

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, 1979

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

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W. H. Skrdla, Iowa

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Illinois	*T. Hymowitz	Nebraska	*J. H. Williams
Indiana	*M. L. Swearingen	North Dakota	*J. S. Quick
Iowa	*I. T. Carlson	Ohio	*S. Z. Berry
Kansas	*C. E. Wassom	South Dakota	*R. M. Peterson, Chmn
Michigan	*R. L. Andersen	Wisconsin	*W. H. Gabelman
Minnesota	*H. Pellett		

U.S. Department of Agriculture

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3. PROGRESS OF WORK AND PRINCIPAL ACCOMPLISHMENTS:

a. Introductions Having Special Value

Described below are plant introductions reported by cooperators in 1979, that are considered to have made important contributions to plant breeding programs and to U.S. Agriculture.

(1) Alfalfa

(a) Alfalfa PI's 228152 from USSR, 231731 from Wisconsin ex USSR, 251689, and 263154, both from USSR contributed 89% of diploid M. falcata germplasm to the Wisconsin germplasm release, W76-42 in 1979.

(b) Reported in volume 19(2) of Crop Science was the release of the C-6 alfalfa (Medicago sativa and M. falcata) germplasm pool by USDA, SEA, AR and the Colorado AES in 1978. According to the registration notice, C-6 traces to a collection of drought-resistant selections made by A. C. Dillman at Bel Fourche, SD, between 1910 and 1914 and to a collection assembled at Mandan, ND. Both collections trace directly to introductions made by N. E. Hansen in the early 1900's. The selections used provided 24 of the 36 entries of the C-6 germplasm pool. Origins of those 24 entries include: PI 19534, (M. falcata from Samara Province, USSR, PI 20571, M. media, PI 20726, wild M. falcata from

Samara Province, PI 20714, 'Cossadi', PI 23625, M. falcata from Orenburg, USSR, PI 24452, M. falcata from Tomsk, Province, Siberia, PI 25192, PI 27288, and PI 28070, all M. falcata from Semipalatinsk Region, Siberia.

(c) Several Plant Introduction alfalfa were used in the variety 'Classic' developed by FFR Cooperative. The identity and specific contributions of individual lines is not known because the PI's were used in a germplasm pool and contributed traits indirectly in this way.

(d) Alfalfa PI's 346919, Medicago sativa ssp praefalcata from USSR and 315484, M. sativa ssp sativa, also from USSR were used in Kansas in a study of glandular trichomes on Medicago species. Plants having this trait were found in both accessions.

(2) Canarygrass

(a) A single plant selection of annual canarygrass (Phalaris canariensis) from PI 250741, Iran, was released as the variety 'Keet' by the Minnesota AES in 1979.

(3) Corn

(a) The corn introduction, PI 217473 is early and has good combining ability after two cycles of recurrent selection.

(4) Cucumber

(a) Cucumber PI 390244 (Hyuga 2) from Japan has tolerance to Atrazine.

(b) PI 308915, Cucumis sativus from the USSR is useful as a gene marker. It carries the double recessive gene for crinkled leaf, cr cr, and the recessive gene for green fruit. It also has short internodes.

(c) At Missouri, it was found that the resistant reaction to cucumber mosaic virus, CMV-M, infection in Mungbean, Phaseolus aureus (Vigna radiata), strain PI 271401, in crosses with susceptible strains PI 201868 and 368307, was conditioned by a single dominant gene designated Cmm. The Cmm locus was not linked with loci controlling color of seed texture layer or color of seed coat.

(d) An extreme dwarf cucumber was found in PI 308916 from USSR. It is controlled by the homozygous recessive state of a simply inherited gene, designated cp for compact. The dominant allele yields the standard vine type plant. The plant has short internodes, a brachytic type stem, poorly developed tendrils, and small flowers. Seed is about 1/3 the size of standard cultivars. PI 308915, also from USSR, exhibits similar traits.

(5) Orchardgrass

(a) Orchardgrass yield tests at Lethbridge, Alberta, Canada, show that over a 4-year period of a 1974 forage test, PI's 315420 and 325298 had a great yield advantage during the third harvest. In a 3-year 1975 forage test, PI 325298 shows promise because it ranked second in forage production following 'Chinook'.

PI 315420 is the USSR variety 'Pervomaskaja' collected by Jones and Keller in 1975. PI 325298 was collected from the wild near Stavropol by Skrdla in 1967.

(6) Red fescue

(a) Festuca rubra, from Netherlands, 237182, was released by MSU as the variety 'Wintergreen'. The cultivar is handled by Northrup King and is having good acceptance in France where it is the first U.S. turfgrass cultivar to be licensed in Europe. It proved to be rust resistant in France.

(7) Spinach

(a) The spinach breeding lines ARK 120 and AR 200 x 202 derived their resistance to white rust from the original source possessed in PI 165560 from India.

(8) Sunflower

(a) A morphological trait in sunflower called "Chaffy head" was derived from PI 175728 introduced from Turkey. The trait is characterized by completely sterile heads having a massive proliferation of chaffy vegetative tissue where disk florets, and later achenes, usually form. The resulting head is revolute, extremely contorted, more or less globular, and usually splits in the center of the disk early in development. Ray flowers are not usually present nor are the usual disk florets. The symbol ch is suggested for this chaffy head character that is apparently conditioned by a single recessive gene.

(9) Tomato

(a) PI's 126445 and 127826, both L. hirsutum from Peru and 126449 L. hirsutum f. glabratum from Peru demonstrated the highest level of resistance to tomato pinworm and the vegetable leafminer as measured by the number of vegetable leafminer mines and damaged larvae of the pinworm. Levels of resistance to either insect in L. esculentum accessions studies appeared intermediate.

L. esculentum 128230 from Bolivia and 140403 from Iran were moderately resistant to both insects in at least 2 tests.

(b) PI's 213189 from Greece, Sel. T. 1385 'Early Chatham', and 298633 from USSR, 'Pioneer 2761', were used in the pedigree of 'Oregon Cherry' (OSU T6-16) a tomato released in 1978.

(c) The tomato, PI 272735 from San Salvador is being used in the breeding program at Alabama for fruit flavor, high soluble solids and heat tolerance; PI 204998 from West Virginia, Lycopersicon esculentum x L. pimpinellifolium is being used for superior heat tolerance; and PI 379039, L. cheesmanii from Ecuador for earliness, soluble solids, and heat and salt tolerance.

(d) 'Auburn 76' FMN tomato developed by Greenleaf and released by the Alabama Agricultural Experiment Station in 1977 incorporates the 3 dominant gene pairs I/I from L. pimpinellifolium Acc. 160 (PI 79532, Peru), Mi/Mi from L. peruvianum PI 128657, Peru, and Tm_2a/Tm_2a from L. peruvianum, PI 128650, Chile.

(10) Ornamentals

(a) Crabapple

1/ Crabapple cultivar 'Jackii', PI 54083, has been reported to be resistant to scab, fire blight, and blotch. This flowering crabapple provides a year round display of excellent foliage, flowers, and fruits, and is highly recommended for landscape use in the North Central Region except Alaska.

(b) Dianthus

1/ PI 371894, Dianthus plumarius introduced from Siberia, has been released as Dianthus cv. 'Snow King' by the Nebraska Agricultural Experiment Station.

(c) Impatiens

1/ PI 349629 ($2n = 16$), and 354252, 354254, and 354259 ($2n = 32$), Impatiens introduced from New Guinea in 1970 by Harold Winters of the USDA-SEA-AR, were used in the parentage of the new Impatiens cv. 'Blue Moon' developed and released by the Iowa State University.

b. Accomplishments at the Regional Station

(1) New agronomic, horticultural, and industrial plant introductions received in 1979 totalled 850 accessions. About 2,000 accessions were grown for seed increase plus 1330 for insect and disease evaluations. More than 12,200 packets of seed and plants were distributed. About 250 individual seed requests were received, 70 from foreign sources and 180 from domestic sources.

Incoming collections included 80 corn from Italy, 100 Setaria italica from an exploration in Taiwan (starch was classified as "sticky" vs "non-sticky"), 300 tomatoes from the People's Republic of China and 90 sunflowers including 20 from Indian tribes in Southwestern U.S.

(2) Construction of a metal frame shop and equipment storage building was completed in early summer of 1979. This building will greatly enhance our facilities for storing and maintaining farm equipment. This building was constructed with AR funds in the amount of \$125,000.

(3) Construction of a 60 x 220 foot office, laboratory, and seed processing building was begun in the fall of 1979 with scheduled completion in the summer of 1980. This building will provide much needed space and will enhance our research and seed production work. Funds for building are Regional Research Funds in the amount of \$350,000.

(4) A cooperative agreement with the University of Nevada at Reno for increasing seed of alfalfa introductions under cages is being continued. One hundred fifty cages

were constructed and planted, with 1979 being the first seed year. The seed will be sent to the regional station at Ames for storage. Plans are to continue the work in 1980.

(5) A cooperative agreement with South Dakota State University was negotiated for the production and harvest of a collection of native grasses. The first seed harvests under the contract were made in the fall of 1979. The work is being continued in 1980.

(6) One plant exploration was conducted in 1979. This was the final phase of a three phase exploration to Mexico, Central, and South America. This exploration extended into Southern Mexico, Belize, and Guatemala, in January and February 1979 and was conducted by R. L. Clark and H. F. Winters. A total of 423 accessions were collected including 55 tomatoes, 84 peppers, and 164 Cucurbita species, mostly squash.

(7) Reserve quantities of seed of about 324 accessions were sent to the National Seed Storage Laboratory in 1979. This included 111 sunflowers and 112 radish.

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

(a) Disease resistance screening

1/ Disease screening

a/ Tomato fruit rot (Rhizoctonia solani) evaluations were made on 253 lines, 18 of which need further evaluation as possible sources of useful resistance. PI 193407 continues to exhibit resistance, but is not homozygous for this character.

Attempts to isolate and identify the substance in fruit extracts inhibiting growth of R. solani in culture are continuing.

b/ Diplodia stalk rot evaluations were made on 140 lines of PI corn using inoculated, replicated (6) field tests. The two best lines were PI 194384 and PI 227937, both exhibiting better stalk rot resistance than AES 704, but not quite as good as H533H.

c/ Rust evaluations were made on the 140 lines in the stalk rot plots and 5 (194384, 221817, 221820, 318723, and 415281) showed good polygenic type resistance, as represented by very few pustules on the entire plant.

2/ Disease control

a/ The three year program of sunflower seed production was continued. The purpose is to prevent seed borne downy mildew in our increase seed. No systemically infected plants were found in this year's planting.

b/ Cucumis and Cucurbita seedlings from original seed are still observed for Squash Mosaic Virus infections in the greenhouse. Diseased plants are rogued and destroyed.

c/ Several corn lines are being grown in the greenhouse for seed increase. These lines have proven to be very susceptible to smut in the field such that very few seeds are produced.

(b) Insect Resistance Screening

1/ A technique was developed for evaluating seedling corn plants for resistance to leaf feeding by black cutworm larvae. Although more time consuming, placing 3rd instar larvae in the whorl of seedlings was superior to scattering larvae on the soil surface. The optimum number of larvae to use was 2 per plant. Infesting corn plants 4-6 cm in extended leaf height resulted in more feeding and a better test than infesting plants 10-12 cm in extended leaf height.

A total of 2,626 corn genotypes were evaluated in the greenhouse for resistance to leaf feeding by 3rd and 4th instar black cutworm larvae. All genotypes were susceptible.

2/ A study was made to learn the effect of resistance to 2nd generation European corn borer in borer-resistant corn plant introductions on incidence of stalk rot of corn. A borer infestation in susceptible genotypes increased incidence of stalk rot; the increase was less in borer resistant genotypes. Statistical analysis of the data has not been completed but there appears to be numerous interactions and significant correlations among corn genotypes, borer damage, and incidence of stalk rot.

3/ Sunflower introductions were evaluated for resistance to bird damage. PI 204578, an ornamental sunflower from Turkey, was not damaged by birds. The head of this introduction is covered by long petals which remain on the head after seed set and apparently protect the seeds from bird feeding.

4/ No unusual insect problems were noted at the Plant Introduction Farm during the 1979 growing season.

(9) Ornamental Program

(a) In cooperation with the NC-7 Ornamental Subcommittee, 944 ornamental plants of 10 introductions were sent on request to the NC-7 Regional Trial Cooperators and Arboreta, Botanic Gardens, and Parks Cooperators in the North Central Region. Ornamental plant introductions sent on NC-7 Regional Trial included Betula Maximowicziana (PI 420323-420327), Betula nana (PI 414758), Fraxinum excelsior (PI 385251), Genista multibracteata, Picea Omorika (PI 399396), Pyrus communis (PI 418783), Rhus lancea (PI 419221), Syringa pekinensis, Taxus baccata (PI 399411, 399412), and Thuja Occidentalis.

1/ NC Regional Trial Cooperators

a/ A total of 720 plants were distributed to the Regional Trial Cooperators for planting at 29 trial sites. All the 13 states in the NC Region participated in the ornamental program. In addition, 20 plants were sent to the University of Maine, 10 to the NE Regional Plant Introduction Station, and 23 to the University of Kentucky.

2/ NC Arboreta Cooperators.

a/ 178 plants of 5 introductions [Betula Maximowicziana (PI 420323-420327), Fraxinum excelsior (PI 385251), Genista Multibracteata, Rhus lancea (PI 419221), and Taxus baccata (PI's 399411, 399412)] were sent on request to the 13 Arboreta, Botanic Gardens, and Parks cooperators in the NC Region.

3/ Miscellaneous Distribution

a/ Twenty-seven plants of 7 Ulmus species and hybrids (PI 310432, 313551, 313981, 313982, 313983, 313984, and 341756) were rooted from cuttings for the Northern Great Plains Research Center. In addition, 5 plants were sent on request to a cooperator in Ohio, 3 in South Carolina, and 11 in California.

(b) More than 2,000 ornamental plants were propagated (sexual or asexual) and grown at the Regional Plant Introduction Station. It is expected that about 1,500 ornamental plants of 15 introductions will be distributed during 1980.

(c) Miscellaneous

1/ Ten-Year Evaluation Reports for Amelanchier, Clematis, Euonymus, Forsythia, Hydrangea, Hypericum, Ligustrum, Malus, Philadelphus, Physocarpus, Rosa, Shepherdia, Spieaea, and Weigela were prepared and distributed to the NC-7 Ornamental Trial Cooperators, nurserymen and plant scientists.

2/ Presented an invitational paper at the 29th Annual Meeting of the International Plant Propagators' Society held at St. Louis, MO, on December 11-14, 1979. The title of the paper was "Introduction, Testing, and Evaluation of Ornamental Plants."

3/ Invited as a guest speaker at the Annual Meeting of University of Wisconsin Horticultural Club, Madison, WI, on April 17, 1979. Topic, "U.S. Plant Introduction System."

4/ Presented a seminar on "Vegetative Propagation of Douglas-fir" to the Faculty and Graduate Students, Department of Horticulture, Iowa State University, Ames, IA, on January 15, 1979.

5/ Visited Ornamental Trial sites at Glencoe, Lisle, and Urbana, IL; W. Lafayette, IN; Clinton, IA; Chaska and Waseca, MN; Columbia, Elsberry, and St. Louis, MO; and Madison and Milwaukee, WI.

c. Regional cooperative program

The Nebraska Station has intensified the evaluation program on alfalfa introductions. This work now includes yield trials, replicated tests for insect resistance, in addition to the single row field evaluation trials made in the past.

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:

a. 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 by increased food production, improved food quality, energy conservation, and a cleaner environment. The evaluation of plant introductions and the exchange for 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.

b. Fruit rot resistance from PI 193407 is being incorporated into the tomato breeding program at Mississippi. Rhizoctonia fruit rot is a major disease of tomatoes not only in Mississippi but the other southeastern tomato production areas. Resistance such as that derived from PI 193407 will save the tomato growers of several states many thousands of dollars when resistant varieties are released.

c. Stalk rot resistance in present corn belt lines is good, but 5 to 15% losses still occur from this disease. Our location of new sources of resistance to this disease can lead to the broadening of the germplasm base in corn and to reduction in the level of stalk rot each year on millions of acres.

d. Rust resistance from PI lines also play a part in broadening the germplasm base of our corn belt lines and provide additional protection against the development of new races of rust.

e. Our program of control of seedborne downy mildew in sunflowers assures that the Plant Introduction system will not introduce new strains of the downy mildew fungus (Plasmopora halstedii), or distribute infected seed to cooperators.

f. Roguing virus-infected seedlings of cucumber and pumpkin in the greenhouse helps prevent the introduction of new strains of several widely distributed viruses. These viruses are easily spread mechanically and by insect vectors.

g. The technique for evaluating seedling corn plants for resistance to black cutworm will enable researchers to further evaluate corn for resistance to this insect. Although resistance has not been found, it is important to continue to search for a source of resistance to this pest.

h. The study of the relationship between 2nd generation European corn borer infestation and incidence of stalk rot is useful because it demonstrates that resistance to the borer will reduce the severity of stalk rot. There is also evidence that resistance to stalk rot may reduce borer damage. These findings are additional justification in continuing efforts to develop corn genotypes resistant to both pests.

i. Birds can be serious pests of sunflowers and plant resistance is the best method of control. The identification of a characteristic in sunflowers that may reduce bird damage is the 1st step in developing bird-resistant cultivars.

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 (c) coordination of regional cooperative programs.

b. Implement computer assisted programs in cooperation with the Germplasm Resources Information Project.

c. Finish construction of shop and equipment storage building and begin work on Seed Processing and Office and Laboratory Building.

d. Assist with planning and executing foreign and domestic plant exploration.

e. Continue with disease screening for new sources of stalk rot and rust resistance in corn, and Rhizoctonia fruit rot in tomato. The chemical nature of the fruit rot resistance of tomato PI 193407 will be investigated in cooperative work with chemists at the Northern Regional Research Center in Peoria.

f. Screening will also be done for Septoria leafspot resistance in tomato and northern root knot nematode in alfalfa. If good resistance is found, crosses will be

conducted to determine cellular differences between disease resistant and susceptible plants.

g. The present entomologist is being transferred to another location. Work for next year will be dependent upon locating a replacement.

h. Ornamental Distribution 1980. It is expected that more than 1500 ornamental plants of 15 introductions will be distributed in 1980. The distribution list includes Acer Ginnala 'Flame', Betula fontinalis, Chamaecyparis Lawsoniana 'Triomf Van Boskoop' (PI 414760), Clematis orientalis, Crataegus punctata 'Ohio Pioneer', Genista tinctoria 'Golden Dwarf', Ilex opaca 'Secret', Juniperus horizontalis 'Livingston', J. horizontalis 'Wisconsin', Physocarpus opulifolius 'Darts Golden', Salix repens 'Golden Dwarf', Thuja occidentalis 'Hoseri', Viburnum lantana 'Mohican' (PI 316679), V. x rhytidophylloides 'Alleghany' (PI 316675), and V. sargentii 'Onondaga' (PI 316680).

i. About 2,000 plants of more than 20 plant introductions will be propagated and raised at the Regional Station. These plants will be maintained until they attain adequate size and then distributed to the NC-7 Ornamental Cooperators.

j. Reports and Publications

(1) To prepare and distribute five- and ten-year ornamental testing and evaluation reports

(2) To prepare a publication entitled, "List of New Ornamental Plant Introductions" for publication in the HortScience (requested by the American Society for Horticultural Science).

(3) To prepare and distribute a special North Central Regional Research Publication entitled, "25 Years of Woody Ornamental Testing and Evaluation Program" (Requested by the NC-7 Ornamental Subcommittee).

(4) To attend and participate in the annual meetings of professional and semi-professional organizations, and crop commodity groups.

(5) To visit NC-7 Ornamental Trial Sites in the North Central 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 [author(s) is a member of the Regional Station Staff]:

(1) CLARK, R. L., J. H. Hill, and M. D. Ellis. 1980. Tomato scorch, a new virus disease of tomatoes. Phytopathology 70: (In press)

(2) BHELLA, H. S. 1979. Introduction, testing, and evaluation of ornamental plants. Proc. Int. Plant Prop. Soc. 29. (In press)

(3) BHELLA, H. S. 1979. Ten-year testing and evaluation reports for the North Central Regional Plant Introduction Station, Ames, Iowa).

(4) BHELLA, H. S. and J. Moore. 1979. Vegetative propagation of Viburnum cvs. 'Alleghany', 'Mohican', and 'Onondaga'. Journal Paper No. J-9723 of the Iowa Agriculture and Home Economics Experiment Station, Ames, Iowa.

(5) JARVIS, J. L. 1980. Resistance in sunflower introductions to sunflower moth. Iowa St. J. Res. Accepted for publication Oct. 2, 1979.

(6) JARVIS, J. L., and W. D. Guthrie. 1980. Resistance of maize plant introductions to sheath-collar feeding by 2nd-generation European corn borers. Maydica. Accepted for publication Dec. 5, 1979.

(7) SHAFTON, A. L., R. L. Clark, W. H. Skrdla, and K. Rawal. 1980. A computer processible nomenclature for gene symbols. USDA-ARS-NC-3. (In press)

b. State Station Publications

(1) Iowa

(a) WEIGLE, J. L., and D. W. Pasutti. 1979. 'Blue Moon' Impatiens. HortScience 14(6):766.

(b) WEIGLE, J. L., and D. W. Pasutti. 1979. 'Tropical Sunset' Impatiens. HortScience 14(6):767.

(c) WEIGLE, J. L., D. W. Pasutti, and A. R. Beck. 1979. 'Burgandi' Impatiens. HortScience 14(6):768.

(2) South Dakota

(a) RUMBAUGH, M. D. 1979. N. E. Hansen's contributions to alfalfa breeding in North America. Bul. B665, Agr. Exp. Station, South Dakota State Univ., Brookings, SD. 11 p.

c. Journal Articles

(1) Kansas

(a) KREITNER, G. L., and E. L. Sorensen. 1979. Glandular trichomes on Medicago species. Crop Sci. 19(3):380-384.

(b) KREITNER, G. L., and E. L. Sorensen. 1979. Glandular secretory system of alfalfa species. Crop Sci. 19, July-August 1979. p. 499-502.

(2) Minnesota

(a) ROBINSON, R. G. 1979. Registration of Keet annual canarygrass. Crop Sci. 19(4):562.

(3) Missouri

(a) SITTIYOS, P., J. J. Poehlman, and O. P. Sehgal. 1979. Inheritance of resistance to cucumber mosaic virus infection in mungbean. Crop Sci. 19(1):51-53.

(4) North Dakota

(a) TOWNSEND, C. E., G. A. ROGLER, A. C. WILTON, and R. J. Lorenz. 1979. Registration of C-6 alfalfa germplasm. Crop Sci. 19(2):298.

(5) Wisconsin

(a) ARNY, D. C., C. R. Grau, and P. E. Saleman. 1979. Occurrence of maize dwarf mosaic in Wisconsin and reaction of sweet corn Plant Introduction accessions and commercial hybrids. Plant Disease 64(1):85-87.

(b) BINGHAM, E. T., and T. J. McCoy. 1979. Cultivated alfalfa at the diploid level: Origin, reproductive stability, and yield of seed and forage. Crop Sci. 19(1):97-100.

(c) FOY, C. D., G. C. Gerloff, and W. H. Gabelman. 1973. Differential effects of aluminum on the vegetative growth of tomato cultivars in acid soil and nutrient solution. J. Amer. Soc. Hort. Sci. 98(5):427-432.

(d) RIBEIRO, Raul de L. D., and D. J. Hagedorn. 1979. Screening for resistance to and pathogenic specialization of Fusarium oxysporum f. sp. phaseoli, the causal agent of bean yellows. Phytopathology 69(3):272-276.

(6) USDA Beltsville and Nevada

(a) HARTMAN, B. J., O. J. Hunt, J. H. Elgin, Jr., R. N. Peaden, and B. D. Thyr. 1979. Registration of Washington SNI alfalfa germplasm. Crop Sci. 19(3):416.

(b) McCOLLUM, G. D. 1975. Interspecific Hybrid Daucus carota x D. capillifolius. Bot. Gaz. 136(2):201-206.

7. APPROVED:

March 7, 1980

Date

Ronald M. Peterson

Chairman, NC-7 Technical Committee
R. M. Peterson

3/11/80

Date

R. W. Hougas

NC-7 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 crops.

a. Alfalfa

(1) Grundbacher, F. J., and E. H. Stanford. 1962. Genetic factors conditioning resistance in alfalfa to the stem nematode. *Crop Sci.* 2:211-217.

(2) Yen, Sheng-Tian, and R. P. Murphy. 1979. Cytology and breeding of hexaploid alfalfa. I. Stability of chromosome number. *Crop Sci.* 19(3):389-393.

b. Cucumber

(1) Kauffman, C. S., and R. L. Lower. 1976. Inheritance of an extreme dwarf plant type in the cucumber. *J. Amer. Soc. Hort. Sci.* 101(2):150-151.

c. Daucus

(a) Dudits, D., G. Hadlaczky, E. Levi, O. Fejer, Z. Haydu, and G. Lazar. 1977. Somatic hybridisation of Daucus carota and D. capillifolius by protoplast fusion. *Theor. Appl. Genet.* 51, 127-132.

d. Oats

(1) Eagles, H. A., R. M. Haselmore, and C. A. Stewart. 1978. Nitrogen utilisation in Libyan strains of Avena sterilis L. with high groat protein and high straw nitrogen content. *N.Z. Journ. of Agri. Research* 21:65-72.

e. Panicum

(1) Brown, R. H., and R. E. Simmons. 1979. Photosynthesis of grass species differing in CO₂ fixation pathways. I. Water-use efficiency. *Crop Sci.* 19(3):375-379.

f. Pumpkin

(1) Eisa, H. M., and H. M. Munger. 1968. Male sterility in Cucurbita pepo. *Am. Soc. for Hort. Sci.* 92:437-479. June 1968.

g. Sunflower

(1) Brigham, R. D., and J. K. Young. 1979. Inheritance of "Chaffy head" in sunflower. *Crop Science*, 19(4):561-562.

h. Tomato

(1) Basi, Jr., A., E. L. Moore, and W. E. Batson, Jr. 1979. Histopathology of resistant and susceptible tomato fruit infected with Rhizoctonia solani. *Phytopathology* 79(6):556-559.

(2) El Ahmadi, A. B., and M. A. Stevens. 1979. Genetics of high-temperature fruit set in the tomato. *J. Amer. Soc. Hort. Sci.* 104(5):691-696.

(3) El Ahmadi, A. B., and M. A. Stevens. 1979. Reproductive responses of heat-tolerant tomatoes to high temperatures. *J. Amer. Soc. Hort. Sci.* 104(5):686-691.

(4) Schuster, D. J., V. H. Waddill, J. J. Augustine, and R. B. Bolin. 1979. Field comparisons of Lycopersicon accessions for resistance to the tomato pinworm and vegetable leafminer. *J. Amer. Soc. Hort. Sci.* 104(2):170-172.

(5) Werner, R. A., S. F. Jenkins, Jr., and D. C. Sanders. 1979. The interaction of four isolates of Rhizoctonia solani with fruit of seven tomato lines. *Plant Dis. Reprtr.* 63:716-718.

i. General

(1) Burton, G. W. 1979. Handling cross-pollinated germplasm efficiently. *Crop Sci.* 19(5):685-690.

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III. Program Reviews:

- A. There was no review conducted of the Plant Introduction Research Unit nor any of its programs in 1979.