

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, **1988**

I. PROJECT: NORTH CENTRAL **REGIONAL** PROJECT NC-7
Introduction, **Multiplication**, Evaluation, Preservation,
Cataloging, Enhancement, and Utilization of Plant Germplasm

II. COOPERATING AGENCIES AND **PRINCIPAL** LEADERS:

A: **Administrative Adviser** R. L. Mitchell, Missouri

B. **Regional Coordinator** *R. L. Clark, Iowa

C. **State Experiment Stations and Representatives**

1. Illinois	*T. Hymowitz	7. Missouri	*A. McKendry , Secy.
2. Indiana	*J. Janick	8. Nebraska	* D.J. Andrews, Chm.
3. Iowa	*I. T. Carlson	9. N. Dakota	*J. Franckowlak
4. Kansas	* C. E. Wassom	10. Ohio	* S.Z. Berry
5. Michigan	*A. Iezzoni	11. S. Dakota	* A . B o e
6. Minnesota	*H. Pellett	12. Wisconsin	*W. Tracy

* Voting members

D. **U. S. Department of Agriculture**

1. ARS Plant Introduction Office	*G. A. White
2. ARS National Program Staff, Germplasm	*H. S. Shands
3. ARS Area Director , Midwest Area	G. E. Carlson
4. Cooperative State Research Service	S. Wiggins
5. Soil Conservation Service	*E. T. Jacobson
6. Northern Regional Research Center, Peoria	* R. Kleiman
7. National Seed Storage Laboratory	*S. Eberhart

E. **North Central Regional Plant Introduction Station, Ames, Iowa**

1. USDA-ARS staff	
a. Research Leader and Supervisory Plant Pathologist	R.L. Clark
Secretary	L. Sunstrom
b. Research Agronomist	W. W. Roath
Agricultural Research Technician	B.J. Morrell
c. Horticulturist	M. Widrlechner
d. Research Entomologist	R.L. Wilson
1. Agricultural Research Technician (Insects)	S.G. McClurg
ii. Agricultural Research Technician (Insects)	C. Abel

2. Iowa State University Staff

a. Farm Superintendent	L.L. Lockhart
i. Field-Lab Technician III	D. Lutjen
ii. Field-Lab Technician II	M. Channing
iii. Clerk Typist II	L. Minor
iv. Clerk Typist II	Vacant
b. Curator/Coordinator (GRIN system) and Corn Collection	M.J. Millard
i. Coordinator I	Vacant
c. Research Associate II (Plant Pathology)	C.C. Block
d. Curator I (Grasses, Brassica)	B.C. Abel
e. Curator I (vegetables)	K. Reitsma
f. Curator I (Sunflowers, miscell.legumes)	J. Pomeroy
g. Curator I (Amaranthus)	D. Brenner

III. PROGRESS OF WORE AND PRINCIPAL ACCOMPLISHMENTS

A. Introduction of new **germplasm**

New accessions entering the NC-7 program in 1988 **totalled** 2,880, including over 900 corn, 1350 **oilseed** Brassica, and 187 beets.

B. Germplasm Multiplication

Seed increases were attempted on nearly 2500 accessions at Ames, including: 686 corn, 379 Brassica, 334 Amaranthus, 328 Helianthus, 165 Cucumis (cucumber and cantaloupes), 135 foxtail millets, 71 **proso** millets, 78 pumpkin-squash, 62 carrot, 45 cuphea, 40 parsley, 36 **Crambe**, and 33 chicory. Another 100 beets were increased in Utah under isolation tents in the field.

Pollination by hand (sunflower, pumpkin, corn) or bees (cantaloupe, cucumber, carrot, parsley, Brassica, wild sunflower) is carried out on all outcrossing species to maintain genetic purity. Inbred corn is **selfed**, others are sib-mated. Population size for corn and sunflower regenerations is 200, but pumpkin, cantaloupe and cucumber regrows involve 24 plants.

C. Germplasm Distribution

There were 314 domestic seed requests and 101 foreign in 1988. Packets distributed **totalled** 14,264 domestic, 10,884 foreign. By region in the US, 5,177 went to scientists in our North Central Region, 4,278 to the Western Region, 3,482 to the Southern and 275 to the Northeast. The total packets distributed in 1988 (25,148) is up by nearly 6,000 from last year, continuing a trend of increased use of our germplasm by researchers, especially in foreign countries.

Distributions by **crop** show the effects of Crop Advisory Committee evaluation plans being carried out. **Oilseed** Brassica was highest in distribution (**8605**), followed by Cucumis (6525) and Helianthus (3951). Others of significance were: corn • 1847 packets, beets • 889, carrot • 623, Melilotus • 406, **Crambe** • 381, Cuphea • 251, Agrostis • 151, Pumpkins • 157, and Amaranthus • 141.

D. Germplasm Evaluation

1. Woody Ornamental Regional Trials.

a. Regional cooperators were sent 814 plants of 16 accessions for trial at 27 sites. An additional 215 plants of these same accessions were sent to arboreta.

b. Computer-generated "Report of Planting," "Plot Information," and "First-year Performance Report" forms were distributed to trial sites along with old-system "Ten-year Performance Report" forms for plants sent in 1978.

2. Cooperator Evaluations

a. Vegetables

The entire cucumber collection was evaluated for five diseases (downy mildew, powdery mildew, angular leafspot, anthracnose, and target leafspot). Accessions exhibiting resistance to at least two diseases were: 279466 and 279468 • DM, ALS, AN; 390244 and 390246 • DM, AN; and 267942, 390240, 390255, 451976, 432876, 432865, 436672, and 489754 • DM, ALS.

Alternaria leaf blight resistance in the newly released carrot from Wisconsin "High Carotene Mass Carrot Population" came from PI 261648. Other carrot and parsley accessions are being successfully used in regeneration of somatic embryos from callus culture.

Tomato accessions are being used in Ohio as sources of insect resistance and in Michigan as sources of bacterial canker resistance.

Fusarium and pink root resistance were located in several onion accessions and resistance to both diseases was found in 10 accessions of 4 wild Allium spp. in tests in Wisconsin.

b. Oil Seed and Special Crops

Sunflower accessions showed rust tolerance in Minnesota (170412, 170418, 170426, 251464, 380563) and possible Phomopsis resistance in North Dakota (431535, 431538, 471077). Other useful traits found included: short plant height, good yield, drought hardiness, and cytoplasmic male sterility.

Oilseed Brassica accessions showed black rot resistance (especially PI **173861**), winterhardiness, low seed glucosinolates, and **blackleg** and white rust resistance.

Six **Crambe** accessions showed good yields in Nebraska in 1988 but will need to be evaluated further. In Wisconsin, drought tolerance in amaranth was noted in PI 477913 and good yields of A. cruentus accessions was observed in Nebraska.

c. Legumes

Two 'Hairy Peruvian' alfalfa accessions (PI 247789 and 247790) were used to develop the recently released germplasm '**B16-PLH**,' and its leafhopper resistance came from the two PI accessions. Trifolium semipilosum (PI 234412) was used as a differential for Rhizobium strains in Michigan. Three Astragalus canadensis accessions (199778, 236744, and 315667) showed good vigor, erect growth and excellent forage and seed yield potential in a space-plant nursery in Brookings, South Dakota in 1988.

Rust resistance was noted in the common bean accession PI 171772 but it needs further evaluation. Four accessions of peas (471275, 471300, 471305, and 471330) need further evaluation for possible tolerance to Aphanomyces root rot. Out of 170 Vigna accessions tried in Minnesota and South Dakota, 10 showed promise of high yields. The chickpea accession PI 451432 from Iran yielded well under hot dry conditions in North Dakota in 1988.

d. Grasses and Corn

Three PI lines of **Dactylis** were used in the development of the variety "Dawn," a new 8 clone synthetic Orchardgrass. All three accessions (315417, 315425, 325302) came from the USSR and contributed hardiness, good seeding ability, and leaf and stem rust resistance. Of 70 **proso** millets tested in Minnesota the best yielding accessions were: PI 212108, 408805, and 463423. Of 58 foxtail millets the highest yielders were 182260 and 290464. Good drought and chinch bug tolerance was found in Sorghum accessions grown in Kansas.

Resistance in corn to head smut (especially in 213730 and **340837**), common rust, 1st and 2nd brood European corn borer, and drought was reported by cooperators in 1988. Other useful traits noted included: long kernels, hard stalks, high kernel row number, and attractive seed colors (for ornamental corn).

3. Evaluations at the PI Station

a. Agronomic and horticultural traits

Variation for plant height, total plant weight, and the enzyme diaphorase was found and recorded in 39 accessions of **Cuphea**. Additional accessions will be collected in Brazil in 1989.

Plants **in the** mint family (Lamiaceae) were screened for suitability as honey bee forage. After two years, the following species show promise: Aeostache foeniculum, A. rugosa, Pycnanthemum virginianum, and a plant that is probably a hybrid between A. foeniculum and A. rueosa. **Winter** hardiness tests are continuing on Brassica species at 9 locations on 422 accessions; The most promising types for seed yield in Iowa at this time are B. juncea accessions.

b. Pest evaluations

One hundred corn lines were evaluated for silk feeding resistance to the corn **earworm** but none were better than the susceptible check. Of 575 corns tested for first brood European corn borer resistance, 95 rated resistant. PI 340856, a **popcorn**, has been found to be resistant to silk feeding by the corn **earworm** and, based on the reaction of **F1's** with susceptible popcorn, the resistance is dominant.

Data were collected from the field on the reaction of 163 sunflower accessions to the sunflower moth.

Wide differences were noted in lygus bug reproduction on 28 amaranth accessions (A-5503 had 20.8 lygus to 379.4 for A-5552 after 3 weeks of feeding).

Of 50 accessions, selected from 700 previously tested corn lines with good resistance to race **1** of northern leaf blight, 11 had excellent resistance to races 1 and 2 of NLB: 482974, 482975, 482977; 482979, 482984, 482989, 482991, 482997, 483000, 483006 and 485343. However, all were susceptible to common smut. Another 64 accessions were evaluated in our winter nursery in Puerto Rico for rust and southern leaf blight. The most promising lines were: **196303**-segregating for rust resistance, SLB resistant, **277162**-moderate resistance to rust and SLB, **321111**-resistant to rust, susceptible to SLB, **444707**-resistant to rust, moderately resistant to SLB, **511784**-susceptible to moderately resistant to rust, resistant to SLB, **512027**-susceptible to rust, resistant to SLB, **512029**-moderate resistance to rust and SLB, **506347**-segregating for rust resistance, resistant to SLB, **506348**-segregating for rust resistance, resistant to SLB. .

Powdery mildew resistance in cucumber was found in 36 of 750 accessions in greenhouse tests on true leaves. Spore production was lowest on leaves of 197088, 288238, 321006, and 390258.

IV. Plans for next year

Through interactions with 10 Crop Advisory Committees and the National **Program** Leader for Germplasm, we will continue with our germplasm acquisition program. By utilizing data in GRIN we will attempt to prevent duplicate samples from entering the System and will work more closely with personnel at the National Seed Storage Lab in cleaning up multiple back up seed lots housed there. We will also be able to provide some relief to **NSSL's** cold storage space problem by temporarily storing large seed lots of several species in our new cold storage room.

We will continue our close liaison with the **CAC's** to facilitate suitable evaluation programs, including **entry of** descriptor data into GRIN.

Winter nursery increases of corn and sunflowers will continue in Puerto Rico and we will grow out 50 accessions of corn on St. Croix for post entry quarantine (APHIS approval pending).

APPROVED:

David J. Atsdrews

David J. Atsdrews, Chairman, Technical Committee

07/08/1989

Date

Roy L Mitchell

R. L. Mitchell, Administrative Adviser

11/3/89

Date

V. Publications

From the PI Station Staff

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ATTACHMENT 1 .

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