skrdla, Iowa

State Experiment Stations and Representatives

Kansas	*C. E. Wassom, Chm.	Missouri	*L. E. Cavanah
Alaska	*R. L. Taylor	Nebraska	*J. H. Williams
Illinois	*T. Hymowitz	North Dakota	*J. S. Quick
Indiana		Ohio	*M. H. Niehaus
Iowa	*I. T. Carlson	South Dakota	*R. M. Peterson
Michigan	*R. L. Andersen, Sec'y	Wisconsin	*W. H. Gabelman
Minnesota	*C. Stushnoff		

U.S. Department of Agriculture

ARS Germplasm Resources Laboratory	*G. A. White
	H. L. Hyland
ARS National Program Staff	Q. Jones
ARS Area Director, Mid-Great Plains Area	C. W. Alexander
Cooperative State Research Service	C. O. Grogan
Soil Conservation Service	*A. A. Thornburg
Northern Regional Research Center	*L. H. Princen
Agricultural Research Service	J. L. Jarvis, Iowa

*Voting members of NC-7 Technical Committee

North Central Regional Plant Introduction Station, Ames, Iowa

Regional Coordinator	W. H. Skrdla
Horticulturist	
Research Plant Pathologist	R. L. Clark
Research Entomologist	J. L. Jarvis

3. PROGRESS OF WORK AND PRINCIPAL ACCOMPLISHMENTS:

a. Introductions Having Special Value

Described below are plant introductions, reported by cooperators in 1976, that are considered to have made important contributions to plant breeding programs and to U.S. agriculture. Additional reports on these and other plant introductions which describe their value in greater detail are provided in Appendix C of this report, titled "Promising Plant Introductions for 1975," which will be issued later.

(1) Alfalfa

(a) PI 277425, Medicago sativa, from Turkey contributed stem nematode resistance to the Canadian variety 'Trek' released in 1975. PI 277425 was originally introduced as 204591. Ref: Hanna, M. R., and E. J. Hawn, 1976. Registration of Trek alfalfa. Crop Sci. 16(3): 444.

(b) Three of 18 alfalfa germplasm pools resistant to stem nematode released by ARS and the Washington AES carry germplasm derived from alfalfa plant introductions. WCS3 traces to Nev. Syn Y (which traces to bacterial wilt resistant

selections from PI 211608). WHS3 traces to PI 141462, and WZS1 was developed from an intercross of 39 plants, including one plant from PI 141462 - ARS & SAES alfalfa release notice 8/19/76.

(2) Corn

PI 251934, the variety 'Chernovitskaya 21' from USSR, contributed germplasm to the variety 'Trojan M70'. An inbred line developed by selfing 251934 was used in the male parent of M70 and this hybrid was first marketed by Trojan in 1971. Its approximate relative maturity is 70 days. The hybrid was sold primarily in the northern corn growing areas of the U.S. and Canada, primarily in Manitoba. In the five-year period following its release in 1971, over 1.3 million dollars worth of seed was sold. M70 has been planted further south than its zone of adaptation for double cropping after peas, wheat, etc. It has also been used for emergency planting after hail, floods, etc.

PI 251934 is an early maturing line, requiring only 53 days from planting to mid-silk at Ames.

(3) Sunflower

Three sunflower introductions contributed germplasm to four North Dakota high oil disease-resistant parental lines, HA 300, HA 301, HA 302, and HA 303. The three introductions are PI's 372172, Peredovik 301; 372173, Peredovik 304; and 371936, Voshod, all from USSR. The CMS line, PI 343765 from France, contributed genes for fertility restoration in male-sterile cytoplasm.

(4) Beans

resistant (a) PI 165078, Phaseolus vulgaris from Turkey, contributed bacterial wilt/germplasm to the dry bean variety 'Great Northern STAR' released by the Nebraska AES. PI 165078 is tolerant to three strains of bacterial wilt--yellow, orange, and purple.

"'GN STAR' was named after Son-of-Star, a Hidatsa Indian, who provided Oscar H. Will, Oscar H. Will Company, Bismark, North Dakota, in 1887, with some 'Great Northern' dry bean seed. The seed was then advertised and this is the first record of the GN bean in the seed trade."

(b) The leaves of PI 165421, Phaseolus coccineus from Mexico, was highly tolerant to all isolates of Xanthomonas phaseoli which were tested. The leaves were also tolerant to X. phaseoli, Brazil isolate. All P. vulgaris PI lines were susceptible to this isolate, although tolerant to other isolates. The pods of PI 165421 were susceptible to the X. phaseoli Brazil isolate.

(c) PI 207262, Phaseolus vulgaris from Colombia, has tolerance to common blight (Xanthomonas phaseoli).

(5) Cucumbers

Cytological investigations of 50 wild Cucumis introductions revealed the presence of three tetraploid species with $2n = 48$ chromosomes and one hexaploid species with $2n = 72$ chromosomes, while all other species are diploid containing $2n = 14$ or $2n = 24$ chromosomes. The work, which was done at Colorado State University, indicates that all polyploids are perennial, have efficient vegetative reproduction systems, and may have originated from the spontaneous formation of polysomatic cells.

(6) Onion

PI 294455, Allium cepa from Great Britain, has good storage qualities.

(7) Peas

PI's 193586 and 193835, Pisum sativum, both from Ethiopia, contributed germplasm resistant to Pea Seedborne Mosaic Virus to the Wisconsin-released Wis 7105 and Wis 7106.

(8) Tomatoes

Of 97 lines of tomato species of plant introductions and commercial varieties evaluated in Canada, 18 introductions were resistant to the foot and root

rot pathogen, Fusarium oxysporum in pot tests, and 19 were resistant in a seedling assay method. No resistance was found among 21 commercial field and greenhouse cultivars. There was a direct correlation between the production of adventitious roots and the degree of stem girdling at soil level, a response that possibly could be exploited as a disease escape mechanism.

b. Accomplishments at the Regional Station

(1) New agronomic, horticultural and industrial plant introductions received in 1976 totaled 800 accessions, including 200 wild native sunflowers and 180 tomatoes collected by H. F. Winters and R. L. Clark in Central America. 2500 were grown for seed increase and revitalization, plus 1100 for insect and disease evaluations. About 800 to 1000 were carried over from 1975. More than 13,200 packets of seed and plants were distributed.

(2) Plant introductions were evaluated in the field and greenhouse for disease and insect resistance:

(a) Disease screening:

1/ Tomato fruit rot (Rhizoctonia solani) evaluations were made on another 350 introductions. PI 294449, which looked very good in the 1975 tests, looked good again in 1976, with 15 healthy fruits out of 23 inoculated. PI 339326, a large-fruited line from Turkey, showed promise in its first year of testing, 1976, with 43 healthy fruits out of 60 inoculated.

Crosses between 193407, earlier reported to have fruit rot resistance, and 306137, a large-fruited susceptible line, indicated the dominance of resistance in the F_1. F_2 populations will be evaluated next summer to try to determine how many genes are involved.

2/ Diplodia stalk rot inoculations were made on 120 lines. Data are yet to be analyzed in comparison to stalk strength characteristics. These data will be obtained on the Instron machine in Dr. Foley's lab, ISU. The most promising stalk rot resistance appeared in 357103 and 357128, both exhibiting as much resistance as AES704, the resistant check. Other lines with almost as good a level of resistance were: 357093, 357095, 357096, 357097, 357100, 357108, 357111, 357118, 357125, 357126, 357129, 393725, 393732, and 393757.

3/ Rust evaluations were made on the 120 lines in the stalk rot plots. Highly rust-susceptible checks (PI 228167) were interspersed throughout the plots to provide a source of inoculum. The best resistance (mature plant, polygenic type) appeared in: 357093, 357094, 357108, 357114, 357118, 357121, 357124, 357128, and 357129, all from Ethiopia.

(b) Disease control:

1/ The three-year downy mildew program for new sunflower introductions was continued. Only a couple of systemically infected seedlings were found in the seed increase plots. The sunflowers in the entomologist's plot, however, had many infected seedlings. Since this land had been in sunflowers in 1975, most of these probably represented infections from soil-borne inoculum. All downy mildew infected plants were destroyed.

2/ Cucurbita and Cucumis seedlings were again examined in the greenhouse for virus symptoms, diseased plants being rogued.

(c) Insect resistance screening:

1/ Corn introductions were evaluated in the field for resistance to larvae of the European corn borer. Introductions which showed both resistance to sheath feeding and had low numbers of stalk cavities were 186209, 209135, 218183, 218191, and 226685.

2/ Sunflowers were evaluated for resistance to sunflower moth; 37 accessions (out of 351 tested) were not infested but need further evaluation.

Earlier flowering sunflower introductions tended to be more heavily infested than did those that flowered later.

3/ Peppers were evaluated for resistance to green peach aphid. No accessions were resistant, but a number of individual plants showed either tolerance or a low level of resistance. These plants were selected and grown for seed increase.

(3) Ornamental evaluation and distribution: Our horticulturist retired on January 1, 1976, so we were without professional assistance in this area during the year. However, because of plans for distributing ornamental material that he prepared prior to retirement, we were able to proceed with the usual spring distribution.

Cooperators at 35 trial sites in the NC Region planted 22 ornamental species, or a total of 1294 plants as part of the regional trial program of the NC-7 Ornamental Plants Subcommittee. At the same time, six of the NC Region's arboreta received 464 plants. Miscellaneous distribution amounted to 44 plants to seven different sites.

A horticulturist has been appointed and will report for duty on March 28, 1977.

c. Domestic Exploration

Exploration for superior pecans continues. The states of Missouri, Kansas, and Illinois are cooperating in this venture. The work is still in the exploratory phase, i.e., to search for and locate superior trees. Later, collections of nuts and scionwood will be made.

d. Regional Cooperative Program

The Ohio station assisted with the increase and evaluation of another 150 tomato introductions in 1976. The Nebraska and Indiana stations continue to systematically evaluate new alfalfa introductions for insect resistance, and data is given to the Regional Station. Other stations in the region continue to evaluate plant introductions, as needed, in search of desired plant traits for inclusion in their breeding programs.

4. USEFULNESS OF FINDINGS:

Plant introductions continue to provide valuable germplasm for plant traits, disease and insect resistance and other traits that are useful to plant breeders for developing and improving crop varieties, which benefits the general public. The evaluation of plant introductions and the exchange and dissemination of information and seed, through the NC-7 project, helps to better serve crops workers. The permanent maintenance and preservation of plant introductions assures a valuable germplasm pool for present and future use.

5. WORK PLANNED FOR NEXT YEAR:

a. Continue (i) program of seed increase, storage, preliminary evaluation; (ii) pathology and entomology screening and evaluation work; (iii) check new plant introductions for abnormalities; (iv) local and regional testing of new crops and ornamentals, and (v) coordination of regional cooperative programs.

b. Assist the Missouri and other stations with domestic exploration for native pecans in the southern part of the region.

6. PUBLICATIONS ISSUED OR MANUSCRIPTS PREPARED DURING THE YEAR:

Publications that concern information from the North Central Region on plant introductions are listed below. Publications from other regions on NC07 primary maintenance crops are listed in Appendix A.

a. Regional Station Publications [author(s) is a member of the Regional Station staff]:

(1) Sowell, Grover, Jr., S. W. Braverman, R. L. CLARK, R. V. Connin, S. M. Dietz, B. J. Fiori, J. L. JARVIS, G. R. Pesho, and H. F. Winters. 1976. A summary of reports on the resistance of plant introductions to diseases, insects, and nematodes. Capsicum spp. (Printed and distributed by S-9 Plant Introduction Station, Experiment, Georgia.)

(2) Skrdla, W. H. 1975. The U.S. Plant Introduction system. HortScience 10: 570-574.

(3) Gunn, C. R., W. H. Skrdla, and H. C. Spencer. ____. Classification of Medicago sativa L. using legume characters and flower colors. (In manuscript.)

(4) Mock, J. J., and W. H. Skrdla. ____. Evaluation of maize plant introductions for cold tolerance. (In manuscript.)

b. State Station Publications

(1) Fick, G. N., D. E. Zimmer, and T. E. Thompson. 1976. Wild species of Helianthus as a source of variability in sunflower breeding. Proc. Sunflower Forum, Fargo, No. Dakota, January 1976, pp. 4-5.

c. Journal Articles

(1) Iowa

(a) Carlson, I. T. 1973. Registration of Carroll birdsfoot trefoil. Crop Sci. 13(5): 579-580.

(2) Minnesota

(a) Robinson, R. G. 1973. Registration of Alden annual canarygrass. Crop Sci. 13(6): 771-775

(b) Robinson, R. G. 1976. Registration of Petite tickbean. Crop Sci. 16(1): 124.

(c) Hovin, A. W., C. C. Berg, E. C. Bashaw, R. C. Buckner, D. R. Dewey, G. M. Dunn, C. S. Hoveland, C. M. Rincker, and G. M. Wood. 1976. Effects of geographic origin and seed production environments on apomixis in Kentucky Bluegrass. Crop Sci. 16(5): 635-638.

(3) Nebraska

(a) Coyne, D. P., and M. L. Schuster. 1976. 'Great Northern Star' dry bean tolerant to bacterial diseases. HortScience 11(6): 621

(b) Nelson, L. A. 1976. Registration of Dawn proso millet. Crop Sci. 16(5): 739.

(c) Vogel, K. P., V. A. Johnson, and P. J. Mattern. 1976. Protein and lysine content of grain, endosperm, and bran of wheats from the USDA World Wheat Collection. Crop Sci. 16(5): 655-660.

(4) North Dakota

(a) Fick, G. N., and D. E. Zimmer. 1975. Linkage tests among genes for six qualitative characters in sunflowers. Crop Sci. 15(6): 777-779.

(5) Ohio

(a) Nault, L. R., D. T. Gordon, D. C. Robertson, and O. E. Bradfute. 1976. Host range of maize chlorotic dwarf virus. Plant Disease Reptr. 60(5): 374-377.

(6) South Dakota

(a) Semeniuk, G., and M. D. Rumbaugh. 1976. Reaction of some perennial and annual Medicago species and cultivars to the yellow leafblotch disease caused by Leptotrochila medicaginis. Plant Disease Reptr. 60(7): 596-599.

(7) Wisconsin

(a) Bingham, E. T. 1975. Registration of alfalfa germplasm from cultivated x wild hybrids. Crop Sci. 15(6): 889.

(b) Kelly, J. D., and F. A. Bliss. 1975. Quality factors affecting the nutritive value of bean seed production. Crop Sci. 15(6): 757-760.

(c) Kelly, J. D., and F. A. Bliss. 1975. Heritability estimates of percentage seed protein and available Methionine and correlations with yield in dry beans. Crop Sci. 15(6): 753-757.

(d) Murray, G. M., D. P Maxwell, and R. R. Smith. 1976. Screening Trifolium species for resistance to Stemphylium sarcinaeforme. Plant Disease Reptr. 60(1): 35-37.

(8) USDA, Beltsville

(a) Webb, R. E., and C. E. Thomas. 1976. Development of F_1 spinach hybrids. HortScience 11(6): 546.

(9) USDA-ARS Series

(a) Barry, B. D., J. A. Burnside, and H. S. Meyers. 1976. Cucumis species resistance to striped cucumber beetle seedling feeding and bacterial wilt. U.S. Dept. of Agr. ARS-NC-46. Aug. 1976. 33 pp.

7. APPROVED:

Mar. 8, 1977
Date

C. E. Wassom
Chairman, Technical Committee
C. E. Wassom

3/11/77
Date

R. W. Hougas
Regional Administrative Adviser
R. W. Hougas

MISCELLANEOUS PUBLICATIONS

1. Publications

The publications listed below are from other regions, and foreign sources, but concern NC-7 primary maintenance crops:

a. Alfalfa

(1) Beard, D. F., and I. I. Kawaguchi. 1973. Registration of W.L. 216 alfalfa. Crop Sci. 13(1): 128-129.

(2) Hanna, M. R., and E. J. Hawn. 1976. Registration of Trek alfalfa. Crop Sci. 16(3): 444.

(3) Pesho, G. R. 1975. Clover root curculio: Estimates of larvae injury to alfalfa tap roots. J. Econ. Entomol. 68(1): 61-65.

(4) Taylor, N. L. 1956. Pubescence inheritance and leafhopper resistance relationships in alfalfa. Agron. J. 48:78-81.

b. Panicum

(1) Keck, R. W., and W. L. Ogren. 1976. Differential oxygen response of photosynthesis in soybean and Panicum milioides. Plant Physiol. 58:552-555.

c. Cucumber

(1) Dane, F., and T. Tsuchiya. 1976. Chromosome studies in the genus Cucumis. Euphytica 25:367-374.

d. Tomato

(1) Henderson, W. R., and S. F. Jenkins, Jr. 1972. Venus & Saturn -- Two new tomato varieties combining desirable horticultural features with southern bacterial wilt resistance. North Carolina AES Bull. 444. 13 p.

(2) Jarvis, W. R., and H. J. Thorpe. 1976. Susceptibility of Lycopersicon species and hybrids to the foot and root rot pathogen Fusarium oxysporum. Plant Disease Reptr. 60(12): 1027-1031.

(3) Thyr, B. D. 1976. Inheritance of resistance to Corynebacterium michiganense in tomato. Phytopathology 66(9): 1116-1119.

e. Corn

(1) Good, R. L., and E. S. Horner. 1974. Effect of normal cytoplasms on oo resistance to southern corn leaf blight and on other traits of maize. Crop Sci. 14(3): 368-370.

f. Brassica and Crambe

(1) Armstrong, G. N., and J. K. Armstrong. 1974. Wilt of Brassica carinata, Crambe abyssinica, and C. hispanica caused by Fusarium oxysporum f. sp. conglutinans race 1 or 2. Plant Disease Reptr. 58(5): 479-480.