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, 1972

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 — E. F. Frolik, Nebraska
Regional Coordinator — W. H. Skrdla, Iowa

State Experiment Stations and Representatives

Nebraska	*J. H. Williams, Chm.	Minnesota	*L. C. Snyder
Alaska	*R. L. Taylor	Missouri	*A. D. Hibbard
Illinois	*E. B. Patterson	North Dakota	*C. A. Peterson
Indiana	*K. J. Leesman, Sec'y	Ohio	*M. H. Niehaus
Iowa	*I. T. Carlson	South Dakota	*R. M. Peterson
Kansas	*C. E. Wassom	Wisconsin	*W. H. Gabelman
Michigan	*R. L. Andersen		

U.S. Department of Agriculture

Agricultural Research Service	*J. L. Creech
Cooperative State Research Service	C. I. Harris
Soil Conservation Service	*R. S. MacLauchlan
Northern Regional Research Laboratory	*W. H. Tallent
U.S. Forest Service	*D. H. Dawson
Agricultural Research Service	*J. L. Jarvis, Iowa

*Voting members of NC-7 Technical Committee

North Central Regional Plant Introduction Station Staff, Ames, Iowa

Regional Coordinator	W. H. Skrdla
Horticulturist	A. F. Dodge
Plant Pathologist	R. L. Clark
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 1972, that are considered to have made important contributions to plant breeding programs and to U.S. agriculture. Additional reports, described in greater detail, are provided in Appendix C of this report, titled "Promising Plant Introductions for 1972".

(1) Reed Canarygrass

Individual plants within 12 plant introductions were selected at Minnesota for low total alkaloid concentration and used as parents in crosses to evaluate their agronomic characteristics.

(2) Corn

(a) At the Florida Station, 12 corn introductions are considered to have sufficient resistance to Southern Corn Leaf Blight (H. maydis) for use in a resistance breeding program.

(b) From Illinois, information was received that corn hybrids with Ht resistance to H. turcicum from PI 217407, Ladyfinger popcorn, were widely used in the northern corn belt in 1972. This resistance gave excellent protection against Northern Corn Leaf Blight. These hybrids were planted on an estimated 5 million acres. It is also estimated that 30 to 50 bushels per acre more yield was obtained because of resistance. At $1.50 per bushel, this could mean an additional $200 millio income for farmers.

(3) Crownvetch

Two of five crownvetch lines used in an improvement and selection program at Illinois were plant introductions. The selection of these lines was based on two years' observations of relative yield, vigor, regrowth after cutting, winterhardiness and other characteristics. PI 238142, Turkey, has fine leaves, good yield

and vigor, high protein and very good prairie vole performance in growth study. PI 325264, USSR, has good yield and vigor and very high protein and low lignin content.

(4) Sunflower

At Minnesota, nine sunflower introductions from Russia were reported to be immune to Sclerotinia stalk rot, rust, and downy mildew. Of the nine introductions, seven are named varieties of Helianthus tuberosus, one is a cross between H. tuberosus and H. annuus and one is a cross of H. tuberosus x H. annuus x H. mecrophyllus. These are all non seed producing lines and available as tubers only.

(5) Cucumbers

(a) PI 200818, from Burma, was used in the development of WR18, a bacterial wilt resistant cucumber, by backcrossing for five generations to SMR18. The work, at Wisconsin, included a study using WR18 on the miltiplication and movement of Erwinia tracelphila in resistant and susceptible cucurbits.

(b) Three cucumber introductions, PI 196289 and PI 197087 from India and PI 220860 from Korea, contributed to the newly released variety 'Carolina' which has moderate to good resistance to downy and powdery mildews, anthracnose, scab, angular leafspot, cucumber and watermelon mosaic viruses.

(c) The cucumber introduction PI 212233 from Japan, contributed powdery mildew resistance to the cultivar 'Spartan Salad' released by the Michigan Station in September, 1972.

(6) Carrots

(a) PI 226043 from Japan was crossed with commerical types in a breeding program for Alternaria resistance at Wisconsin. Six additional accessions need further evaluation for possible use as sources of Alternaria; three from Netherlands, one from England and two from Japan. However, better resistance, than that presently available, is still needed.

(b) Two carrot introductions from Japan, PI 226043 and PI 294090 and one from Netherlands, PI 261648, were found to have outstanding resistance to Alternaria dauci fungus, a serious economic disease in Florida. The resistance is not complete immunity as the leaflets still become infected in the form of local lesions, but the disease spreads much more slowly.

(7) Lettuce

(a) Of 178 plant introductions tested four years in Wisconsin, five showed no infection in heavily infested fields where susceptible cultivars suffered extensive losses. An additional four introductions showed tolerance or resistance.

(b) PI 171669 contributed root rot resistance to the variety 'Marquette' released by the Wisconsin Station.

(8) Tomatoes

(a) Three tomato introductions were found to have resistance to bacterial canker and were used in a canker virulence test in Wyoming. Two are wild species from Ecuador (PI 251305, Lycopersicon hirsutum var. glabratum) and Utah (PI 344102, Lycopersicon pimpinellifolium, 'Red Currant') and the third is PI 330727, 'Bulgaria #12' from Bulgaria.

(b) PI 330727 also contributed resistance to the bacterial canker resistant line H 2990 released jointly by Heinz U.S.A. and ARS, USDA. It is also resistant to Verticillium albo-atrum and Fusarium oxysporum f. lycopersici Race 1.

(c) Four tomato introductions were found to have resistance to ozone.

(d) A wild species from Peru, PI 126449, contains an ethanol soluble factor that is highly detrimental to developing fruitworm larvae.

(9) Solanum (ornamental)

PI 247828, Solanum nodiflorum, from Belgian Congo received considerable publicity for its ornamental value. It produces a fairly large, well-shaped plant with purple stems that bear bright red fruit about an inch in diameter. Stems with fruit that are cut in the fall dry well and make desirable material for winter flower arrangements. As the fruit dries, it wrinkles slightly but this adds interest to the surface texture. The dry fruit retains its bright red color and remains firmly attached to the stem. The plant itself makes an attractive outdoor planting at the

Georgia Experiment Station, Griffin. Five reports were received from users of this material in the North Central Region. Since it is a sub-tropical plant, it should be started indoors early, like about March, or earlier.

(10) Pistachia

The Wichita, Kansas, Department of Parks and Recreation has made extensive use of the Chinese pistache. The first pistache plants for this Kansan undertaking came from the Plant Introduction Station, Chico, California. At Chico the pistachia had been grown since its introduction by F. N. Meyer, from the Wei-tsan Mountains near Peking, China in 1906. Following ecesis of the Wichita trial plants, hundreds of these trees have been grown from local seed. This deciduous tree serves as a globe-headed street tree, and informally as both ornament and shelter in playground and picnic areas. Some of these park plantings were made on old denuded gravel pits. Here the Chinese pistache with its colorful early and late season foliage, as well as, its scarlet to purple berries is a successful ornamental introduction for a difficult site.

b. Accomplishments at the Regional Station

New agronomic, horticultural and industrial plant introductions received in 1972 totaled about 700, including ornamentals. For seed increase and rejuvenation, more than 3,000 accessions were grown, including 800 perennial accessions carried over from 1971. Special purpose plantings (720 accessions) included 135 corn accessions for corn borer resistance screening, 345 tomatoes for fruit rot resistance and 280 corn for blight and stalk rot resistance. Plant material distributed amounted to 13,000 seed packets and 1,670 ornamental plants for a total of 14,670 items distributed.

Plant introductions were evaluated in the field and greenhouse for disease resistance:

The last 280 introductions on our corn seed list were evaluated in the field for resistance to Diplodia stalk rot, rust, and smut. Only four lines (PI 303917, 340821, 340822, and 343951) showed enough resistance to stalk rot to warrant further testing. Nineteen lines showed some rust resistance (polygenic type) with five (PI [illegible] 340861, 340863, 340872, and 340873) of these showing good resistance. Only eight lines (PI 303928, 303931, 340819, 340825, 340830, 358522, 358533 and 358537) showed no smut on any of the forty plants in the four reps.

Another 340 tomato introductions were evaluated for fruit rot (Rhizoctonia) resistance. Fruits were taken from the field in the mature green stage and put in a sand bench heavily infested with R. solani. Only two (PI 205001 and 205044) showed good resistance, with less than 40 percent of the fruits rotted. Six others (PI 211838, 212432, 224592, 231729, 251315, and 251319) showed less than 65 percent of the fruits rotted. Rutgers was 100 percent rotted.

In a four-field study it was determined that sunflower downy mildew (Plasmopara halstedii) is seed-borne to a high extent in at least two lines, PI 256334 and PI 2563[illegible] This means we will continue to grow new introductions for three years in order to produce disease-free seed for distribution.

A virescence disease of Crambe which has been noted in our plots in previous years was determined to be other than aster yellows. Presently the causal agent is unknown but a virus is suspected, possibly turnip mosaic virus. Identification of the pathogen will be attempted during the next season.

More information on disease work at the Regional Station is available in Supplement I of this report.

Insect resistance evaluations were made on plant introductions, both in the field and greenhouse:

Pepper introductions were evaluated in the field for resistance to larvae of the European corn borer. Only sweet peppers were evaluated inasmuch as previous work had shown that the pungent principle in peppers, capsaicin, is responsible for the resistance to the borer in pungent and very pungent peppers. All sweet peppers that were tested were susceptible.

Corn introductions were evaluated in the field for resistance to second generation larvae of the European corn borer. Plants with eight or fewer cavities per plant are considered to be of sufficient resistance to evaluate further. Thirty-three corn introductions with eight or fewer cavities per plant were found in 1972. The following corn introductions had eight or fewer cavities per plant in both 1971 and 1972: PI 222612, 222614, 222631, and 222643. None of the other thirty-three introductions, showing potential resistance in 1972, were screened in 1971.

An unidentified lepidopterous larva was noted damaging the tubers of Helianthus annuus x H. tuberosus. Specimens were identified as Eucosma womonana. This is a native insect of no known previous economic importance. There are only three references to it in the literature, all of a taxonomic nature.

More detail on insect work at the Regional Station is available in Supplement II of this report.

Ornamentals forwarded on request totalled 1,666 plants. This included 1,267 plants of 14 coordinated regional trial introductions and 399 plants of 52 accessions. The coordinated regional trial introductions consisted of 7 trees, 5 shrubs, 1 ornamental grass and 1 herbaceous perennial. Five-year reports were prepared of 16 regional trial introductions planted in 1966.

c. Domestic exploration

The exploration for native grasses in South Dakota, sponsored by NC-7, was concluded on June [redacted], 1972. More than 1,000 collections from 50 co[redacted] Big Bluestem, Indiangrass and Switchgrass were collected and are now being evaluated.

On July 1, 1972, the domestic exploration project, sponsored by NC-7, for native pecans in Kansas, Missouri, Illinois and Oklahoma, became effective.

d. Regional Cooperative Program

The Ohio Station assisted with the increase and evaluation of 150 new tomato introductions. The Nebraska and Indiana Stations continue to evaluate new alfalfa introductions for insect resistance.

4. USEFULNESS OF FINDINGS:

Plant introductions continue to provide valuable germplasm for plant characters, 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 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 (1) program of seed increase, storage, preliminary evaluation; (2) pathology and entomology screening work; (3) local and regional testing of new crops and ornamentals; and (4) coordination of cooperative program.

b. Assist the Missouri station, and others, 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 NC-7 primary maintenance crops are listed in Appendix A.

a. Regional Station Publications

(1) Clark, R. L. 1972. Longevity of ergot sclerotia in cold storage. Phytopathology 62(7):750-751.

(2) Dodge, A. F. 1972. Five-year report on regional plantings of ornamental and shelter plants in the North Central Region 1966-1970. North Central Regional Plant Introduction Station, Ames, Iowa. 18 pp. 17 tables.

(3) Jarvis, J. L., and W. D. Guthrie. 1972. Relation of horticultural characteristics of peppers to damage by larvae of the European corn borer. Iowa State J. Sci. 46(4):463-470.

(4) Skrdla, W. H. 1972. New crops--food for the future? HortScience 7(2): 156-159.

b. State Station Publications

(1) Nebraska

(a) Coyne, D.P., and M. L. Schuster. 1972. Release of 'Emerson' - a new large-seeded Great Northern dry bean variety tolerant to bacterial wilt disease. Vegetable Research Report, Nebraska, AES PR 93:2-3.

(b) Coyne, D. P., and M. L. Schuster. 1972. Progress in development and performance of an early maturing common blight tolerant Great Northern dry bean. Vegetable Research Report, Nebraska, AES PR 93:4-8.

(c) Coyne, D. P., and M. L. Schuster. 1972. Progress in combining high tolerance to common blight and bacterial wilt diseases and earliness in Great Northern dry beans. Vegetable Research Report, Nebraska AES PR 93:11-12.

(d) Hill, K., D. P. Coyne, and M. L. Schuster. 1972. Leaf, pod and systematic chlorosis reactions in Phaseolus vulgaris to halo blight bacterium controlled by different genes. Vegetable Research Report, Nebraska AES PR 93:21-22.

(e) Steadman, J. R., and D. P. Coyne. 1972. Root rot resistance trials of plant introduction and breeding lines at Scotts Bluff, Nebraska--1971. Vegetable Research Report, Nebraska AES PR 93:27.

(2) Ohio

(a) Alexander, L. J., and G. L. Oakes. 1971. Ohio M-R 9 and Ohio M-R 12: two new tomato varieties resistant to five Ohio strains of TMV. Ohio Agr. Res. Dev. Center Res. Bul. 1045, 19 pp.

c. Journal Articles

(1) Iowa

(a) Eberhart, S. A., A. R. Hallauer and W. A. Russell. 1972. Registration of four maize germplasm synthetics. Crop Sci. 12:132.

(2) Nebraska

(a) Hill, K., D. P. Coyne and M. L. Schuster. 1972. Leaf, pod, and systemic chlorosis reactions in Phaseolus vulgaris to halo blight controlled by different genes. J. Amer. Soc. Hort. Sci. 97(4):494-498.

(3) North Dakota

(a) Zimmer, D. E. and M. L. Kinman. 1972. Downy mildew resistance in cultivated sunflower and its inheritance. Crop Sci. 12(6):749-751.

(4) Ohio

(a) Alexander, L. J., G. L. Oakes and C. A. Jaberg. 1971. Additional studies with tomato mutant, curl. J. Hered. 62(3):197-200.

(b) Alexander, L. J., G. L. Oakes, and C. A. Jaberg. 1971. The production of two needed mutations in tomato by irradiation. J. Hered. 62(5):311-315.

(5) Wisconsin

(a) Newton, H. C. and L. Sequeira. 1972. Possible sources of resistance in lettuce to Sclerotinia sclerotiorum. Plant Disease Reptr. 56(10):875-878.

(b) Hagedorn, D. J., R. E. Rand and S. M. Saad. 1972. Phaseolus vulgaris reaction to Pseudomonas syringae. Plant Disease Reptr. 56(4):325-327.

(c) Sequeira, L. and J. B. Raffray. 1971. Inheritance of downy mildew resistance in two plant introductions of Lactuca sativa. Phytopathology 61(5): 578-579.

(d) Watterson, J. C., P. H. Williams, and R. D. Durbin. 1972. Multiplication and movement of Erwinia tracheiphila in resistant and susceptible cucurbits. Plant Disease Reptr: 56(11):949-953.

(6) USDA, Beltsville

(a) Adamson, W. C., G. A. White and J. J. Higgins. 1972. Variation in leaf development and dry matter yield among kenaf varieties and introductions. Crop Sci. 12(3):341-343.

(b) Allen E. H. and W. P. Wergin. 1972. Development of Fusarium wilt disease in a susceptible introduction of Lycopersicon pimpinellifolium. Phytopathology 62:743.

(c) Barksdale, T. H. 1972. Resistance in tomato to six anthracnose fungi. Phytopathology 62(6):660-663.

(d) Barksdale, T. H. 1972. Anthracnose resistance in F_2 populations derived from ten tomato introductions. Plant Disease Reptr. 56(4):321-323.

7. APPROVED:

January 19, 1973
Date

J. H. Williams
Chairman, Technical Committee
J. H. Williams

January 19, 1973
Date

E. F. Frolik
Regional Administrative Adviser
E. F. Frolik

MISCELLANEOUS PUBLICATIONS

1. Printed Publications.

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

a. Pumpkin

(1) Fassuliotis, G. 1971. Susceptibility of Cucurbita spp. to the root-knot nematode, Meloidogyne incognita. Plant Disease Reptr. 55(8):666.

b. Tomatoes

(1) Kerr, E. A., Z. A. Patrick and D. L. Bailey. 1971. Resistance in tomato species to new races of leaf mold (Cladosporium fulvum CKE). Hort. Res. (Canada) 11:84-92.

(2) Patrick, Z. A., E. A. Kerr, and D. L. Bailey. 1971. Two races of Cladosporium fulvum new to Ontario and further studies of Cf_1 resistance in tomato cultivars. Can. J. Bot. 49(2):189-193.

(3) Pelham, J. 1972. Strain - genotype interaction of tobacco mosaic virus in tomato. Ann. Appl. Biol. 71:219-228.

(4) Thyr, B. D. 1972. Virulence of Corynebacterium michiganense isolates on Lycopersicon accessions. Phytopathology 62(9):1082-1084.