NORTH CENTRAL REGIONAL PLANT INTRODUCTION STATION
NC-7 ANNUAL REPORT, JANUARY 1 - DECEMBER 31, 1991

I. PROJECT TITLE: NC-7 "New Crops - The Introduction, Multiplication, Evaluation, Preservation, Cataloguing, Enhancement, and Utilization of Plant Germplasm.

II. COOPERATING AGENCIES AND PRINCIPAL LEADERS:

A. Administrative Advisor — T.A. Fretz, Iowa
B. Regional Coordinator — *P.K. Bretting, Iowa
C. State Experiment Stations Representatives

1. Illinois	*T. Hymowitz	7.	Missouri	*P. Beuselinck
2. Indiana	*J. Janick	8.	Nebraska	*D. Andrews
3. Iowa	*I. Carlson	9.	N. Dakota	*J. Franckowiak, Chmn.
4. Kansas	*C. Wassom	10.	Ohio	*S. Berry
5. Michigan	*A. Iezzoni	11.	S. Dakota	*Z. Wicks
6. Minnesota	*H. Pellett, Secy.	12.	Wisconsin	*W. Tracy

*Voting members

D. U. S. Department of Agriculture

1. ARS National Program Staff, Germplasm	*H. Shands
2. ARS Plant Introduction Office	*G. White
3. ARS Area Director, Midwest Area	K.D. Murrell
4. Cooperative State Research Service	D. Sleper
5. Soil Conservation Service	*E. Jacobson
6. National Center for Agric. Util. Research	*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	P. Bretting
Secretary	L. Wilson-Voss
b. Research Agronomist	W. Roath
Agricultural Research Technician	B. Van Roekel
c. Horticulturist	M. Widrlechner
(1) Agricultural Research Technician	N. Harrold
(2) Biological Aide	J. Edwards
d. Research Entomologist	R. Wilson
(1) Agricultural Research Technician (Insects)	S. McClurg
(2) Biological Aide	R. Schweppe
(3) Biological Research Technician (Insects)	C. Abel
e. Biological Aide	J. Colvin
Biological Aide	J. Blankman
Biological Aide	L. Burke
Biological Aide	Vacant
Biological Aide	Vacant

2. Iowa State University Staff

a. Farm Superintendent	L. Lockhart
(1) Field-Lab Technician III	M. Czajkowski
(2) Field-Lab Technician II	D. Baker
(3) Clerk Typist II	L. Minor
b. Computer Coordinator (GRIN) & Corn Curator	M. Millard
(1) Assistant Computer Coordinator (GRIN)	P. Lundeen
(2) Field-Lab Technician II	T. Ladjahasan
c. Research Associate II (Plant Pathology)	C. Block
d. Curator I (Brassica, Grasses)	R. Luhman
e. Curator I (Vegetables)	K. Reitsma
f. Curator I (Sunflowers)	Vacant
g. Curator I (Amaranth)	D. Brenner

XII. PROGRESS OF WORE (P.K. Bretting)

A. Personnel changes
1. Resignations: A. Paul Ovrom, Agricultural Research Technician, resigned to return to graduate school. Cynthia Stauffer, Sunflower Curator, . . resigned to return to the private sector. Delbert Lutjen, Field-Laboratory Technician, took early retirement. Abby Nielsen, Agricultural Research Technician, resigned to take a position at the NADC. Harold Lundgren, Biological Aide, resigned to take a position in the private sector.
2. New employees: Peter Bretting was hired as Research Leader and Coordinator. Ronald Schweppe was hired as a Biological Aide.
3. Honors and awards: Mark Millard,. Computer Coordinator and Maize Curator, received the first Annual National Plant Germplasm System Special Achievement Award.
4. Other: Hamadi Ben-Salah, research assistant in the Cuphea program, passed his doctoral preliminary examinations. Taiby Ladjahasan, technician in the maize program, began doctoral work in maize breeding. Richard Wilson, Research Entomologist, recruited and directed Laura Vermeer, a USDA/ARS Research Apprentice.

B. Construction
1. A 30' X 100' greenhouse was completed, as was the Entomology Building.
2. A lithium chloride de-humidifier was installed in the large cold room.
3. A greenhouse was re-furbished by adding a new plastic roof and endwalls.
4. A cold-frame was re-built.
5. The second phase of coldroom storage shelving was constructed.
6. A storage garage was re-roofed as the first stage of its conversion into a bee-overwintering facility.

(IV summarizes the accomplishments and progress that are presented in greater detail in the individual staff reports later in the document.)

IV. Progress in germplasm management, research, and education (P.K. Bretting)

A. Acquisition:
1. Nearly 2300 germplasm accessions were acquired by the NCRPIS during 1991 (details listed under curators' reports).
2. Significant acquisitions include:
a. Thirty-seven accessions of twelve Cuphea species were collected during an expedition to southcentral Mexico.
b. More than 100 wild sunflower accessions were collected in the central u. s.
c. More than 850 maize accessions were acquired.
d. Nearly 400 Panicum accessions were acquired.
e. Nearly 400 Melilotus accessions were acquired.

B. -Maintenance:
1. More than 37,000 accessions representing more than 300 genera and 1300 species are now maintained at the NCRPIS.

C. Regeneration:
1. Nearly.2300 accessions were regenerated at the NCRPIS or at tropical sites.
a. Eight hundred and eighty-nine accessions were regenerated using honeybees in cages. The great majority of this effort was devoted to the cucurbits.
b. Thirty -five accessions were regenerated via both fly and bee pollination.

D. Distribution:
1. More than 21,000 seed packets were distributed to researchers in the U. S. (ca. 75% of the total) and abroad (the remaining 25%).
2. One hundred and ninety-four cuttings were distributed. More than 500 individual landscape plants were distributed for long-term evaluation at

28 sites in the North Central Region. Distribution of other ornamental germplasm reached an all-time high.

E. Germination/viability/health testing:
1. More than 3,400 accessions were assayed for their* germinability/viability.
2. Erwinia stewartii was shown to be transmitted, 'albeit very inefficiently, in maize kernels. Initial attempts to characterize an unusual, very virulent melon disease yielded ambiguous results.

F. Inventory and data entry:
1. Various accessions were added to the inventory and appropriate data were entered into GRIN. This effort was particularly intensive for Amaranthus, Cucurbita pepo, Cunhea, sunflowers, and maize.
2. A committee of curators and clerical staff developed a standard, NCRPIS-wide protocol for de-accessioning samples.

G. Characterization:
1. Isozyme analyses of more than 150 cucumber accessions revealed that controlled pollination by bees in cages retains the accessions' original genetic profiles more faithfully than does open-pollination.
2. Characterization data were recorded for maize, Brassica, millets, carrots, amaranths, and other crops. With amaranths, characterization data are helping with de-accessioning redundant samples.
3. The entire Melilotus collection is being characterized by M. D. Rumbaugh at Utah State University.

H. Evaluation:
1. More than thirty Cuphea accessions were-evaluated agronomically.
2. Several genera in the Asteraceae were evaluated as dye plants.
3. Aaastache germplasm was evaluated for essential oil composition.
4. More than 300 maize accessions were evaluated for resistance to corn earworm feeding. Almost 400 accessions were re-tested *for* resistance to European corn borer. Nearly 600 accessions were evaluated for resistance to European corn borer leaf feeding.
5. Nearly 40 accessions of sunflower species were evaluated preliminarily for resistance to sunflower moth.
6. Nearly 50 amaranth accessions were evaluated for resistance to lygus bugs.
7. About 400 sunflower accessions were screened for resistance to Alternaria.

I. Enhancement:
1. *More* than 100 interspecific, backcross, and/or somaclone Cuphea lines are under development as a domestic source of medium chain-length fatty acids.
2. Two mint genera are being selected as superior nectar sources for bees.
3. A selection program for non-shattering amaranth hybrids was initiated.

(The cases listed under "Utilization. selected from among the Accession Performance Reports received at the NCRPIS during 2991.)

J. Utilization:

1. L. Campbell, USDA/ARS, ND, released two Beta germplasm populations derived from NCRPIS accessions with high sucrose concentrations.
2. C. Wozniak of North Dakota State University utilized accessions of Echinochloa crus-galli and Panicum miliaceum in an in vitro tissue culture study of auxin-inducible proteins, one of which, CAP1, which was detected via polyclonal anti-serum and immunoblotting.
3. R Poe et al., University of Nebraska, NE, identified Cucurbita accessions resistant to trifluralin.
4. G. Seiler, USDA/ARS, ND, released 13 Helianthus lines, derived from accessions of wild species, that are tolerant to downy mildew.

5. H. Gorz and F. Haskins, USDA/ARS and University of Nebraska, NE, released two Melilotus lines derived from NCRPIS accessions;
6. Several accession% of kiwano, Cucumis metuliferus, were utilized by D. Marsh of Lincoln University, NE, in an effort to develop a specialty crop for the Midwest. Resistance to Fusarium and significant variability in agronomically-important traits were observed; and the selection program was continued.
7. G. Fick, of Seed America, Inc., MN, and J. Miller, USDA/ARS, -ND are utilizing several Helianthus accessions to identify potential source% of "low cadmium accumulation" genes.
8. J. Robbins, USDA/ARS, IA, is utilizing a maize accession as a resistant check for identifying sources of resistance to 1st generation European Corn Borer.
9. E. E. Gerrish, Cargill Inc., IA, is utilizing maize accessions to improve "Baby Corn" varieties, and to develop prolific populations for Asia.
10. J. Lofgren, Dahlgren & Co., MN, identified sources of resistance to downy mildew, race 3, and rust races 2 and 4 from sunflower accessions.
11. P. Higley, Iowa State University, IA, utilized Carthamus tinctorius accessions to study the host range of a Phytophora sp.
12. S. Khalil, Iowa State University, IA, utilized maize accessions to determine the extent of vesicular arbuscular mycorrhizal fungi.
13. A. Rosielle, Asgrow Seed Co., IA, utilized maize accessions in his breeding program, particularly as sources of insect resistance.
14. G. Koslofsky, Interstate Seed Co., ND, utilized Helianthus accessions to identify potential sources of resistance to sclerotinia head rot and wilt.
15. L. Darrah, USDA/ARS, MO, utilized a maize accession as a potential source of resistance to corn rootworm.
16. M. Lee, Iowa State University, IA, utilized maize accessions to study the genetic control of insect and disease resistance.
17. L. Pollak, USDA/ARS, IA, utilized a broad suite of tropical maize accessions in a breeding program for special quality traits.
18. M. Abdallah, MN, utilized Helianthus accessions to breed for seed length, resistance to Verticillium and other agronomically important trait%.
19. G. Daniel, Agway Inc., ND, utilized Helianthus accessions to breed for seed length and weight.
20. B. Haglan, IA, utilized maize accessions to provide seed to Indian tribal groups for their personal use.
21. A. F. Troyer, DeKalb Plant Genetics, IL, utilized maize accessions as sources of earliness in hi% breeding program.
22. S. Thompson, United AgriSeeds, IL, utilized maize accessions to map genes conferring resistance to corn lethal necrosis.
23. K. Ziegler, Iowa State University, IA, utilized maize accession% to broaden the genetic base of U. S. commercial popcorn.
24. M. Anthony, IN, utilized maize accessions in hi% breeding program.
25. A. Gathman, Southeast Missouri State University, MO, utilized Cuuhea accessions in molecular systematic studies.
26. J. Farley, DeRuiter Seeds, OH, utilized Cucumis accession% a% sources for low-temperature germination, and disease resistance.
27. J. Barker, USDA/ARS, ND, utilized Helianthus accessions to study the role of trichomes in preventing sunflower stem weevil predation.
28. S. Mulholland et al:, University of Minnesota, MN, utilized maize accessions to study phytolith morphology.

K. Education/extension/other service

1. R. Wilson and M. Widrlechner presented &e&lectures in various Iowa State University classes.
2. L. Lockhart conducted twelve tours of the NCRPIS for visiting scientist% and laypeople.

3. M. Millard acquainted visiting scientists from the Vavilov Institute with GRIN and maize curatorial methods.

4. P. Lundeen, Assistant Computer Coordinator, presented monthly computer software/GRIN training sessions, and also conducted frequent individual training sessions.

L . Other

1. A Specific Cooperative Agreement was established with Prof. M. K. Misra, Seed Science Center, Iowa State University, to develop an integrated, computerized image analysis system for maize ear morphology.

V. Individual-progress reports

A. Germplasm Maintenance, Evaluation, and Enhancement of Cuohea and other New Crop Species.(W.W. Roath)

1. Acquisition

New accessions; We acquired 155 Cuphea accessions representing 12 species in 1991.

Significant progress; The main activity was the Mexican collection trip in September. We collected 37 accessions representing 12 species. One species, C. schumannii Koehne, is new to the collection.

2. Maintenance and distribution

Number of Cuphea accessions

available		distributed		at NSSL		regenerated		germination	
no	%	no	%	no	%	no	%	no	%
154	19.2	109	13.6	90	11.2	101	12.6	118	14.7

Distribution of C. lanceolata and C. viscosissima

Species	No. Accessions	No. Packets
C. lanceolata	39	162
C. viscosissima	27	120
other species	43	286
total	109	568

Significant progress: As this year's increases are in the *process* of being cleaned and have yet to be stored, I do not know the number of accessions actually increased to the minimum amount of seed needed for distribution. However, it is anticipated that this year's increases will bring the original collection to where this material is, for the most part, available for distribution. This will allow concentration upon increase *of* the material collected *in* Brazil and Mexico.

3. Characterization/taxonomy

Characterization data for the 101 increased (regenerated) accessions are in the process of being recorded and will be entered into GRIN. Photographs of these accessions were taken and filed.

Species identification was confirmed on seven accessions in the collection and for the 37 accessions from Mexico. Dr. S.A. Graham has been most helpful in accomplishing this task.

4. Evaluation

Thirty-four C. viscosissima accessions were planted in a replicated trial at Ames for evaluation of plant mass, seed yield, 100 seed weight, oil percent, and fatty acid composition. This material is in the process of being cleaned.

5. Enhancement

Twenty-eight C. viscosissima X C. lanceolata F1 crosses and 24 C. viscosissima X C. lanceolata F1 backcrosses were planted for additional backcrosses.

Twenty-seven C. viscosissima F1 crosses were planted for production of F2 seed. These seed will be analyzed for oil percent and the best of these crossed to C. viscosissima X C. lanceolata hybrid for selection for nondormancy and auto-fertility.

Fifty-one R2 somaclone lines and their parents were planted in replicated trials at two locations for evaluation of induced variability. These data are in the process of being assembled and analyzed.

6. Meetings attended

Iowa Academy of Science, Dubuque.

NC-7 Technical Committee, Sturgeon Bay, WI

New Crops Crop Advisory Committee, Indianapolis, IN

Second National New Crops Symposium: Exploration, Research, and Commercialization, Indianapolis, IN

Annual Cuohea project review at Oregon State University, Corvallis.

First European Symposium on Industrial Crops and Products, Maastricht, The Netherlands.

Numerous Plant Breeding Seminars, Crop Improvement Committee meetings, and Outlying Research Station meetings, Agronomy Department, ISU.

7. Presentations or seminars

Ben-Salah, H., and W.W. Roath. 1991. Callus growth and plantlet regeneration evaluation of Cuahea viscosissima Jacq. ,-accessions. 103rd -- 'Session-Iowa Academy Science.

Chen, W., and W.W. Roath. 1991. Plant isozyme evaluation-of.two Cuphea species. 103rd Session Iowa Academy Science.

..Roath, W.W. 1991. United States Cuphea research. First European Symposium Industrial Crops and Products.

8. Publications

Published or accepted for publication

Ben-Salah, H., and W.W. Roath. 1991. Callus growth and plantlet regeneration evaluation of CuDhea viscosissima Jacq. accessions. Program Abstr. Iowa Acad. Sci. 103rd Session :4.

Chen, W., and W.W. Roath. 1991. Plant isozyme evaluation of two CuDhea species. Program Abstr. Iowa Acad. Sci. 103rd Session :3.

Knapp, S.J., L.A. Tagliani, and W.W. Roath. 1991. Fatty acid and oil diversity of CuDhea viscosissima: A source of medium-chain fatty acids. J. Amer. Oil Chem. Soc. 68:515-517.

Roath, W.W. 1991. Effects of harvest methods and storage conditions on seed germination of two CuDhea species. Proc. 1st Int'l. Conf. New Industrial Crops. Accepted Mar. 1991.

Roath, W.W. 1991. United States Cuuhea research. 1st European Symp. Industrial Crops Prod. Program and Abstr.:L61.

Roath, W.W., M.P. Widrlechner, and R. Kleiman. 1992. Morphological and agronomic variability in CuDhea viscosissima Jacq. J. Industrial Crops Products. Accepted Sept. 1991.

9. In review

Ben-Salah,.H., W.W. Roath, and R.C. Shoemaker. 1992. Callus growth and plantlet regeneration of CuDhea viscosissima Jacq. accessions. Submitted to Industrial Crops Prod.

Wilson, R.L. and W.W. Roath. 1992. Insect pests and pollinators on Cuphea in central Iowa. Submitted to J. Xan. Ent. Soc.

10. OTHER ITEMS

a. Graduate Students

Mr. Ben-Salah has successfully passed his preliminary examinations, and is working on data to complete his thesis. He has identified significant variability between C. viscosissima accessions for their ability to regenerate 73 plantlets from callus (see above publication lists), and is in the process of quantifying induced variability in 52 somaclone lines grown 'in trials this past season.

Mr. 'Chen has identified enzyme polymorphisms 'in C. lanceolata and C. viscosissima (see publications list). He has also developed a simplified DNA extraction and purification technique. He will report on this technique at the Iowa Academy of Science (IAS) meetings this year.. His work is being partly. supported by a small grant from IAS.

11. CONCLUSIONS

The CuDhea project's current objectives are:..
1. Completing a comprehensive ex situ collection of Cuphea germplasm.
2. Continuing CuDhea characterization, evaluation, and enhancement.

3. Identifying and elucidating the biosynthetic pathways and the genetic regulation of the biosynthesis and deposition of medium chain-length fatty acids in Cuphea.
4. Coordinating the ARS effort to domesticate Cuphea,

12. STRENGTHS AND WEAKNESSES

The programmatic strengths include high quality technical assistance. The program's technician and two graduate research assistants provide invaluable assistance. Additional strengths include other NCRPIS staff and their contributions to field work, data base processing, and computing. The NCRPIS's field and laboratory facilities are excellent, and provide an environment where work can be accomplished efficiently and without outside interference. The cooperative work with Dr. Knapp at OSU provides a source of information and gennplasm so that progress can proceed at an even greater pace.

The primary programmatic weakness is the continued erosion of financial support. This project has not had an increase in funding since it started 6 years ago, yet we must compensate for wage increases while simultaneously increasing productivity. We need a full time laboratory technician to be able to exploit the progress made by the graduate student's work. We also need additional greenhouse space because plants are crowded so closely that contamination due to shatter may occur. We must bolster OSU funding to its original levels ie. from $80,000 to the original $92,500.

13. PLANS

The southern Mexican trip this past September completed the Cuphea field collections originally planned. However, with the incorporation of C. viscosissima X C. lanceolata, hybrids into the domestication program, there may be justification to collect additional populations of C. lanceolata from Mexico. There are 32 accessions of C. lanceolata in the NCRPIS collection, but only two are documented as originating in Mexico, the rest are reintroductions of material from European botanical gardens.

This trip would be longer than the recent one, because the C. lanceolata's range is considerably larger than the territory covered recently. Dr. Widrlechner and I are planning a joint exploration trip to Mexico for Zinnia, Sanvitalia, and C. lanceolata.

Increase, characterization, and evaluation of the known self-pollinated species from the Brazilian collection will be initiated in 1992. We will continue growing approximately 100 accessions per year. In addition the C.lutea accessions will be increased. These accessions are to be part of the interspecific crossing program described later.

We will concentrate on the C, viscosissima X C. lanceolata hybrid during the next three years with the goal of releasing the ten best Midwest-adapted germplasm lines derived from this hybrid in the fall of 1994. The proposed scheme to accomplish this is outlined below

1992-93 Greenhouse: 200-300 single seed descent -lines.-will be grown for 3-4 cycles to select for homozygosity for nondormancy and autogamy. Twenty seed from each descent line from the final cycle will be collected and planted in the 1993 field.

1993 Field: Five-seed hills of two replications, two locations will be planted to reselect for emergence, yield and oil content.

1994 Field: The top 50% of the remaining lines will be grown from bulked seed from the two 1993 locations in four replication - two location yield trials. Plots will be 1m x 6m and will serve to increase the number of seeds. Yield and oil content will be measured and the best 10 lines selected for germplasm release.

14. Summary:
1992-93 Greenhouse: 200-300 single seed descent select for nondormancy & autogamy *3-4 cycles*

1993 Field: 2 replicationss, 2 locations, 5 seeds per hill plantings to evaluate 200 - 300 lines for yield, oil %, and emergence

1994 Field: 4 replications, 2 locations, 1 X 6 m plots, to evaluate 100 lines for yield, oil %, and emergence. ,

1994 post harvest: Release 10 best germplasm lines.

15. Fatty acid biosynthesis:

The following studies of biosynthesis are planned for the period:
1.Establish fertile C. viscosissima X C. lutea and/or C. lanceolata X C. lutea hybrids by backcrossing or chromosome doubling.

2.Perfect a DNA extraction procedure.

3.Establish C. lutea and C. viscosissima genomic libraries in plasmid or lamda vectors.

4.Identify low copy number Cuuhea genomic fragment from genomic libraries.

5.Isolate genomic DNA from the hybrid populations from item 1 above.

6.Genetic analysis of RFLP linkages with capric and lauric acid loci.

16. Specific Coopertaive Agreement with Oregon State University:

The research pursued under this Specific Cooperative Agreement involves a breeding program focused upon the Cuphea viscosissima x C. lanceolata crosses and backcrosses selected for self-fertility and nondormancy. Several populations of these crosses have been developed and will be used in further yield and oil content improvement, as well as in mutation breeding for seed shatter resistance. Some naturally occurring mutants with fruits that apparently retain their seed have been identified. Several fatty-acid mutants have been identified and are the subject of genetic and genome mapping studies, and may provide genes for improving lauric acid content.

REFERENCES

Knapp, S.J., L. Tagliani, J. Crane, D. Webb, T. Brandt, and J. DeNoma. 1991. Cuphea and Limnanthes: Is biotechnology the key to commercializing these crops. pp. 23-24. In (ed.) 2nd Nat'l. Symp. New Crops Exploration, Res. Commercialization Program & Abstr., Indianapolis.

Knapp, S.J., L.A. Tagliani, and W.W. Roath. 1991. Fatty acid and oil diversity of Cuphea viscosissima: A source of.medium-chain fatty acids. J. Amer. Oil Chem. Soc. 68:515-517.

Kruger, S.K., and S.J. Knapp. 1991. Mating systems of Cuphea lanceolata and C. lutea. Theor Appl. Genet. 82:221-226.

Webb, D.M., and S.J. Knapp, 1991. Genetic parameters for oil yield in a population of *Cuphea lanceolata*. Crop Sci. 31:621-623.

B. Entomology (R.L. Wilson)

1. Progress

a. FIELD

(1) Corn

Corn earworm evaluation: Two hundred four PI accessions were evaluated for silk feeding resistance. Fifteen accessions (PI 503683, PI 503789, PI 503665, PI 514997, PI 514752, PI 503683, PI 181837, PI 515112, PI 515115, PI 503861, A-10075, A-10333, A-10578, A-10025, and A-10382) had larval weights equal to the resistant check ('Zapalote Chico').

European corn borer evaluation: A retest of 398 accessions previously rated as resistarit was planted, infested and rated for damage to leaf feeding. One hundred twenty-six accessions maintained a rating of 3 or less (resistant).

As part of Craig Abel's MS project, 313 accessions were evaluated for ECB leaf feeding resistance. Three accessions rated resist&t.

In cooperation with Linda Pollak, 276 crosses from her LAMP research were evaluated for ECB leaf feeding resistance. Fifty-nine of her crosses rated resistant.

(2) Sunflower

Thirty-four accessions were placed in a randomized complete block test to help refine the sunflower moth evaluation technique. Samples have been harvested, and are presently being hand-threshed and blown.

Three accessions of wild-type sunflower were planted in combinations of large vs small cages vs open plots, adult moths vs egg pads, and Bonzi vs natural growth. Plots have been harvested and hammermilled and are ready for clippering.

Eight Hungarian lines were evaluated for sunflower moth resistance in cooperation with Larry Charlet and Gary Brewer (Fargo, ND). Material is not processed at this time.

(3) Amaranth

Forty-seven accessions were evaluated in the field for resistance to lygus bugs.

b. LABORATORY

(1) Diets

Seventy-two diets were prepared with air dried silks from Linda Pollak's Puerto Rico plots of LAMP material. Data have not yet been analyzed.

Thirty-two diets were prepared using lyophilyzed sunflower parts. The-test is half complete.

(2) Rearing

A colony of sunflower moths is being maintained for use in our summer field evaluation of the sunflower collection.

A small colony of corn earworms was started. If successful, we will be able to rear enough for our field evaluations of the maize collection.

c. GREENHOUSE

(1) Tests

Maize silks were grown in the greenhouse for use in a corn earworm oviposition experiment. Test is still in progress.

d. MISCELLANEOUS

(1) Graduate Students

aa. I'm the major advisor for one MS graduate student in Entomology (Craig Abel).

bb. I presently serve on 2 MS (Entomol.) and 1 PhD graduate student committees (Agron.).

(2) Manuscript Review

aa. During 1991, I peer reviewed several manuscripts.

bb. The Journal of Economic Entomology asked me to review a couple of manuscripts.

d. EEO ACTIVITIES

Attended Wellness Fitness Day at NADC, Jan. 17, 1991.

Attended Substance Abuse meeting at ISU. April 9, 1991.

Hired Mia Bernstein (black female) as a work study helper for the summer of 1991.

Participated in ARS Research Apprentice program during summer of 1991. Laura Vermeer (white female) was assigned a research project on sunflower.

Attended "Multicultural Training" at NADC. Sep. 4, 1991.

e. ENTOMOLOGY AND AGRONOMY DEPARTMENT ACTIVITIES

I regularly attend faculty meetings held in both departments.

Attended Agronomy meeting on Tractor Safety. Feb. 21, 1991.

I attend meetings of the Crop Improvement Panel in the Agronomy Department.

Guest lectured in Entomology 110. September 26, 1991.

Serve on Agronomy Dept. Building Committee.

Serve on Agronomy Dept. Greenhouse Committee.

Serve on Agronomy Dept. Awards Committee.

Attended meeting for Chemical Hygiene Plan at ISU. Dec. 5, 1991.

f. MEETINGS ATTENDED

National meeting of the Entomological Society of America, Reno, NV. Dec. 8-12.

Annual meeting of the American Amaranth Institute, Sydney, NE. Aug. 16-17, 1991.

National Heliothis/Helicoverpa workshop, San Antonio, Tx. Sep. 16-19, 1991.

Annual meeting of the NC7 Technical Committee, Sturgeon Bay, WI. Aug. 22-23.

Annual meeting of the North Central Branch, Entomological Society of America, Milwaukee, WI. March 17-20, 1991.

Annual meeting of the Iowa Academy of Science, Dubuque, IA. Apr. 19-20, 1991.

g. SHORT COURSES ATTENDED

"How to handle difficult people", Des Moines, IA. Jan. 25, 1991.

"Coaching and counseling skills for managers", Des Moines, IA. Jan. 28, 1991.

"RPES Training" taught by Dr. Gerloff. Ames, IA. July 11, 1991.

h. PAPERS PRESENTED AT MEETINGS

"Entomology report to NC-7". Annual NC-7 Technical Committee meeting at Sturgeon Bay, WI. Aug. 22, 1991.

"Insects on Cuphea". North Central Branch meeting of The Entomological Society of America at Milwaukee, WI. Mar. 17-20, 1991. (Paper co-authored by Bill Roath)

i. INVITED TALKS

Guest lecturer in Entomology 110 class at ISU. Talked about "Host Plant Resistance-What's It All About?". September 26, 1991.

j. OTHER

President of the Iowa chapter of OPEDA.

Actively involved in the design of the Plant Introduction Station Entomology Building greenhouse addition.

Acting Research Leader from Jan. 1 until June 30, 1991.

Presented staff seminar on "The Budget", Jan. 22, 1991.

Attended fundholders meetings at NADC.

Attended ARMPS Review meeting for PI Station, Ames, IA. July 18, 1991.

Attended Popcorn Field Day at McHone Seeds, Ames, IA. Sep. 3, 1991.

Hired Ron Schweppe as a GS-3 Biological Aide.

Chairman of Agricultural Sciences section of the Iowa Academy of Science

2. PLANS

a. FIELD

(1) Evaluate 300 corn PI lines for corn earworm silk feeding resistance.

(2) Evaluate 1000 corn PI lines for resistance to first generation European corn borer.

(3) Evaluate 20 wild-type and 50 other sunflower PI lines for resistance to sunflower moth.

(4) Evaluate parents, F1's, F2's, and backcrosses of PI 340856 popcorn crossed to three inbred popcorn lines.

(5) Test corn rootworm fecundity after feeding on silks selected from corn earworm resistant and susceptible corns.

(6) Evaluate 50 amaranth PI lines for resistance to lygus bugs.

(7) Participate in a cooperative research project to field test corn earworm resistant corns in Oregon (Gary Reed, cooperator) and Georgia (Bill Wiseman, cooperator).

(8) Plant several sunflower accessions for gathering pollen and flower parts to be used for development of a laboratory method for evaluation for sunflower moth resistance.

(9) Compare honey bees and flies for pollination efficiency of Brassica. (Cooperate with Rick Luhman).

b. LABORATORY

(1) Evaluate diets prepared from soxhlet extraction of corn earworm resistant and susceptible corn silks.

(2) Evaluate diets prepared from soxhlet extraction of sunflower pollen to determine if this would be a good method for screening for resistance to sunflower moth.

(3) Continue long term colony of sunflower moth.

(4) Continue rearing newly started colony of corn earworms.

(5) We may start a small rearing colony of fall armyworms.

-- (6) Continue to work on the biology and laboratory diet for the amaranth curculio.

c. GREENHOUSE

(1) Re-establish rearing colonies of 2 species of aphids when greenhouse addition is completed.

(2) Continue to develop method for evaluation of wild-type sunflowers for resistance to sunflower moth.

d. MISCELLANEOUS

(1) Continue active participation in Departments of Entomology and Agronomy.

(2) Continue to attend professional meetings and present research results.

(3) Continue working with graduate students.

(4) Continue to develop cooperative research projects with other scientists.

(5) Continue to educate myself on the principles of EEO and to apply them in my capacity as a supervisor.

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C. Horticulture (M.P. Widrlechner)

1. Germplasm Collections

a. Acquisition

According to the GRIN reports, I received 90 new accessions of ornamentals and 5 accessions of mint-family plants during 1991. Most of these accessions came from Indices Seminum. There were no important explorations during 1991,

b. Maintenance

(1) Available for distribution:

Ornamentals (NC-7 priority site) 380/1177 (32%) (110 genera)
Ornamentals (For trials or transfers) 106/334 (32%) (97 genera)
Mint-family Plants (Bee Pasture) 30/105 (29%) (11 genera)

(2) Distribution:

I'distributed 12 plants, 182 cuttings, and 182 seed packets of ornamentals to meet germplasm requests and 605 plants as part of the NC-7 Trials. There were more ornamental germplasm

requests in 1991 than ever before. There were no distributions of bee pasture accessions in 1991.

(3) Duplicated at NSSL:

Ornamentals (NC-7 Priority Site) 77/1177 (7%)
Mint-family Plants (Bee Pasture) 3/105 (3%)

(4) Regenerated:

Ornamentals (NC-7 Priority Site) >44/1177 (4%)*
Ornamentals (For trials or transfers) 5/334 (2%)
Mint-family Plants (Bee Pasture) 27/105 (25%)

* The 44 accessions regenerated comes from the GRIN report. This is an underestimate because it does not include woody ornamentals regenerated after the 1991 plant inventory, which occurred about a year ago. These plants will be inventoried during March, 1992.

(5) Tested for Germinability/Viability

Ornamentals (All Accessions Held as Seed) >107/1179 (9%)*
Mint-family Plants (Bee Pasture) 30/105 (29%)

* The 107/1179 figure comes from the GRIN report. However, it does not include 19 tests performed in late 1991/ early 1992, 20 tests in progress, or 20 tests run previously that had not yet been loaded in GRIN. Because some accessions may have had more than one test, the actual figure for ornamental accessions tested is somewhere between 107 and 166.

(6) Significant Progress

We had an excellent year for caged seed increase from a test plot that had been used for the evaluation of honey bee preference. We made good progress with germination testing of both herbaceous ornamentals and mint-family plants. Demand for ornamental germplasm was the highest on record. This is in part due to an article on Caragana frutex that was published in late 1990 and also because of increased demand from international exchanges (Indices Seminum).

c. Characterization/Taxonomy

During 1991, there were no organized projects on the crops that I curate.

d. Evaluation

Five hundred plants of twelve landscape-plant accessions were distributed for testing in 1991 (see below). Three years of honey bee preference data await publication in the Proceedings of the 12th North American Prairie Conference. Essential oil analyses of Agastache were published in the Journal of Agricultural & Food Chemistry in 1991. Accessions of Calendula, Tithonia, and Zinnia were evaluated as dye plants.

e. Enhancement

Hybrids between Agastache rugosa and Agastache foeniculum are being propagated for future testing as nectar sources. Two cycles of

selection for early flowering, seed production, and persistence have been made in Salvia azurea. This selected population will be increased in 1992.

2. Research

a. Coordination of the NC-7 Regional Ornamental Trials:

(1). Plant Distribution - 500 plants of 12 accessions were sent on request to regional cooperators for planting at 28 sites (an additional 105 plants of these accessions were sent to arboreta). New trial sites have been established in Newark, OH and Kokomo, IN.

(2). Computer-generated "Report of Planting," "Plot Information," "First-year Performance Report," and "Five-year Performance Report" forms were distributed to trial site cooperators this spring along with old-format "Ten-year Performance Report" forms. Returned forms are presently being compiled and entered into GRIN.

(3). The NC-7 Ornamentals Subcommitte met in July at Penn State. Much of the discussion dealt with two points: the future organization of the project and ways' of reporting information gained from evaluations.

(4). Four newsletter updates and two special letters were sent to trial site cooperators in 1991, to keep them informed about current developments at Ames and throughout the program.

(5). Two manuscripts were prepared to summarize the performance of trial plants. The first was written by Jeff Iles of ISU and me to report on the best-performing accessions at the ISU trial site. This paper appeared in American Nurseryman in March, 1992. The second is a report summarizing the performance of 27 populations of landscape plants from Yugoslavia that were distributed for testing in the late 1970s. This paper is currently in peer-review and will be submitted to Journal of Environmental Horticulture in 1992.

(6). At the end of July, 1991, my Agricultural Research Technician, Paul Ovrom, resigned to work on his M.S. I developed a new position description and initiated a search to locate a replacement. The new position description will increase the involvement of the new Technician with the Ornamental Trials. It is expected that a new Technician will be hired by March, 1992.

b. Germplasm Activities in Crops Other than Those I Curate:

(1) Eight requests for seeds of lines with special horticultural characteristics were handled by the Horticulturist, resulting in the distribution of 540 packets of seed:

(2) Through cooperative work with Jack Staub's lab at the University of Wisconsin, a survey of isozymes in paired open-pollinated and cage-pollinated-seed samples of 157 accessions of Cucumis sativus has been completed. I wrote- up the results of this survey and the manuscript has been accepted for publication in the FAO/IBPGR Plant Genetic Resources. Newsletter.

(3) Pollen and soil samples from populations of native azaleas and evergreen rhododendrons in Ohio were taken in June, as part of a study to examine variation in native Rhododendron. Seed

samples were taken-from these populations in October by Richard Larson, of the Dawes Arboretum, and these have been deposited with the Clonal Germplasm Repository at the National -Arboretum.

(4) An examination of NPGS collections of Chinese medicinal plants has been completed and a compilation of the results has been accepted for publication in the Herb,'Spice, and Medicinal Plant Digest.

(5)' I helped prepare a cover story on our cucurbit collections that was published in HortScience in 1991. I am coordinating a similar cover story for our root and tuber vegetables for a future HortScience.

C. Other Research and Training Activities

(1) A study of the literature of germplasm preservation, i.e. research on seed, pollen and tissue culture storage and longevity, has been accomplished using citation analysis. The results of this study have been accepted for publication in the FAO/IBPGR Plant Genetic Resources Newsletter; A similar citation analysis of the literature of germplasm multiplication is underway.

(2) During 1991, I worked with Peter Bretting to develop an outline for a Plant Germplasm course that will be taught at ISU during Fall Semester, 1992. This course can be used both to educate graduate students and to assist in staff development.

(3) Work continued on the taxonomy of Rubus in Iowa. An Old World raspberry previously undescribed in the midwestern flora was described in a 1991 publication in Michigan Botanist.

4. Meetings Attended

March - Shade Tree Short Course (Ames, IA)
April - American Rhododendron Society (Oakland, CA)
June - American Assoc. of Botanical Gardens & Arboreta,
Woody Landscape Plant CAC,
Center for Development of Hardy Landscape Plants (Minneapolis, MN)
July - American Soc. for Horticultural Science,
Root & Bulb Vegetable CAC,
Leafy Vegetable CAC,
NC-7 Ornamental Subcommittee
Herbaceous Ornamental CAC (University Park, PA)
August - NC-7 Technical Committee (Sturgeon Bay, WI)
October - American Chestnut Foundation (Waldorf, MD)
November - National New Crops Symposium,
New Crops CAC (Indianapolis, IN)
December - Eastern Region - International Plant Propagators' Society (Long Island, NY)

5. Presentations and Seminars

ISU Agronomy Forum - "Who Uses Plant Introductions & Why"
ISU Genetics 260 - "Conserving Genetic Diversity"

6. Publications which Appeared in Print in 1991

Charles, Denys J., 'James E. Simon, and Mark P. 'Widrlechner. 1991. Characterization of essential oil of Aaastache species. Journal of Agric. & Food Chem. 39: 1946-1949.

'Clark, Raymond L., Mark P. Widrlechner, Kathleen R. Reitsma, and Charles C. Block. 1991. Cucurbit germplasm at the North Central Regional Plant Introduction Station, Ames, Iowa. HortScience 26: 326,450-451.

Widrlechner, Mark P. 1991. NC-7 Regional Ornamental Trials: Evaluation of new woody plants. Proceedings of the Metropolitan Tree Improvement Alliance 7: 41-47.

Widrlechner, Mark P. 1991. Seed storage for the commercial propagator. Combined Proceedings of the International Plant Propagators' Society 40: 571-575.

Widrlechner, Mark P. and Richard R. Rabeler. 1991. Rubus parvifolius (Rosaceae), naturalized in Illinois and Iowa. Michigan Botanist 30: 23- 30.

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7. Other Items

a. During 1991, I was named Secretary of the Board of Directors of the Center for Development of Hardy Landscape Plants, a non-profit foundation that is beginning to coordinate national efforts to breed and select superior, stress-tolerant landscape plants. I was also appointed Chairman of the Research Committee of the American Rhododendron Society. I ended my tenure as vice-president of the American Chestnut Foundation.

8. Conclusions

a. Curation

1991 was a reasonably productive year for germplasm increase. The extremely wet spring did not turn out to be a great hindrance. We were able to get large seed increases from the bee pasture test plot and herbaceous ornamentals were well established in a new cage field. I have a skillful crew and I expect that we will make even more progress during 1992 since I have been able to hire a replacement for Paul Ovrom. Many of the herbaceous ornamentals in the cage field that did not produce seed in 1991 should do so in 1992, assuming that they overwinter successfully.

We have increased our'efforts with germination testing to document the viability of our ornamental collections. And once NSSL is ready to receive more seed samples, a higher proportion of these collections will be duplicated there.

There are-some "hanging items" that I hope to finally clear up in 1992, such as finishing the transfer of genera that belong to other priority sites and reorganizing-ornamental site'crops to better reflect curation practices.

b. Research

1991 turned out to be one of my best years for publishing research results. Besides the publications that appeared in print during the year, there are seven other papers that are scheduled to be published in 1992. The bee pasture project is benefitting greatly from the arrival of Roger Fuentes-Granados. During the next two years, he will be working on reistance to verticillium wilt and assessment of genetic diversity in Agastache. He was also instrumental in coordinating seed increase and germination testing of bee pasture germplasm. Two other projects that have progressed well in 1991 were a summary of the performance of landscape plants from Yugoslavia and a citation analysis of the literature of germplasm multiplication.

D. PLANT PATHOLOGY (Charles Block)

1. PROGRESS

a. Field

(1) Sunflower:

(a) About 390 sunflower PI's were rated for Alternaria leaf blight resistance (279 cultivated and 115 wild annuals). None of the cultivated accessions were highly resistant, but many had partial or "field" resistance comparable to that found in Hybrid 894. Two cultivated PI's performed well in each of the past three years; PI's 480472 and 480473, both from Zambia. Two accessions, Ames 3221, [L-2625-1 (Ukraine) -1] and Ames 3223, [L-2625-1 (Ukraine) - 3] had a resistant reaction - many small, chlorotic spots, but little necrosis.

(b) The wild sunflowers were difficult to test because of a high incidence of Septoria leaf blight, a disease with symptoms similar to Alternaria's. Many PI's had 50-85% of the leaf area killed by Septoria. PI's resistant to both Alternaria and Septoria included PI's 413030, 413031, 413090, 413155, 413162, 413164, 413165, 413168, and 413170.

(2) Corn:

(a) All the seed increase plots (~800) were inspected for incidence and severity of leaf diseases. Disease pressure was slight, with only rust and smut common. Northern leaf blight and carbonum leaf spot were the only other diseases present. They occurred on a few accessions.

(b) Continued study on seed transmission of Erwinia stewartii. Accomplished the first proven demonstration of seed transmission in the field. Seed to plant transmission appears to be inefficient. Seven positive plants were detected among 1307 (0.54%) in a seedlot that had 79% of

the seeds carrying *E. stewartii*. Greenhouse transmission was 4.3% from the same seedlot.

(c) Several thousand plants were inoculated with *E. stewartii* to obtain infected seed for lab and greenhouse tests.

(3) Melons:

Two serious diseases developed in the *Cucumis melo* cages: anthracnose - caused by *Colletotrichum laaenarium* and a bacterial disease. All 440 cages were monitored weekly from July 19 to August 8 to assess damage and rate of spread. Copper sprays were slightly effective in slowing disease spread. Anthracnose was the more serious of the two diseases, killing many accessions prematurely and causing extensive fruit decay.

(4) Other diseases:

(a) Squash mosaic virus was widespread in the *Cucurbita pepo* increase planting. The disease can be seed transmitted.

(b) Aster yellows mycoplasma disease was diagnosed on crambe, vernonia, wild sunflower, flax, calendula and zinnia. The pathologist cooperated with Agdia, Inc. of Elkhart, Indiana by supplying infected plants to aid development of a diagnostic test.

b. Greenhouse/laboratory

(1) Sunflower:

40 accessions (28 resistant and 12 susceptible), were selected to correlate greenhouse, leaf disk and field test results for *Alternaria* tolerance/resistance. The leaf disk assay could discriminate between some of the resistant and susceptible genotypes, but not all. Leaf disk testing has potential, but needs refinement.

(2) corn:

(a) *E. stewartii* populations dropped after 4 months of seed 'storage. No transmission of *E. stewartii* occurred in the same seedlot that 'originally had 4.3% transmission.

(b) Only 3% "of the seeds harvested from inoculated and severely diseased 'corn plants carried the bacterium.

(3) Melons:

Extensive work on the origin of the melon bacterial disease failed to prove that the pathogen was seed transmitted or that the'pathogen was-resident in the farm greenhouse soil supply.

Seed of 50 accessions (suspected of potentially carrying the bacteria) were planted in both the greenhouse and growth chamber, using sterile and non-sterile farm greenhouse soil. No seed transmission occurred. Seeds were also obtained from fruit in 3 field cages where the plants were severely diseased. No seed transmission occurred.

c. Miscellaneous

(1) Meetings/presentations:

(a) Presented poster at 13th Annual Seed Technology Conference - Iowa State, Feb., 1991.

(b) Presented poster and paper at Regional Seed Researchers Meeting - University of Illinois Mar. 1991.

(c) Poster presented at ISU Dept. of Plant Pathology annual poster session, May, 1991.

(d) Organized display for Dept. of Plant Pathology open house at VEISHEA, May, 1991.

(e) Attended National Cucurbit Meeting and Cucurbit Crop Advisory Committee Meeting, Rocky Ford, CO, Sept. 8-9.

(f) Attended NC-7 Technical Committee meeting at Sturgeon Bay, WI, Aug. 22-23, 1991.

(g) Presented Plant Pathology department seminar on seed transmission of Stewart's wilt in corn, Nov., 1991.

(2) ISU Classes attended:

(a) Seed Pathology, 3 cr.
(b) Genetic Engineering Lab Techniques, 3 cr.
(c) Biological Control of Plant Diseases, 2 cr.
(d) Training session on the Drug Free Workplace, 1 hr.
(e) Training session on Laboratory Chemical Safety, 1 hr.

(3) Others:

(a) Compiled and loaded Rhizoctonia data on cucumber onto GRIN.
(b) Attended weekly staff meetings.
(c) Served on the Plant Pathology Graduate Curriculum Revision Committee.
(d) Served on the Plant Pathology Research Faculty Review Committee.
(e) Attended weekly plant pathology seminars

2. Plans for 1992

a. Field/Greenhouse/Lab

(1) Sunflower:

(a) Continue Alternaria evaluations on sunflower. Test 200 accessions; a combination of retesting promising PI's and new accessions.

(b) Collect leaves from wild sunflower increase plots for leaf disk assay. Will save scarce seed of these PI's by avoiding a separate growout for disease evaluation.

(2) Corn:

(a) Continue research on biology of Erwinia stewartii seed transmission.
(1.) Produce infected seed in winter greenhouse for spring growout.
(2.) Determine percent seed infection.
(3.) Research longevity of bacteria in stored seed.
(4.) Determine efficiency of seed to plant transmission.
(5.) Establish location of bacteria in seed using immuno-microscopic techniques.
(6.) Improve sensitivity of ELISA detection assay.

(b) Inspect increase plots for diseases.

(3) Melons:

(a) Inspect increase cages for diseases.
(b) Experimental planting to test using induced resistance, to protect against melon anthracnose by inoculating the young plants with the same fungus.

(4) Cucurbita pepo

(a) Test seed in jars by ELISA for presence of squash mosaic virus.
Are we getting infected seed from infected plants in the field?

b. Planned meetings/presentations

(1) Attend and present paper at Sunflower Research Workshop, Fargo, ND. Jan, 1992.
(2) Attend 14th annual Seed Technology conference at ISU. Teach portion of workshop on seed t&sting methodology, Feb, 1992.
(3) Attend Illinois Corn Breeders School. Mar., 1992.
(4) Attend North Central division of APS society meetings in June, Urbana-Champaign, IL.

(5) Attend NC-7 Technical Committee meeting at Ames in July. Assist with tour.
(6) Assist with field tour for International Crop Sciencd Congress meetings, July.
(7) Present paper at American Phytopathological Society meetings, Portland, OR, August.
(8) Submit poster for Plant Pathology department poster session.

c. Miscellaneous

(1) Renew pesticide applicator certification.
(2) Update MSDS sheets and laboratory safety manual.
(3) Compile and submit data for GRIN - Alternaria on sunflower, powdery mildew on cucumber.

E. FARM SUPERINTENDENT (L. Lockhart)

1. Labor

During the calendar year 1992, 220 applications for hourly employment were received and reviewed. There were 140 interviews resulting in 114 hourly employees hired. Six employees were dismissed for *poor* work performance and two for habitual tardiness. Currently there are 27 part-time hourly employees working at the NCRPIS.

2. Maintenance Projects Completed

a. Installed Lithium Chloride Dehumidifier.
b. Completion of 30' x 100' Seed Increase Greenhouse.
c. Recovered an existing bubble house roof and endwalls.
d. Re-built existing cold frame.
e. Constructed second phase of cold storage shelving.
f. Acquired new carpet for seed picking room to eliminate damage to blower caps and tubes.
g. Removed old roof and repaired sheathing on storage garage.

3. Tours

This past year I have organized and conducted 12 tours ranging from a single visiting scientist to a group of 35 non-scientists.

4. Conferences, Training, Etc.

Attend&;'

a. Numerous Departmental Seminars
b. Worker Right-to-Know Update, ISU
c. Chemical Hygiene Plan Meeting, ISU
d. Obtained Class A, Commercial Drivers License
e. Obtained State Commercial Pesticide certification in the following

categories:- 1A, 1B, 1C, 1D, 3G, 04, 10.

5. P&chasing

Served as central purchasing person for PI farm. Gathered and summarized requests, wrote specs and obtained supplies to be used at the farm.

6. Goals and Plans for 1992

a. Maintenance
(1) Work as a liaison between contractors, ISU Experiment Station, USDA and Utility providers to assure construction of Entomology greenhouse proceeds as smoothly as possible.
(2) Renovate Storage garage so it can be used as a honey bee overwintering facility.
(3) Drain and tile as many field as resources allow.
(4) Expand dry storage facilities by remodeling old bee equipment room.
(5) Plan remodeling of Seed Storage work room. Remodel if resources are available.
(6) Ventilate attic storage area to eliminate moisture condensation problems.
(7) Construct new furrow opener to be used for cage construction.

b. Other:

(1) Attend ASA Meetings in Minneapolis,
(2) Attend Area LISA Meetings.
(3) Computerize and automate weather data collection.

F. Controlled Pollination With Insects. (C. Abel)

1. Progress

a. Cage pollinations: Controlled pollinations using honeybees began this year with the oilseed brassicas on April 23rd. Controlled pollinations ended this past year on September 24th with our Helianthus increases. 889 accessions were increased this year by controlled pollinating with honeybees. Because some of our honeybee nucs may be reused in the same season and some cages contained more than' one species of plant, 651 nucs were needed to do the pollinating of the 889 accessions.

35 accessions'of Daucus were control pollinated in cages by using a combination of honeybees and house flies.

Crops control pollinated using insects during 1991 and the number of accessions pollinated include: Brassica (175), vegetable crops (476),

Cuphea (28), ornamentals (98), Helianthus (60), Entomology research (24), and Amaranth curator increases (24).

b. Beekeeping: We purchased 270 2lb. packages of honeybees this year. 150 of these went directly into nucs for Brassica pollinating and the rest were used for making nucs for our summer pollinating season.

Bees were purchased from three different suppliers with each supplier offering a different race of honeybee. Traits important to us, such as brood production, cool weather flying, honey production etc., were rated and it was found that the Buckfast honeybee was superior to the Carniolan and Caucasian races of honeybee from their respective suppliers.

After two summers of observations, it was found that painting the pollinating nucs different colors and sequence shifting the nucs decreased the drifting of the bees in the field.

Nuc lids made from Masonite siding with a baked enamel finish were found to be superior for this purpose than other materials. 96% of the lids made from Masonite siding weathered the first year without substantial warping. This compares with success rates for the following materials: 3/4" pine (67%), 3/4" plywood (78%), and wafer board (91%).

An improved system for raising house flies was obtained from Dr. Elliot Krafsur of Iowa State University and will be implemented next year for our house fly rearing operation.

2. Future plans

a. An indoor wintering unit is scheduled to be built next year. This unit will allow us to winter our nucs that were used the previous summer for use the next year. If successful, this system should offer us substantial savings in our controlled pollination operation.

b. Early spring house fly rearing for Brassica pollinating and bumble bee rearing for pollinating certain Cuphea species will be attempted. Pollinating proficiency and insect management costs will be two important factors considered while working with these insects as pollinators.

3. Miscellaneous

a. Assisted Dr. Kamran Fakhimzadeh in working on a procedure for detecting tracheal mites in bees using cross sections of honeybee thoraxes in oil and centrifuging them.

b. Completed the following courses at Iowa State University: Statistical Design, Insect Physiology, and Insect Morphology.

G. Zea Curator

1. Activities.

a. Curatorial Information.

(1) Acquisition.

(a) New accessions received.

The 855 Zea acquisitions in 1991 can be divided as follows:

1. 229 Accessions were received for NCRPIS (North Central Regional Plant Introduction Station)-managed maintenance. A quarter of these are new accessions received through quarantine mainly from Africa. A significant number are accessions previously registered in Crop Science. Another group were received from the University of Illinois's Crop Evolution Lab which was discontinued a few years back. These accessions are mainly teosintes and teosinte crosses.

2. 626 new accessions'were received from the program managed by North Carolina State and funded by USDA which is regenerating native accessions at the maize germplasm banks in Peru, Colombia, and Mexico. 225 accessions were from Mexico, 326 accessions were from Colombia, and 75 were received from Peru. Many accessions previously received from Mexico received supplemental seed in 1991.

3. We received from the Colombian germplasm bank 1132 accessions held by them from other countries such as Bolivia, Peru, and Ecuador. These are not considered acquisitions by the NCRPIS but these are NPGS (National Plant Germplasm System) acquisitions. This seed is very old and was supposed to go to NSSL -(National Seed Storage Laboratory) for storage under optimum conditions. Since they were shipped here, we took the opportunity to go through the seed and make a listing. We also took pictures of the seed for future reference. This was finished in 1991 and then all of the seed was forwarded to NSSL. They will be putting this seed into the group for top priority increase in the new tropical increase program.

(b) Significant progress.

We have only a very few accessions of corn registered in Crop Science which are not in the collection now at Ames. Many of these are accessions registered at Iowa State and

these are expected early next year. The North Carolina State Program has finished its contract and its responsibility has been absorbed by another program cooperatively run by CIMMYT, USAID, USDA-ARS and several cooperating banks in Central and South America including those previously mentioned. However, there should be at least another 1200 accessions from the North Carolina State program which have been increased and will be shipped in 1992.

(2) Maintenance and distribution.

(a) #/% available for distribution.

53% (5981) of the 11363 accessions held in December 1991 were available for distribution. This can be broken down to 66% available for those 5670 corn accessions maintained at Ames (excluding the Galinat-Mangelsdorf collection), 56% available for those 4750 accessions regenerated in the North Carolina State project, and 26% available of 105 wild accessions of Zea. No accessions of the 1644 received from the Galinat-Mangelsdorf collection are available yet and these are not part of the Ames percentage. When these accessions are included in the Ames managed total, the percentage available becomes only 51%.

It is estimated that another 25% are partially available and would be added to the available percentage if they were stored on shelves or received PI numbers. The Galinat-Mangelsdorf collection represents 14% of the collection and only recently have some facilities been obtain to increase them.

(b) #/% distributed

We distributed 2753 packets of Zea seed in 1991. This represents 18% of all Zea accessions, 35% of accessions available. 33% of those accessions distributed were tropical regenerated accessions and 1.5% were for teosinte accessions.

(c) #/% duplicated at NSSL

NSSL has seed of 59% (6658) of Zea accessions held at NC-7. This percentage has fallen in recent years due to space limitations at NSSL. We have been setting aside seed for NSSL over the past five years and we should be able to increase this figure by 25% in 1992 when NSSL's new storage space becomes available.

(d) #/% regenerated

In 1991 512 accessions were regenerated. This represents 4.5%.of the Zea collections; These can be subdivided as follows:

1 . 393 regenerations were attempted in Ames in 1991. The year was somewhat difficult with a wet spring that delayed planting, followed by a dry summer. Many early accessions had spotty ear pollination due to this stress. The later accessions received moisture, but fewer heat units. Wind blew down many accessions from Ethiopia. Several of these were abandoned. The final difficulty was an unusually early frost. Hourly help was in unusually short supply from late August into September causing delays in note taking and harvests. All in all 66% of the accessions were regenerated successfully.

2. 107 accessions or .9% of the collection were regenerated in Puerto Rico in 1991. The Tropical Research Station at Mayaguez provided land, labor, and management during the season at the farm at Isabela. We provide seed, plans, two individuals for pollination management, and shipping costs of ears to Ames. The cooperation was excellent this year as previously. The material, except for some southern U.S. inbreds, was of excellent quality.

3. Five accessions were planted, pollinated, and harvested in 1991 in the greenhouse. One accession was Zea mays subsp. mexicana, which was isolated in the corner of the greenhouse under plastic, with air provided by a filtered fan. Over 200 plants were planted in automatically watered pots. Seed production was excellent with 4.5 kilos harvested. This demonstration increase will provide the model for future teosinte increases. The farm manager and his staff provided excellent help in producing this increase. Much'was learned that may be incorporated into future greenhouse design. Two of the Galinat-Mangelsdorf accessions were successfully increased as were two 'corn-teasinte crosses. Two Zea diploperennis were planted in 1991, but have not yet been harvested.

4. . More than 2.5 kg of fruit from one accession of Zea luxurians was received from-the SCS station on Molokai, Hawaii through the help of the WRPIS (Western Regional Plant Introduction Station).

5. Six of eight accessions sent to Dr. L. Darrah at the University of Missouri for regeneration were received and stored.

49 of 50 Accessions planted during the St. Croix 90-91 quarantine increase season were received in 1991. One failed due to poor germination. These accessions are not part of the 512 accession total mentioned previously.

(e) #/% tested for germinability/viability

Germinations have been performed on 60% of all Zea accessions held at NCRPIS during the last 5 years. This figure is more than the accessions available at the NCRPIS. In 1991, 1509 accessions were germinated and data entered into GRIN. An additional 300-500 germinations were performed but are not summarized because they were not entered into GRIN. Also, recent NSSL germinations of lots recently received at NCRPIS are not calculated in this figure.

(f) Significant progress

During the last five years, we made significant progress in increasing accessions adapted to the temperate zone and accessions of tropical adaptation which have not been replenished by the banks in Colombia, Mexico, and Peru. We now have more greenhouse space and have worked out some techniques for growing the Galinat-Mangelsdorf collection of few, old seed of tropical adaptation. Hopefully, we can begin addressing the 1644 accessions of this collection. However, more greenhouse space must be dedicated to these types of rescue operations. Other accessions from the tropical banks need re-increase due to low germination, low quantity, or high demand. The LAMP top 5% accessions are an example. The TROPICAL BANK--CIMMYT--USAID--USDA-ARS project is just beginning and will be immersed in rescue work for some time... The NCRPIS's needs have not been officially addressed by this project. Therefore, we must make considerable efforts to begin more tropical increases to ensure that these accessions can be maintained correctly.

(3) Characterization/taxonomy

(a) #/% characterized/classified

It is estimated that 40% of currently held accessions have all available passport data entered into GRIN. Twenty-five percent of Zea accessions held at the NCRPIS have some racial classification. Mostly, these are designations

provided by collectors or-the banks in Colombia, Mexico, or Peru.' These racial designations may need verification. Most accessions grown by the NCRPIS have accession characterization data which has been obtained during increase. Perhaps only as much as 30% of this data has been extracted from fieldbooks and entered into GRIN.

(b) Significant progress

Most of those accessions grown in Ames, Puerto Rico, or St. Croix in 1991 have some characterization data available in field books, but these data need to be entered into GRIN. Significant progress has been hindered mainly by lack of assistance with data entry and lack of computers and software. Data have been obtained, but I do not count these data as usable until they are entered into GRIN.

(4) Evaluation

(a) #/% evaluated

An independent CRIS for maize evaluation does not exist. As a result of the entomology CRIS and RRF funds allocated to maize evaluation, 59% of all accessions have been evaluated tolerance to first brood European corn borer. Also, preliminary work on corn earworm resistance as expressed by silk feeding has been carried out. The corn earworm data has not yet been summarized and entered into GRIN.

The acting plant pathologist has for the last 2 years screened our increase plots for diseases which are important for import of seed into some countries. To date, no sorghum downy mildew has been observed. Common corn smut, common rust, and leaf blights are always present in some amount and we will be unable to indicate that our increases are free of these diseases. This problem is becoming more critical with time as more and more import restrictions are erected world-wide.

(b) Significant progress

In 1991, the entomologist reevaluated 398 accessions for first brood corn borer to verify earlier ratings obtained. Most of these accessions had shown some resistance earlier. C. Abel evaluated 373 Peruvian accessions for the first time for this resistance. All these data have been entered into GRIN.

(5) Enhancement and/or utilization

(a) #/% enhanced

No enhancement program has been undertaken in Zea at the NCRPIS.

(b) Significant progress

Preliminary discussions regarding a germplasm enhancement program occurred during the 1991 Maize CAC meeting. It is likely that this topic will be discussed in future meetings.

c. Support/administrative personnel

(1) Significant accomplishments

Mr. T. Ladjahasan began work toward a doctoral degree in plant breeding. He planted more than 400 accessions which were selfed for future chemical analysis. He plans to work on breeding for nutritional factors.

d. Meetings attended

I attended several meetings in 1991. These are:

The National Sweet Corn Breeders Annual Conference occurred in Madison, Wisconsin, September 12-14. I discussed the Crookham maize collection with Dr. W. Tracy. He indicated that he would be determining the most important material in this collection for rescue in 1992. I learned about sweetcorn breeders' interests and difficulties.

The PGOC and GRIN Site meetings were held in Beltsville, Maryland, September 15-20. I received the 1st Annual NPGS Special Achievement Award for my work as maize curator and GRIN liaison and computer coordinator. We discussed the new computer and GRIN3 revisions and I was appointed to a special steering committee to oversee the development of the new NPGS computer system.

The Agronomy society meetings were held in Denver, Colorado, October 27-31. I attended the new germplasm section presentations which had a large maize component.

A meeting was held at Fort Collins, Colorado, November 1, after the Agronomy meetings to discuss NSSL-SEED REPOSITORY-GRIN policies and procedures.

The 1991 Maize CAC meeting was held in conjunction with the American Seed Trade Association meetings, December 9-12. A current spending outline of NCRPIS maize work was presented for CAC review. No

recommendations were made at this meeting, but recommendations are expected at future meetings of this group relating to our priorities in maize.

e. Presentations or seminars

Numerous visitors and groups toured NCPRIS and learned NCRPIS procedures for maize curation. Several weeks were spent with 2 scientists from the Vavilov Institute to familiarize them with GRIN and our curation methods in maize. Dr. Luskatov assisted me in reexamining maize accessions obtained from the Vavilov Institute in the past to clarify passport information written originally in Russian. We were able to determine that we had actually received some accessions more than once from that institute.

2. Other items

We were charged with managing the data for GRIN3 *from* the LAMP project. We entered passport data for *more* than 15,000 accessions evaluated by LAMP but not yet in NPGS. These accessions are expected to be deposited at least at the NSSL. Ten thousand of these accessions in NPGS had their passport updated by LAMP data. This project is very time consuming (2-3 weeks for the maize curator), but these data will provide more complete characterization of the accessions held at the NCRPIS.

A cooperative agreement was made with Iowa State University's Seed Science Laboratory to create a computerized visual database for corn ears. A postdoc, S. Panigrahi, will carry on this work with Dr. P. Bretting and myself acting for the USDA-ARS side of the cooperative agreement.

3. Conclusions

a. State of the program

In summary, we are holding our own in maintaining accessions. The recently acquired responsibility for rescuing the Galinat-Mangelsdorf collection will require additional greenhouse space. The teosinte collection can now be maintained "ex situ" with the same greenhouse space. If the responsibility of the NCPRIS in maintaining accessions held at NSSL, CIMMYT and foreign tropical banks is refined to include our increasing such material, then we will need to expand greatly resources for tropical increases. Preliminary work in this area is currently underway and ongoing.

b. Strengths and weaknesses: What facilitated or hindered progress.

The maize collection requires a full time curator. Additional full-time permanent positions would be most useful in the maize program. Supervising the many temporary workers would then be more efficient. -Travel to other'nurseries needs to be rotated. Many jobs are not being done efficiently due to rapid personnel turnover.

Spring planting and fall harvests are being delayed because of personnel shortages. Tasks of a more technical nature are not being accomplished.

Policy and procedures for improving the maize collection are needed. Currently, the only criteria used for elimination of duplicates are whether a certain accession with the same identifier can be traced to the same collection site or developer. Molecular marker techniques would assist in this effort. An acquisition policy must be developed.

c. Future plans.

(1) Acquisition plans.

It has been recommended by the CAC that all Caribbean accessions held by CIMMYT be deposited at the NCRPIS. We will make efforts to procure this material in 1992.

Maize from Guatemala, Bolivia, Ecuador, Paraguay, and Brazil is not well represented in the collections at the NCRPIS. I will attempt to obtain at least the racial type collections from these countries.

There is not a good representation of tropical inbred lines or elite breeding material in the NCRPIS. I will procure some of these materials from lists made available to me by CIMMYT and the University of Hawaii.

Many public maize breeding programs in the southern U.S. are disappearing Further effort will be devoted to obtaining all the important inbred lines and old open pollinated varieties from this region. Texas, Louisiana, Mississippi, Alabama, and Florida are especially under-represented in the NCRPIS collection.

(2) Increase work

We will attempt to regenerate some of the Galinat-Mangelsdorf collection. Enough attempts should be made to provide 50 regenerations. Further effort will be made to refine the passport data on these accessions.

Fewer accessions of Zea will be regenerated in 1992. Hand pollinations of corn is one of the most demanding on student hourly labor. 150 to 250 accession increases are planned.

Fifty accessions will be sent in 1992 for increase by the Northrup King Company on Molokai, Hawaii.

Five to eight accessions will again be sent to Dr. L. Darrah at the University of Missouri for increase.

Eighty-five accessions will be sent to Puerto Rico for winter increase. These will be mainly LAMP top 5% accessions which are in low supply at the NCRPIS.

Five to ten accessions will be sent to Dr. Brewbaker on Hawaii to test the feasibility of increasing tropical highland maize on Hawiii.

Corn from 165 accessions grown in St. Croix will be received in 1992. These will be stored at the NCRPIS and the NSSL. Forty-five were inbred lines from Cameroon and will probably need to be further increased in Puerto Rico in the 1992-93 season. If we stay on schedule, another 100 accessions will be increased on St. Croix in the 1992-93 season. Zambia has requested that seed sent to NSSL from an IBPGR collection to be returned. We will put top priority into increasing this material in quarantine during the next seasons.

At my suggestion, the quarantine center in Beltsville will be increasing temperate zone accessions in the greenhouse there. These accessions do not grow well on St. Croix. Additionally, accessions from Zambia in low original supply may be increased in this manner.

I hope a beginning can be made in increasing the Crookham sweetcorn collection in 1992.

(c) Characterization and Evaluation work.

Approximately 1000 accessions will be initially screened for corn borer resistance/tolerance by the research entomologist.

Approximately 100 accessions will be screened for earworm resistance by the entomologist.

The LAMP evaluation data will be entered into GRIN. This will include characterization-evaluation data on over 25,000 accessions in the accessions' area of adapation. This data could well total over half a million observations.

I hope to begin entering fieldbook data into GRIN. This job is long overdue.

More than 1200 accessions are expected to be received in 1992 as the North Carolina State tropical regeneration program closes. I will try diligently to assign PI numbers to all Mexican; *Peruvian, and Colombian accessions that have not received them. This could amount to well over 3000 PI numbers assigned in.1992.

(d) Experimental work requiring the maize program's resources.

Over 100 accession will be sent to Puerto Rico for selfing for Mr. T. Ladjahasan's thesis project.

The specific cooperative agreement with Iowa State and their imaging team will need close attention as equipment and software purchases are'completed. This year a database model will be developed.

An Iowa State graduate student will begin a preliminary study of the maize races of U.S. southwest and northern Mexico in 1992. Hopefully, this will generate information for understanding these materials' strengths and weaknesses for future seed requests and future accession procurement.

A similar study is planned with the University of Wisconsin and University of North Dakota to study more closely the Northeastern flints and their relationship to sweetcorn varieties.

(e) Work related travel.

A trip to St. Croix may be necessary in 1992 as Mr. C. Cardona may be away to graduate school and new personnel may be in charge. It has been a couple of years since the last trip and a review may be in order.

The Puerto Rico increase nursery will again require 2-3 weeks of my time in the spring of 1993. One or two other individuals will also need to accompany me.

I will attend the American Seed Trade Association meetings in December to attend the Maize Crop Advisory Committee meetings. The Sweet Corn Breeders meeting will probably also be held then.

I will attend the southern region maize breeders meeting which will probably be 'held in Atlanta. We are planning to review the status of that region's old varieties and inbreds in the NCRPIS.

I will probably attend at least one meeting in.1992 relating to the new GRIN3 software.

A trip-to Hawaii may-be necessary for observation or for site -- review-of one or more of the many places'being explored for . . -increase of tropically adapted materials.

H. Beta-Spinacia (P. Lundeen)

1. Beta

Increase of the sugarbeet collection in Utah is continuing. Due to heavy rains early last summer, the 87 Beta increases produced exceptionally high yields. Sixty-eight of the accessions increased were B. maritima, adapted to wet coastal Europe.

Increases were harvested from two accessions of Beta grown in Ames in the greenhouse(male sterile and male fertile isolines). Three accessions were started for winter increase in 1992.

We received 39 original seed lots in 1991, and stored 62 seed lots received from Utah. No back-up samples were sent to NSSL because the germinations were below 85%. Of 1271 Beta accessions, 578 have available distribution lots.

Germination percentages of the material recently regenerated is improving, as increase practices are improved. There is a concern about germination methods for the wild Beta species. The normal conditions for germination testing are not effective, and long periods of scarification in sulfuric acid may be an added selection pressure.

There were two Sugarbeet CAC Meetings this year - one that coincided with the ASSBT meetings and one with the ASA-CSSA meetings. The CAC is monitoring incorporation of old lines and breeder material into the system. There was also interest in moving all NSSL priority material to Ames.

The 406 observations entered in '91 were from the 1990 growing season. (There were 4236 previously loaded observations updated in 1991 that had the "add date" updated to the 1991 by software.) The 1991 observations have not been loaded yet. Aphanomyces was added to the list of 1991 evaluations. Unexpected results of the agronomic evaluations was the discovery of high concentrations of root sugar in the wild Beta types.

2. Spinacia

As of 1989, there were 282 accessions of Spinacia in the collection. All but 25 accessions are availible for distribution, although only 12 accessions have control-pollinated distribution lots.

We regerminated 255 of the 257 distribution lots available. The average germination percentage is in the high 70's. There are 25 distribution lots dating back to the early 50's. Twenty of these early accessions had germinations above 70%.

There must be a program to reincrease those accessions originally increased without pollination control. Stuart Andrew, currently increasing our Beta collection in Utah, is willing to increase the Spinacia collection. There is also a member of the Leafy Vegetable CAC

who has shown interest in helping. I have not had the time to develop a proposal, yet.

I. COMPUTER COORDINATION (P. Lundeen)

1. TRAINING

a. ISU Training

A number of staff members have taken advantage of the mini-courses on WORDPERFECT, WINDOWS, and DOS. The WORDPERFECT courses have been most valuable.

b. Monthly Computer Meetings

The monthly computer sessions are going well. Although the actual information may not be useful to all those involved, I think some of the individual gains have been made because of interest in these sessions. Some staff have learned much this last year, to the point where I keep underestimating their ability.

c. Individual Training

Individual training is still a major part of this position. The different levels of expertise, and no standard computer hardware and software make goal-oriented training necessary. Individual training has also helped to "breakdown" resistance to using computers.

d. Data Entry

We had 2 people hired this year specifically for data-entry. Both were hired in January and terminated in May/June. Since then, the receptionist has also helped with data entry. Although this means the same person often verifies their own first entry, it does cut down on training. We have had two different receptionist/ data-entry persons since June. It probably takes 4-6 weeks of training to explain the KEY ENTRY program and basic concepts such as lot codes, accessions, etc.

2. DOCUMENTATION

a. Inactive File Procedures

Under the Horticulturist's supervision, a committee representing seed storage, office clerical staff, curators, and computer personnel modified the deadfile sheet and wrote procedures for inactivating and removing accessions. Written procedures based on the disposition of inventory lots has reduced questions and standarized computer changes, and paperwork between crops.

b. Order Processing & Login

As time permits, we have been working on procedures for order processing and login. The major impetus for this has been requests for procedures to design GRIN3. A side effect of these written records has been increased efficiency in finishing orders.

Although both of these documents are still in the early draft stages, I think they are a start on a new station procedures manual. The format of the computer procedures for order processing is cookbook, while that of login emphasizes what needs to be done - not how it is done. The cookbook format allows easier data entry, while the login format is independent of software modifications.

c. Inventory Codes

Minor updates to the inventory codes were made this year, and new versions were printed.

3. COORDINATION & SUPERVISION

During the past year Order Processing was officially placed under my position.

a. Login

We recieved approximately 2,500 new accessions in 1991. Passport data on most of these accessions was entered manually.

372 Ames numbers were assigned to the Rodale Amaranthus Project Shutdown shipment received in 1990. Skeleton inventory, and passport records were loaded and packet labels printed, after duplicates were identified.

We coordinated with the sunflower curator and the research agronomist on the 1991 Helianthus collection trip, the Cuphea Brazil 1989 collection trip, and the Cuphea Mexico 1991 collection trip passport data - creating skeleton records & DBASE files, massaging the returned data files back into GRIN, and print reports for proofing.

b. Observation Data

The sunflower data has been a priority, long range project. Coordinating with the sunflower curator, we loaded disease and insect data for the past 4-5 years. I have been communicating with Mark Bohning (Beltsville) about descriptors and methods of handling observations for Cuphea.

4. PURCHASING & UPGRADES

a. Purchases

We purchased 5 new 386/486 PC's this year. All of these were APEX brand. The PC's seem to be running fine, except for the keyboard. We were also able to purchase enough dot matrix printers so that nearly all PC's have some printer attached.

We have purchased software upgrades for WINDOWS, EXCEL, and obtained test copies of a number of programs this year.

b. Upgrades

Upgrading PC's, specifically IBM PS/2's, is almost as costly as purchasing new machines. Therefore we are continually shifting PC's, giving the most experienced people the newest PC's and upgrading everyone down the line. This requires a large time expenditure, adjusting software to different versions of DOS, different drives, etc. Within the next couple of months, all curators should be using IBM PS2 286 base machines, or better.

This year we have also had a problem with the older PC's needing upgrades, or repairs before they could be reassigned (The Compaq's RAM upgrade, a PS2 needing a new hard drive, etc.). Newer versions of WINDOWS, WORDPERFECT, EXCEL, and DBASE require more hard-disk space, limiting the use of many of our older PC's with 30 MB or less. Three of the IBM monitors were also defective and needed to be replaced, on warrantee or IBM recalls.

There has been concern voiced over what to do with old computers. This has been used as an argument for restricting PC purchases. At this point, no PC has sat unused. Two staff members are still waiting for PC's. Hopefully, when the last shift of computers is in place, we may be considering where to store the IBM PC (8086, I think).

c. PC Cleaning

We discontinued a regular 6 month cleaning schedule for the PC's because of more critical priorities.

5. MOVING

We have been in the process of changing offices. In June we started moving from the conference room to 2/3's of the main office. We also had to shift all the TELENET cabling to the new office. The dividers have cut down on noise and visual distractions.

6. PRIORITIES

The ranking of projects I currently follow has been adjusted a number of times, so it seems a good idea to try to document it. The position originally emphasized maintenance and increase needs. Seed storage tends to be the limiting factor in the maintenance process. Recently, with the accounting program, the shift has been to administrative projects. My philosophy has been that immediate, response to "emergencies" was necessary to maintain peoples confidence in computers, and to keep the normal farm operations running. One final disclaimer: the priority list is modified by requests from Stoner, CAC meetings, CAC member requests, upcoming meetings, etc. Based on these guidelines, a rough list of priorities would run as follows -

a. HIGH

Accounting program
Research Leader's requests
Computer breakdowns
Individual help
Reports for seed storage
Processing germinations
Increase & germination orders & labels
New inventory lots
Order processing & IO orders
Monthly training sessions
Purchasing hardware & software

b. MODERATE

Curator requests
PRIME System maintenance
Field book pages
Hardware upgrades
Software upgrades
Passport proofing
Purchasing research
Documenting procedures
Computer back-ups

c. LOW

Database checking
Checking for duplicates
Loading observations
Defining descriptors
PC cleaning & maintenance
General programming research
Computer software evaluation
Filing & project documentation

J. VEGETABLES (K. Reitsma)

1. ACTIVITIES--General Summary

a. Acquisition

(1) New accessions: 298
(2) Status: 5612 PI-numbers, 950 Ames-numbers, 6562 total.
(3) Significant progress: Ames-numbers were assigned to the majority of the new accessions received in 1991. The 258 accessions received 24 December from NSSL were old cultivars used in a Wyoming breeding program. The seed dates back to 1933 to 1945. NSSL germinated many of the seed lots, and the germinations look relatively good for the age of the seed. GRIN has been checked for duplications and with the few that were found, the "new" seed predates the material in the NPGS.

b. Maintenance and distribution
(1) 3634 (55%) available for distribution.
(2) 3358 (51%) distributed.
(3) 2006 (31%) duplicated at NSSL.
(4) 763 (12%) regenerated.
(5) 568 (9%) tested for germinability/viability.
(6) Significant Progress: See specific crop summaries.

2. ACTIVITIES--Specific Crop Summaries

a. <u>Asparagus</u>

(1) Acquisition
(a) New accessions received: 2
(b) Status: 146 PI-numbers, 10 Ames-numbers, 156 total.

(2) Maintenance and distribution
(a) 43 (28%) available for distribution
(b) 7 (4%) distributed
(c) 0 (0%) duplicated at NSSL
(d) 0 (0%) regenerated
(e) 43 seed lots (32 accessions) (21%) tested for germinability/viability
(f) Significant progress: Asparagus has not been grown for increase at Ames since 1956. Some perennial plantings existed around the farmstead, but the key to their location has been lost and some plantings have been destroyed. This is a difficult collection to maintain and so it would be best if we could find a clonal repository for this collection. The Horticulturist maintains some ornamental plants in the campus greenhouse.

(3) Characterization/taxonomy
   (a) ? (?%) characterized/classified
   (b) Significant progress: There are very little data in the old fieldbooks. Some of the information may be coded for GRIN when descriptors are developed.

(4) Evaluation
   (a) 0 (0%) evaluated
   (b) Significant progress: There has been little interest in this collection.

(5) Enhancement
   (a) 0 (0%) enhanced
   (b) Significant progress: There is no enhancement program in the vegetable crops at NCRPIS.

b. Cichorium

(1) Acquisition
   (a) New accessions received: 4
   (b) Status: 62 PI-numbers, 138 Ames-numbers, 200 total.

(2) Maintenance and distribution
   (a) 42 (21%) available for distribution
   (b) 11 (6%) distributed
   (c) 19 (10%) duplicated at NSSL
   (d) 0 (0%) regenerated
   (e) 0 (0%) tested for germinability/viability
   (f) Significant progress: An additional 21 accessions could be available as soon as PI-numbers are assigned.

(3) Characterization/taxonomy
   (a) ? (?%) characterized/classified
   (b) Significant progress: Few notes are taken on this collection. No official descriptor list has been developed for chicory, but a modified lettuce descriptor list has been suggested.

(4) Evaluation
   (a) 0 (0%) evaluated
   (b) Significant progress: There has been little interest in this crop.

(5) Enhancement
   (a) 0 (0%) enhanced
   (b) Significant progress: There is no enhancement program in the vegetable crops at NCRPIS.

c. Cucumis melo

(1) Acquisition
   (a) New accessions received: 154

(b) Status: 2406 PI-numbers, 257 Ames-numbers, 2663 total.

(2) Maintenance and distribution
(a) 1347 (51%) available for distribution
(b) 804 accessions (1294 pkts) (30%) distributed
(c) 806 (30%) duplicated at NSSL
(d) 453 (17%) regenerated
(e) 274 (10%) tested for germinability/viability
(f) Significant progress: The collection "clean-up" is progressing slowly. Many of the accessions must be grown at least two years in a row to get enough seed to make an accession available for distribution.

(3) Characterization/taxonomy
(a) ? (?%) characterized/classified
(b) Significant progress: The SRPIS notes on GRIN are incomplete, and because the material was grown OP the notes may not characterize the accessions as they exist now. Complete notes will be taken using the CAC approved descriptor list when the accessions are reincreased using controlled pollinations.

(4) Evaluation
(a) 452 accessions (456 pkts) (17%) evaluated
(b) Significant progress:
1. Dr. C. Thomas and Dr. E. Jourdain , U. S.Vegetable Laboratory, Charleston , S.C., continue to evaluate the melon germplasm for downy and powdery mildew resistances as previously unavailable and new accession become available.

2. Dr. J.Staub, University of Wisconsin, received 400 accessions for an initial isozyme analysis screen of the melon collection.

3. M. Kyle and T. Zitter, Cornell University, Ithaca, NY, began work on evaluating the collection for gummy stem blight resistance.

(5) Enhancement
(a) 0 (0%) enhanced
(b) Significant progress: There is no enhancement program in the vegetable crops at NCRPIS.

d. <u>Cucumis sativus</u>

(1) Acquisition
(a) New accessions received: 26
(b) Status: 956 PI-numbers, 107 Ames-numbers, 1063 total.

(2) Maintenance and distribution
(a) 884 (83%) available for distribution

(b) 838 accessions (2027 pkts) (79%) distributed
(c) 528 (50%) duplicated at NSSL
(d) 58 (5%) regenerated
(e) 33 (3%) tested for germinability/viability
(f) Significant progress: Many of the accessions that are not available fall in the "hard-to-handle" category. These accessions will require day-length manipulation, growth regulator treatments, and longer growing seasons in order to get increases. This work will have to be done as hand pollinations in the greenhouse after the summer increases are harvested.

(3) Characterization/taxonomy
(a) ? (?%) characterized/classified
(b) Significant progress: Basic notes for accession identification are taken with each increase of an accession. No characterization data for the vegetables have been entered on GRIN since the late 1970's. (Some fieldbook notes have been put in Key Entry files, but we have to determine what information needs to be put on GRIN and in what format).

(4) Evaluation
(a) ? (?%) evaluated
(b) Significant progress: No new evaluations have been initiated to my knowledge. There were some evaluation programs started in 1989-1990 for which no data has yet been received.

(5) Enhancement
(a) 0 (0%) enhanced
(b) Significant progress: There is no enhancement program in the vegetable crops at NCRPIS.

e. Cucumis sativus wild accessions

(1) Acquisition
(a) New accessions received: 2
(b) Status: 276 PI-numbers, 9 Ames-numbers, 285 total.

(2) Maintenance and distribution
(a) 110 (39%) available for distribution
(b) 60 accessions (79 pkts) (21%) distributed
(c) 22 (8%) duplicated at NSSL
(d) 0 (0%) regenerated
(e) 1 (0%) tested for germinability/viability
(f) Significant progress: Accessions in this collection need special handling. Many species require long growing seasons or have become weedy pests in observation fields. Greenhouse increases will be the primary means of maintenance at Ames.

(3) Characterization/taxonomy
   (a) ? (?%) characterized/classified
   (b) Significant progress: The SRPIS notes on GRIN are incomplete, and because the material was grown OP the notes may not characterize the accessions as they exist now. Complete notes will be taken using the CAC approved descriptor list when the accessions are reincreased using controlled pollinations. This collection is also a taxonomic nightmare. I have found published material where researchers have reidentified NPIS accessions used in their work. Other researchers who concur continue to use the reidentified species name in their publications citing each other's work. Meanwhile, NPGS still maintains the accession as the species assigned when the seed was received. Since we have difficulty getting reidentifications confirmed by the taxonomists in Beltsville, MD, we are updating the species name on GRIN and citing the references as the authorities.

(4) Evaluation
   (a) ? (?%) evaluated
   (b) Significant progress: No new evaluations initiated this year.

(5) Enhancement
   (a) 0 (0%) enhanced
   (b) Significant progress: There is no enhancement program in the vegetable crops at NCRPIS.

f. Cucurbita

(1) Acquisition
   (a) New accessions received: 10
   (b) Status: 783 PI-numbers, 103 Ames-numbers, 886 total.

(2) Maintenance and distribution
   (a) 597 (67%) available for distribution
   (b) 677 accessions (2211 pkts) (76%) distributed
   (c) 379 (43%) duplicated at NSSL
   (d) 80 (9%) regenerated
   (e) 35 (4%) tested for germinability/viability
   (f) Significant progress: We received 257 accessions from IBPGR in 1987. Many of these accessions had fewer than 20 original seed, and 76 were misidentified as to species and genera. In the four years following 1987 we received an additional 135 accessions. We are able to increase about 80 accessions each summer. Unfortunately, about 30 to 50 percent usually need to be grown the following year due to poor plant performance, environmental stress, and other factors.

(3) Characterization/taxonomy
   (a) ? (?%) characterized/classified
   (b) Significant progress: Basic notes for accession identification are taken with each increase of an accession. No characterization data for the vegetables have been entered on GRIN since the late 1970's. (Some fieldbook notes have been put in Key Entry files, but we have to determine what information needs to be put on GRIN and in what format.) Laura Merrick will provide the Cucurbit CAC and each curator with a report concerning her findings in her review of the taxonomy/identification of the NPGS Cucurbita collections.

(4) Evaluation
   (a) ? (?%) evaluated
   (b) Significant progress: M. Kyle and T. Zitter, Cornell University, Ithaca, NY, began work on evaluating Cucurbita spp. for resistance to gummy stem blight.

(5) Enhancement
   (a) 0 (0%) enhanced
   (b) Significant progress: There is no enhancement program in the vegetable crops at NCRPIS.

g. Daucus

(1) Acquisition
   (a) New accessions received: 83
   (b) Status: 573 PI-numbers, 173 Ames-numbers, 746 total.

(2) Maintenance and distribution
   (a) 449 (60%) available for distribution
   (b) 430 accessions (1261 pkts) (58%) distributed
   (c) 159 (21%) duplicated at NSSL
   (d) 59 (8%) regenerated
   (e) 1 (0%) tested for germinability/viability
   (f) Significant progress: We have received 142 accessions since 1987. These accessions are primarily biennial, and it may take three to four years to get enough increase seed to make the accession available. I increase approximately 50 accessions per year.

(3) Characterization/taxonomy
   (a) ? (?%) characterized/classified
   (b) Significant progress: Basic notes for accession identification are taken with each increase of an accession. No characterization data for the vegetables have been entered on GRIN since the late 1970's. (Some fieldbook notes have been put in Key Entry files, but we have to determine what information needs to be put on GRIN and in what format.) The Horticulturist and I would like

to set up a perennial note field for the miscellaneous umbels to take complete notes on all of the accessions received since 1984 (the last large planting for carrot notes).

(4) Evaluation
(a) ? (?%) evaluated
(b) Significant progress:
1.We have had a several requests for material for oil seed analysis.
2. P. Simon and A. Mac Guidwin began evaluating the collection for resistance to southern root knot nematode.

(5) Enhancement
(a) 0 (0%) enhanced
(b) Significant progress: There is no enhancement program in the vegetable crops at NCRPIS.

h. Ocimum

(1) Acquisition
(a) New accessions received: 0
(b) Status: 70 PI-numbers, 5 Ames-numbers, 75 total.

(2) Maintenance and distribution
(a) 41#/ 55% available for distribution
(b) 13#/ 17% distributed
(c) 39#/ 52% duplicated at NSSL
(d) 10#/ 13% regenerated
(e) 30#/ 40% tested for germinability/viability
(f) Significant progress: We are trying to reincrease accessions with OP parentage and accessions with low germinations. For the last two years, wilts have reduced the yields in the increase cages. The 1991 harvests also contained many moldy seed.

(3) Characterization/taxonomy
(a) ? (?%) characterized/classified
(b) Significant progress: Basic notes for accession identification are taken with each increase of an accession. No characterization data for the vegetables have been entered on GRIN since the late 1970's. (Some fieldbook notes have been put in Key Entry files, but we have to determine what information needs to be put on GRIN and in what format.)

(4) Evaluation
(a) ? (?%) evaluated
(b) Significant progress: No new evaluations in 1991.

(5) Enhancement
   (a) 0 (0%) enhanced
   (b) Significant progress: There is no enhancement program in the vegetable crops at NCRPIS.

i. Petroselinum

(1) Acquisition
   (a) New accessions received: 0
   (b) Status: 130 PI-numbers, 13 Ames-numbers, 143 total.

(2) Maintenance and distribution
   (a) 63 (44%) available for distribution
   (b) 2 (1%) distributed
   (c) 23 (16%) duplicated at NSSL
   (d) 0 (0%) regenerated
   (e) 79 accessions (127 lots) (55%) tested for germinability/viability
   (f) Significant progress: The parsley collection requires a longer growing season than what we have at Ames. Green seed is harvested from the majority of the accessions and its viability declines rapidly. The germinations decrease quickly even when fully mature brown seed is harvested. Since there is little interest in the collection and poor quality seed is produced, no increases have been done since 1987/1988.

(3) Characterization/taxonomy
   (a) ? (?%) characterized/classified
   (b) Significant progress: Basic notes for accession identification are taken with each increase of an accession. No characterization data for the vegetables have been entered on GRIN since the late 1970's. (Some fieldbook notes have been put in Key Entry files, but we have to determine what information needs to be put on GRIN and in what format.)

(4) Evaluation
   (a) ? (?%) evaluated
   (b) Significant progress: No new evaluations in 1991.

(5) Enhancement
   (a) 0 (0%) enhanced
   (b) Significant progress: There is no enhancement program in the vegetable crops at NCRPIS.

j. Mints

(1) Acquisition
   (a) New accessions received: 0
   (b) Status: 10 PI-numbers, 8 Ames-numbers, 18 total.
   (c) Genera: Calamintha, Mosla, Origanum, Sideritis.

(2) Maintenance and distribution
   (a) 1 (5%) available for distribution
   (b) 0 (0%) distributed
   (c) 0 (0%) duplicated at NSSL
   (d) 10 (55%) regenerated
   (e) 1 accession (2 lots) (100%) tested for germinability/viability
   (f) Significant progress: Eleven Origanum were grown in field cages with carrots. All were very late flowering, and any seed harvested was immature.

(3) Characterization/taxonomy
   (a) 0 (0%) characterized/classified
   (b) Significant progress: One accession needs reidentification to Ocimum. An herbarium specimen will be sent to Beltsville, MD for identification.

(4) Evaluation
   (a) 0 (0%) evaluated
   (b) Significant progress: No new evaluations in 1991.

(5) Enhancement
   (a) 0 (0%) enhanced
   (b) Significant progress: There is no enhancement program in the vegetable crops at NCRPIS.

k. Umbels

(1) Acquisition
   (a) New accessions received: 17
   (b) Status: 200 PI-numbers, 127 Ames-numbers, 327 total.
   (c) Genera: Ammi, Anethum, Astrodaucus, Bifora, Carum, Caucalis, Chaerophyllum, Coriandrum, Cuminum, Ducrosia, Eryngium, Ferula, Foeniculum, Levisticum, Pastinaca, Pimpinella, Sium, Torilis, Trachyspermum, Unidentified Apiaceae.

(2) Maintenance and distribution
   (a) 57 (17%) available for distribution
   (b) 26 accessions (32 pkts) (10%) distributed
   (c) 31 (9%) duplicated at NSSL
   (d) 93 (28%) regenerated
   (e) 82 accessions (95 lots) (25%) tested for germinability/viability
   (f) Significant progress

(3) Characterization/taxonomy
   (a) ? (?%) characterized/classified
   (b) Significant progress: There are a number of misidentifications in this group of crops. Herbarium specimens will be prepared and sent to Beltsville, MD for reidentification.

(4) Evaluation
(a) ? (?%) evaluated
(b) Significant progress: No new evaluations in 1991.

(5) Enhancement
(a) 0 (0%) enhanced
(b) Significant progress: There is no enhancement program in the vegetable crops at NCRPIS.

(6) Meetings attended
American Society for Horticulture Science (ASHS), Pennsylvania State University, July 19-24, 1991.

Root and Bulb Vegetable Crop Advisory Committee, ASHS, Pennsylvania State University, July 20, 1991.

Leafy Vegetable Crop Advisory Committee, ASHS, Pennsylvania State University, July 23, 1991.

Cucurbit Genetics Cooperative Business Meeting, ASHS, Pennsylvania State University, July 23, 1991.

(7) Publications

"Cucurbit Germplasm at the North Central Regional Plant Introduction Station, Ames, Iowa.", R. L. Clark, M. P. Widrlechner, K. R. Reitsma, C. C. Number 4, April 1991.

"Pollination methods for maintaining carrot germplasm collections.", R. L. Wilson, M. P. Widrlechner, K. R. Reitsma, FAO/IBPGR Plant Genetic Resources Newsletter. 85:1-3.

3. OTHER ITEMS

a. Daucus accessions for 1992 summer cages were started in November 1991. Plant development was hindered due to flooding in the greenhouse (twice in November, once in December). Vernalization treatment will be delayed until late March to allow for better storage root development. Ten accessions bolted in the greenhouse and will be hand pollinated. Five of these annuals have also been sent to Larry Baker, Asgrow, for increase in cages with onions.

b. The coriander increase for 1991 was a failure. The material started in the greenhouse for transplant into field cages flowered when the plants reached a height of about 6 cm. The plants were weak, and seed production was poor or nonexistent. We recently received 52 accessions that we will try direct seeding for cage increases this summer.

c. The Plant Pathologist has not been able to isolate the cause of the bacterial problem in the melon collection. We are still undecided as

to whether a hot water-bath and bleach seed treatment is needed or helpful. These treatments seemed to have no affect on the disease in 1990 and 1991. We will continue to treat the plants in the cages with a fungicide to reduce the spread of the disease to new foliage. This may require several applications over the course of the summer. So far the disease has only effected the melon collection.

d. No backup seed is being sent to NSSL for the vegetable crops until we receive word that are ready to receive materials again.

4. CONCLUSIONS

a. Seed cleaning of 1991 increases is progressing. I do not have data on the success or failure of the attempted increases for the year. I hope to start germinations on the increase seed by April. I will need these data to determine which accessions need to be regrown in 1992. It looks as though seed storage for the vegetable crops will have to be in the summer.

b. I plan to increase 650 Cucumis, 80 Cucurbita, 50 Daucus, 50 Coriandrum, 40 Cichorium, and 30 miscellaneous mints and umbels (to be paired with carrots in cages). This will be approximately 740 cages for this summer's field increases.

c. Dr. J. Simon, Purdue, has made arrangements with the Horticulturist to have us grow out all available dill accessions this summer for oil analysis. Samples of 500 grams (fresh weight) of foliage will be harvested, just prior to flowering, for the analysis. Dr. Simon would also like a minimum of 10 grams of seed for oil analysis if possible. He is also interested in doing a similar analysis of the coriander collection.

K. Crucifers and Grasses (Rick Luhman)

In 1991 the North Central Regional Plant Introduction Station (NCRPIS) received 889 new accessions of the site crops maintained by this curator. The NCRPIS received Alliaria (7 accessions from France, 21 accessions from Germany, 3 accessions from Hungary, 5 accessions from Italy and 1 accession from the United Kingdom), Brassica (1 accession from Canada, 3 accessions from France, 38 accessions from Israel, 1 accession from the Netherlands, 1 accession from Pakistan, 6 accessions from Sweden and 14 accessions from the United States), Crambe (1 accession from Ethiopia, 1 accession from the former USSR and 265 accessions from New Mexico), Echinochloa (13 accessions from the United States and 4 accessions of unknown origin), Erysimum (1 accession from Finland and 1 accession from Germany), Lepidium (6 accessions from Germany), Linum (5 accessions from China, 1 accession from Turkey, 3 accessions from the former USSR and 1 accession from the United States), Panicum (396 accessions from the United States), Setaria (1 accession from Japan, 1 accession from the Philippines, and 1 accession from Switzerland), Sinapis (1 accession from Czechoslovakia, 14 accessions from France, 8

accessions from Germany, 58 accessions from Israel and 1 accession from the former USSR) and Thlaspi (5 accessions from Germany).

About 50% of the accessions maintained have Plant Introduction numbers. The majority of the accessions that are not PI'd are from the genera Brassica, Echinochloa, Panicum, and Setaria. Most of the Brassica accessions that are not PI'd came to the NCRPIS via Peoria, Illinois and were collected in India. Most of the Echinochloa, Panicum and Setaria accessions that are not PI'd were forwarded to us from the Plant Introdution Office (PIO) and were also collected in India. Recently, we received some good passport information on at least some of this grass collection. This information will be entered into the GRIN database and compared with information that we already have.

4,147 packets of Brassica, representing 1,453 accessions, were distributed in 1991. We also distributed more than 100 accessions of Crambe, Panicum, and Setaria. Other genera that were distributed were: Berteroa, Camelina, Echinochloa, Eruca, Isatis, Linum, Sinapis and Thlaspi.

In 1991, 11 Setaria accessions and 4 Panicum accessions were sent to the National Seed Storage Lab (NSSL). At present 33.2% of the total accessions and 66.7% of the PI'd accessions that NCRPIS maintains are at NSSL.

The 1991 regeneration totaled 235 accessions. We attempted to increase 166 Brassica, 18 Echinochloa, 26 Panicum, 18 Setaria and 7 other grass accessions. Of the 235 accessions, 193 were harvested. The remaining 42 accessions either failed to germinate or did not survive in the field until harvest. Those that failed to germinate will be considered for the inactive file.

For the 1991 Brassica increase, data were collected on flowering date, flower color, silique arrangement, plant height, harvest date(s), and number of plants harvested. For the grass increase, data were collected on heading date, stem number, texture, and habit, leaf number and width, panicle length, width, and type, harvest date(s) and number of plants harvested.

For the Brassica increase an average of 90 plants were started and 65 plants were harvested for each inventory lot. For the grass increase (only Panicum and Echinochloa) an average of 94 plants were started and 64 plants were harvested for each inventory lot. The plant loss from start to harvest was at least partially due to the very wet spring that Iowa experienced. To compensate for this in future years 125 to 150 plants will be started in the greenhouse (if seed quantities and germination percent permit). All surviving plants will be transplanted to the field and, after establishment, will be thinned to 100 plants/plot.

699 packets representing 618 accessions were germinated in 1991. The majority of those packets germinated were either five year germinations or of original seed.

Fifty-five Linum accessions were planted in 1991 for observation only. Herbarium specimens were collected on 37 of the accessions and will be sent

for identification. 76 Brassica accessions were also sent to Dr. Neil Harriman (University of Wisconsin, Oshkosh) via Dr. Richard Spjut for identification.

I attended the Forage and Turfgrass CAC on October 21, 1991. The CAC decided to take on Panicum as one of its responsibilities. This meeting coincided with the CSSA-ASA-SSA meetings.

The 1992 winter/spring seed processing activities will be to process the 1991 grass increase. The seed room activities will be to store the 1991 Brassica and grass regeneration.

The 1992 field regeneration will be 150 Brassica accessions, up to 500 grass accessions, and up to 100 Crambe accessions. The remaining 50 cages that are alloted to the Brassica project will be used for an experiment involving fly pollinations. The grass and Crambe regeneration will be dependent on entering the new passport data into the GRIN database. If space and time permit, up to 200 Brassica accessions could also be grown for observation only. There will be an attempt to increase 10 Lepidium accessions, possibly in the greenhouse.

I will experiment with different ways to improve the germination of the Echinochloa collection in 1992. It is my impression that this collection germinates poorly because of dormancy and not because of low viability. An experiment on three accessions in 1991 showed that removeing the seed coat on Echinochloa turneriana improved the germination percentage from 13% to 36%. The increase in percentage germination ranged from 9% to 40%.

L. Amaranthus, Celosia, Chenopodium, Coronilla, Dalea, Galega, Marina, Melilotus, and Perilla (D. Brenner)

1. GENERAL INFORMATION

In 1991 automated watering was instituted in the greenhouse. The new system provides far greater ease and reliability than the old hand method.

As in other years, the main limitation to productivity was the shortage of greenhouse space.

a. Amaranthus 3249 accessions

(1) ACQUISITION

53 accessions (401 accessions most from the close out of the Rodale Research program arrived in 1990, but were Ames numbered in 1991)

(2) MAINTENANCE AND DISTRIBUTION

count	%	
972	30	Available for distribution

36		Seed orders
836		Packets distributed
442	14	Accessions distributed
226	7	Duplicated at NSSL
144	4	Planted or harvested for seed increase in 1991 (includes 12 planted in Dec. 1990, and 44 planted in Dec. 1991)
714	22	Tested for germinability/viability

In 1991 the field plantings were mostly side by side comparisons of accessions, before inactivating duplicates. In addition 38 African A. cruentus were planted for field increases.

Seedlings transplanted in early July suffered in dry weather, but managed to survive. They would have done better if the four vertical sides of the peat pots had been removed at the time of transplanting. Under drought conditions the peat pots get stiff and prevent root penetration. With ordinary rainfall the peat pots break down rapidly, allowing root penetration.

The big greenhouse plantings were in September and December. The summer planting was cancelled because wet weather delayed the field transplanting of other crops, and made greenhouse space unavailable. A large summer planting of A. pumilus (an endangered species) was very successful in the new glass house.

An experiment with minimal daylength control to induce flowering, did not induce flowering. The findings contradicted Zabka (Am. J. Bot. 48:21-28 1961). In January 1992 many accessions reverted from flowering to vegetative growth when the greenhouse lights were reset for long (13 hour) days. I would like to learn about the minimum number of long nights to induce and maintain flowering in daylength-sensitive accessions.

An experimental test of our green house pollen isolation tents was started. The next step is to count seedlings with red vs. green stems to find out how many plants were pollinated by a red stemmed parent.

Amaranth seed lists were sent to the curators of all the large amaranth germplasm collections listed in the IBPGR Directory of Germplasm Collections.

Many germination tests were performed which eliminated the backlog of overdue tests. With this done, many accessions can now be backed up at the National Seed Storage Laboratory.

(3) CHARACTERIZATION/TAXONOMY/EVALUATION

There is no Amaranthus information in OBS (part of GRIN). The usual notes and photography continued. I continued to edit the characterization scheme. It would be easy to enter data on seed colors, seedling stem colors, and seed starch types.

Dr. Richard Spjut plans to study the herbarium specimens he has on hand in Beltsville, and prepare a key to the entire genus.

I was authorized by George White to re-identify amaranths with PI numbers on GRIN. The Computer Coordinator and I will develop an efficient system to do the updates.

78 accessions were grown for comparison before inactivating duplicates. The paperwork for the inactivations will be completed in early 1992.

718 secondary identifiers for Amaranthus accessions were computerized in a DBASE file. The assistant computer coordinator will soon load them into the GRIN database. These identifiers will also facilitate the Ames numbering of Peruvian amaranths that reached us via the Rodale Research Center.

(4) ENHANCEMENT AND/OR UTILIZATION

Preliminary crosses were attempted to develop grain types with reduced shattering (D. Brenner and H. Hauptli 1990 Legacy 3:2-3).

Hybrids between A. cannabinus (Ames 14359) and A. hypochondriacus (K343) were viable but infertile. This cross could be a source of increased seed size in grain amaranths.

Giant amaranths (A. australis PI 553076) from our collection were evaluated for forage quality by Gulimero Covas in Argentina (1991 Amarantos Novedades e Informaciones 9:4). The forage quality was excellent and the growth rate supported its value for forage.

Most of the pink-seeded accessions were grown for seed increase after Dr. Joshi informed me that the pink seed have superior expansion with popping.

(5) PROMISING ACCESSIONS

Ames 5372 A. caudatus pink seeds and an erect green inflorescence.

Ames 15312 A. standleyanus a new species in the collection.

Ames 13483 A. cruentus a very late flowering vegetable

accession from Nigeria. Delayed bolting would enhance its value for leafy vegetable production. It was planted on 20 May 1991 and matured seeds on 9 December 1991.

Ames 16110 A. sp. An accession from a taxonomically mixed wild population in California. This population has floral characteristics of several species as observed by taxonomists (Tucker & Sauer 1958 Madroño 14:252-261)

Ames 18058 A. cruentus collected in a backyard in Ames, Iowa but from Kerala, India. Vegetable landrace, with very intense red coloring.

PI 180815 A. caudatus Love-Lies-Bleeding type with attractive coloring and black seeds, arrived from Turkey as Celosia.

PI 481134 A. hypochondriacus unusually short uniform and erect under greenhouse conditions, selected for high yield in India (IC-42255-5).

(6) PLANS

Dr. James Lehmann provided me with names of Mexican Amaranth researchers, they will get copies of the new seed list when it comes out.

Many accessions will be made available for distribution from seeds increased at the Rodale Research Center. The seed lots should be cleaned and germination tested.

The identification of duplications in the collection should be continued.

New kinds of pollination bags will be tried with field-grown A. hypochondriacus. The bags used currently can cause abortion of the inflorescence.

I will edit an issue of Legacy to come out in the spring of 1992.

b. Celosia 27 accessions

(1) ACQUISITION

Three accessions from Rodale Research were received in 1990 and Ames numbered in 1991.

(2) MAINTENANCE AND DISTRIBUTION

count	%	
5	19	Available for distribution (includes one wrongly identified as Amaranthus)

2		Seed orders
5		Packets distributed
5	19	Accessions distributed
1	3	Duplicated at NSSL
5	19	Planted in 1991
4	15	Tested for germinability/viability

A new cultural method was tried, because of failures with late flowering germplasm. Two accessions were started in early July, and carried out to cages for pollination in pots between frosts in October. This method resulted in long sought success with late flowering PI 288733. The other accession Ames 2235 had many sterile flowers resulting in poor seed set, it might have done better with a long season in a cage.

(3) PLANS

The Celosia argentea accessions should be divided between early and late bloomers, and the October pollination method reserved for late bloomers. The early blooming accessions might do better if transplanted into field soil in late May. Some of the accessions are probably dead, but will require tetrazolium tests to resolve the question; the tests should be arranged.

I plan to write to the Herbaceous Ornamental CAC in the hopes of finding an advisor with expertise in Celosia to help guide the collection.

(4) CHARACTERIZATION/TAXONOMY/EVALUATION

Photography, herbarium specimens, and note taking continued. Additional passport data including secondary identifiers were sought out and entered into GRIN.

There is no Celosia information in OBS. It would be possible to characterize accessions by flower colors, inflorescence shape, improvement status, and, ability to self pollinate without insects.

Dr. Richard Spjut of Beltsville USDA returned taxonomic determinations of two herbarium specimens sent to him in 1980 (PI 274274 & 274280). The computer coordinator will soon enter these changes in GRIN.

(5) PROMISING ACCESSIONS:

PI 288733 a weed type with simple white spikes. The flowers could be dried and stained.

Ames 2235 an ornamental type with mixed cockscomb and plumosa characters orange or purple coloring.

c. Chenopodium 130 accessions

(1) ACQUISITION

none

(2) MAINTENANCE AND DISTRIBUTION

count	%	
2	2	Available for distribution (approximately 20 will be available when germination data in GRIN is manipulated)
13		Seed orders (up from 7 in 1990)
110		Packets distributed
33	25	Accessions distributed
2	2	Duplicated at NSSL
8	6	Planted or harvested in 1991 (includes 3 planted in Dec. 1990 and 2 planted in Dec. 1991)
53	41	Tested for germinability/viability

The seeds of this collection could be deteriorating faster than we can regenerate them. I am uncertain if any other Chenopodium collections are in better health. This collection has three big problems: poor germination percentages, (probably due to deterioration in storage), poor seed set in our hot and humid pollination bags, and plants that are entirely pistillate and therefore do not set seed.

(3) CHARACTERIZATION/TAXONOMY/EVALUATION

The practice of taking notes has continued. There are no OBS entries in GRIN. It might be useful to include information about adaptation for seed maturity in Ames, Iowa, because three accessions have the correct photoperiod adaptation.

(4) PLANS

I plan to contact Mr. Raul Castillo who will soon start at the potato station in Green Bay, Wisconsin. He wrote a Master's thesis on quinoa seed conservation and might help to review the program here. I have been trying for years to get a copy of the thesis, and was delighted when Calvin Sperling knew where the author could be reached.

In 1992 I hope to grow Chenopodium in positive pressure greenhouse tents. The pressure tents should provide pollen isolation within the greenhouse, (allowing more plants per greenhouse), and air conditioning to promote plant health. Similar results can be achieved with growth chambers, but at greater expense.

I could ask Dr. H. Wilson of Texas A&M to do some taxonomic determinations for us. We have two doubtful C. album with large pink or white seeds from Taiwan (PI 433378 & PI 433379).

d. Coronilla 107 accessions

(1) ACQUISITION

(2) MAINTENANCE AND DISTRIBUTION

count	%	
76	71	Available for distribution
3		Seed orders
14		Packets distributed
13	12	Accessions distributed
2	2	Duplicated at NSSL
4 (annuals)	4	Planted for increase in October 1990
1 (annuals)	1	Planted for increase in October 1991
9 (perennials)	8	Long-term planting maintained in 1991
1	1	Tested for germinability/viability

Four accessions of annuals did very well with October plantings, self pollination in greenhouse pots, and summer harvests.

It was another unsuccessful year with the perennial C. varia increases. Nine accessions planted in 1990 yielded negligible seeds, after laborious hand tripping the flowers. In 1992 they will be open pollinated. The next control pollination method to try is the use of bumblebee hives within pollination cages.

(3) CHARACTERIZATION/TAXONOMY/EVALUATION

The usual notes and herbarium specimens were taken.

(4) ENHANCEMENT AND/OR UTILIZATION

Coronilla seedlings have been proposed as a source of industrial enzymes (Gold & Brodman 1991 Ec. Bot. 45(3):334-338). Our large seeded annuals could be useful for this purpose.

d. Dalea and Marina 29 accessions

(1) ACQUISITION

none

(2) MAINTENANCE AND DISTRIBUTION

count	%	
13	45	Available for distribution
1		Seed orders
5		Packets distributed
5	17	Accessions distributed
0	0	Duplicated at NSSL
4	14	Growing from a 1990 planting
0	0	Tested for germinability/viability

Six accessions were made available on the basis of high germination percentages in original seed lots.

The 1990 field planting of four accessions was laboriously hand cross-pollinated, but seed set was poor. In 1992 they will be open pollinated. Bumblebees might be the best solution for control pollination.

(3) CHARACTERIZATION/TAXONOMY/EVALUATION

The passport data for some of these are poor, a series of letters revealed that the Soil Conservation Service has lost the records of the ones they collected. The next step is a letter to the herbarium at the University of Arizona, Tucson, in the hope that herbarium vouchers were kept.

Passport data were found for four Nebraska collections, and were entered in GRIN.

e. Galega 14 accessions

(1) Acquisition

none

(2) Maintenance and distribution

count	%	
2	14	Available for distribution (this excludes 9 noxious weed accessions that have ample quantity and germination)
2		Seed orders
4		Packets distributed
2	14	Accessions distributed
2	14	Duplicated at NSSL

1	7	Planted for increase in 1990 and still alive.
0	0	Tested for germinability/viability

The G. orientalis perennial planting was winter hardy, but suffered greatly from leaf hoppers, flowering was negligible. In 1992 they will be caged early to exclude leaf hoppers; spraying and sticky traps might also help. Unfortunately, spraying would also kill honeybees and make pollination difficult. Experimental plantings in Wisconsin have done very well. I do not know why they do so poorly here.

(3) CHARACTERIZATION/TAXONOMY/EVALUATION

The usual note taking continued.

f. Melilotus 788 accessions

(1) ACQUISITION

382 accessions

These new accessions are from Dr. Herman Gorz of Nebraska. Some replace PIs that he sent us decades ago but were lost. Janae Colvin has been instrumental in processing this deluge of packets, identifiers, and seed lots.

(2) MAINTENANCE AND DISTRIBUTION

count	%	
508	64	Available for distribution
6		Seed orders
123		Packets distributed
110	14	Accessions distributed
225	29	Duplicated at NSSL
48	6	Planted for increase in October 1990
48	6	Planted for increase in October 1991
507	64	Tested for germinability/viability

48 accessions were planted in October, 1990, for harvest in mid 1991. Most remained in conetainers for the entire growing cycle. The M. officinalis plants were carried out to cages for bee pollination. The cave was used to slow plant development so that only a few accessions would need cage pollination at one time. The plants were taken to the campus greenhouse for summer seed maturity in artificially cooled conditions. A similar planting was started in October 1991 for harvests in the summer of 1992.

I am preparing a short paper about pollination and maintenance of Melilotus germplasm for the Plant Genetics Newsletter.

Very long daylengths can be used to induce flowering. It would be helpful to have access to that kind of lighting. Unfortunately, long days are unwelcome light pollution in all the greenhouses that I use, and must share with other users.

(3) CHARACTERIZATION/TAXONOMY

The usual note taking continued. Herbarium specimens were taken for accessions in need of re-identification. The field book pages were redesigned to reflect the fact that plants no longer go outside to be challenged by Iowa winters. The entire collection is being characterized by a CAC supported forage scientist (Dr. M.D. Rumbaugh) at Utah State University. He mentioned problems with mixed species, and incorrect determinations among the seeds we sent him. He will send us a list of problem accessions.

g. Perilla 17 accessions

(1) ACQUISITION

none

(2) MAINTENANCE AND DISTRIBUTION

count	%	
0	0	Available for distribution (15 of the 16 viable accessions will be available when germination data in GRIN is manipulated)
4		Seed orders
28		Packets distributed
15	88	Accessions distributed
0	0	Duplicated at NSSL
3	18	Planted for increase in 1991
15	88	Tested for germinability/viability

An improved method was successfully used for the seed increase: because of a late planting, the plants stayed small and rapidly went to seed.

This perilla collection is small and should remain so. The germplasm is safe in foreign lands where it is an important crop. We should not bear the expense of a world collection of perilla, but refer our clients to bigger collections abroad.

(3) CHARACTERIZATION/TAXONOMY/EVALUATION

A poster and a paper were prepared for the New Crops Conference in Indianapolis. In the course of preparation all accessions were PI'ed and information was sought for gaps in the passport data.

(4) PLANS

Increase the seeds of a newly arrived (1992) accession, Ames 18336.

Perform a short term test of perilla seed survival in liquid nitrogen storage. Liquid nitrogen might help with the problem of rapid deterioration in perilla seeds.

I will write to germplasm facilities in Korea to learn about suppliers where our requestors can be referred. I already have some of this information from Japan.

2. MISCELLANEOUS PROGRESS

We had a visit from Dr. B.D. Joshi who has worked extensively with amaranths. He provided a useful review of our amaranth project here. Many other visitors also provided helpful exchange of seeds and ideas.

I sent approximately 110 letters and made numerous phone calls.

I reviewed two scientific manuscripts.

In addition to sending out horticultural advice with Amaranth seeds, I send a prepared list of commercial seed sources with many seed orders.

3. Professional Meetings

Clover and Special Purpose Legume, Crop Advisory Committee meeting, Geneva, New York, June 25, 1991

1991 Amaranth Institute Annual Meeting, Fort Sidney, Nebraska, August 16-17, 1991

Second National New Crops Symposium, Indianapolis, Indiana, October 6-9, 1991

4. PUBLICATIONS

Perilla Germplasm at the North Central Regional Plant Introduction Station. poster and abstract for the New Crops Symposium

Perilla Uses and Genetic Resources. in: Proceedings of the Second National Symposium on New Crops (in final stages of preparation)

Volunteer prairie maintenance at the Ames High Prairie. Poster at the Annual Meeting of the Nature Conservancy of Iowa

M. SEED STORAGE (L. Burke and D. Lutjen)

1. CALENDAR

1\23\91 Cleaned, stored, inventoried and entered into GRIN the Melilotus collection.

1\24\91 - 1\31\91 Stored Helianthus.

11\31\91 - 2\11\91 Inventoried Agrostis and entered parent information into GRIN. Prepared for transfer to W-6.

2\11\91 - 2\20\91 Cleaned complete Linum collection, took total weights and hundred seed weights. Data entered into GRIN. Pulled germs.

2\25\91 Inventoried original seed.

2\26\91 - 3\6\91 Stored Brassica. (Lisa Burke started work in seed storage).

3\7\91 Inventoried original seed.

3\11\91 - 3\20\91 Cleaned, weighed, hundred seed weight taken, germs taken from distribution lots and inventoried Anethum.

3\20\91 - 3\21\91 Filled seed order for large pumpkin order and large sunflower order. Started inventory on original corn.

3\22\91 - 4\10\91 Inventoried original corn.

4\10\91 Finished original corn.

4\11\91 - 4\12\91 Inventoried and entered Cumimun into GRIN.

4\12\91 - 4\22\91 Inventoried misc. grasses.

4\22\91 - 5\1\91 Stored Echinochloa, Panicum and Setaria.

5\7\91 - 5\22\91 Stored Celosia, Perilla, Chenopodium and Amaranthus.

5\23\91 Started inventory of Amaranthus original and main jar lots.

5\24\91 Switched sunflower accessions over to new PI numbers and put in proper place in original drawers. Continued inventory on Amaranthus.

5\29\91 - 5\30\91 Moved 124 Beta accessions to new PI space in cold storage and put new labels on jars and packets.

6\3\91 - 7\3\91 Continued to inventory Amaranthus and entered original seed from the DeWet collection into seed storage.

7\3\91 - 7\8\91 Stored Beta.

7\8\91 - 7\16\91 Stored Cucurbita pepo, went through complete collection and entered date. Switched glass jars for plastic jars and moved collection into north cold storage.

7\16\91 - 7\18\91 Continued to inventory Amaranthus. Moved Spinacia next to Beta in north cold storage. Moved Ames number sunflower accessions to where the pumpkins were located. Moved Coronilla and Dalea next to Melilotus.

7\22\91 - 10\10\91 Stored Cucumis sativus and Cucumis melo. Updated information on GRIN for complete collections. Put lid labels on jars for Spinacia, Daucus, Coronilla, Asparqus, Feoniculum, teosinte, Dalea, Pastinaca and Vernonia. Corrected accessions where the accession number did not equal the inventory number. Wrote guidlines for entering original seed into seed storage for Peter L. Put labels on original corn jars for Mark M.

10\10\91 Started work on corn collection. Began with first jar in cold storage and updated information on GRIN and added lots(mostly original seed lots) on the database. Packed for shipment to NSSL corn that they do not have or that has low germs at NSSL. Stored extra corn in foil bags and placed the bags on the first two shelves in the new cold storage. Pulled germ on corn placed into main old storage.

12\31\91 Delbert Lutjen retired.

2. SUMMARY

During the time period 1\2\91 through 12\31\91 over 550 (> 21,000 packets) seed orders were filled and over 1450 original seed or elsewhere increase seed lots were entered into seed storage (there were more lots received that did not go through seed storage and the curators were handling those). For detailed information regarding the seed order amounts please see the seed order portion of the annual report.