MINUTES OF THE MEETING OF THE S-9 TECHNICAL COMMITTEE ON THE INTRODUCTION, MULTIPLICATION, AND EVALUATION OF NEW PLANTS FOR AGRICULTURAL AND INDUSTRIAL USES AND THE PRESERVATION OF VALUABLE GERMPLASM

UNIVERSITY OF FLORIDA, INSTITUTE
OF FOOD AND AGRICULTURAL SCIENCES,
GAINESVILLE, FLORIDA

JULY 24-25, 1991

SUBMITTED BY
GORDON PRINE, SECRETARY

S-9 TECHNICAL COMMITTEE 1990-91

AGENDA
S-9 Regional Technical Advisory Committee Meeting
July 24-25, 1991

Host: University of Florida, IFAS, Agricultural Experiment Stations

Location: Hilton Hotel, 2900 S.W. 13 Street, Gainesville, FL

July 24, 1991

8:00 AM	1.	Call to Order
8:10 AM	2.	Introduction of Attendees
8:20 AM	3.	Official Welcome by J. M. Davidson, IFAS Dean of Research
8:35 AM	4.	Approval of Minutes - 1990 Meeting
8:45 AM	5.	Approval/Additions to Agenda for 1991 Meeting
9:00 AM	6.	Appointment of Committees A. Nominations B. Time and Location of Next Meeting C. Resolutions
9:15 AM	7.	Future Role of the S-9 Regional Project and Organization - Review and Discussion - Dr. Gerald Arkin A. Appoint Research Programs, Budget and Facilities and Personnel Committees
9:30 AM	8.	National Program Staff Reports A. Farm Bill - National Genetic Resources Program; Sorghum Curator Position, FY 92 Budget - Dr. Henry Shands
10:00 AM	Coffee Break	
10:30 AM	10.	Update on Research Programs - Dr. Graves Gillaspie
11:00 AM	11.	S-9 Budget Review - Arkin/Gillaspie
11:30 AM	12.	Germplasm Collection Status, CAC Recommendations and Facilities Update - Gil Lovell
12:00 N	Lunch	
1:15 PM	Leave Hilton Hotel on field trip	
1:30 PM	Arrive Fifield Hall - University of Florida campus	

1:35 PM	Dr. Paul Lyrene - Fruit Crops Breeder Blueberry and Small Fruit Breeding
2:00 PM	Dr. Rex Smith - Breeding and Biotechnology Biomass (energy) Research and Biotechnology
2:25 PM	Dr. Carrol Chambliss - Forage Extension Florida Forage Grasses and Legumes
2:50 PM	Refreshments
3:00 PM	Leave Fifield Hall for Dairy Research Unit (DRU)
3:30 PM	Arrive DRU Agronomy Area
	Dr. Ken Quesenberry - Forage Legume Breeder Diego Diz - MS Graduate Student of Dr. Stan Schank - Grass Breeder Dr. Gordon Prine - Ryegrass Breeding and Elephantgrass Management Dr. Tito French - Perennial Arachis Extension and Research
4:30 PM	Leave DRU
5:15 PM	Arrive Hilton Hotel
6:30-7:45 PM	Bar-b-que Dinner at 13th Street Sonny's
8:00-10:00 PM	Committee Meetings 1. Nominations 2. Research Programs 3. Budget 4. Facilities/Personnel

July 25, 1991

8:00 AM	13.	Call to Order
8:10 AM	14.	PI Program Operations, Committee Reports and Discussion 1. Research Programs 2. Budget 3. Facilities/Personnel
10:00 AM	Coffee Break	
10:15 AM	15.	Plant Exploration Proposals - Gil Lovell CSRS - Report and Discussion of National Research Support Project
10:30 AM	16.	Report of 1990 Cotton Exploration Trip in the Baja Peninsula - Dr. James McD. Stewart
10:45 AM	17.	GRIN Update and Review

11:00 AM	18.	Committee Reports and Acceptance 1. Nominations 2. Time and Location of Next Meeting 3. Resolutions
11:30 AM	19.	Unfinished or New Business
12:00 N	Adjournment	

1. **CALL TO ORDER**

The S-9 Technical Committee meeting was called to order in the Gainesville Hilton Hotel, Gainesville, Florida, by Chairman Norman Taylor at 8:00 AM, July 24, 1991.

2. **INTRODUCTION OF ATTENDEES**

	Name	Address	Phone
	Gerald Arkin	GAES 1109 Experiment Street Griffin, GA 30223-1791	404/228-7263
*	William Branch	UGA/Dept. of Agronomy Coastal Plans Exp. Sta. Tifton, GA 31793-0748	912/386-3561
	Michael L. Cagley	USDA/NCGR/Citrus 23418 USDA Road Groveland, FL 39736	904/787-5078
*	Ruben Velez Colon	Agri. Exp. Sta., HC 02 Box 7115 Juana Diaz, PR 00795	809/842-9196 837-3905
	Jim Davidson	University of Florida Dean for Research 1022 McCarty Hall Gainesville, FL 32611	904/392-1784
	Charles Dean	University of Florida Dept. of Agronomy 304 Newell Hall Gainesville, FL 32611	904/392-1814 FAX: 904/392-1840
	Steve Eberhart	National Seed Storage Lab. Colorado State University Fort Collins, CO 80525	303/484-0402 FAX: 303/221-1427
	Graves Gillaspie	USDA/ARS Plant Introduction Station Griffin, GA 30223	404/228-7207

*	Frank Hons	Texas A&M University Soil and Crop Sci. Dept. College Station, TX 77843	
*	Phillip T. Ito	Univ. of Hawaii College of Tropical Agri. 461 W. Lanikaula Street Hilo, HI 96720	808/935-2885
	Robert Kleiman	USDA/ARS Northern Reg. Res. Center 1815 N. University Street Peoria, IL 61614	309/685-4011
	Gilbert R. Lovell	USDA/ARS, S. Reg. Plt. Intro. Sta. Ga. Exp.Sta., 1109 Experiment St. Griffin, GA 30223-1797	404/228-7255 FAX: 404/228-7270
*	Jorge A. Mosjidis	Agronomy Department Auburn University Auburn, AL 36830	205/844-3976 FAX: 205/844-3945
	Jimmie Mowder	USDA/ARS/NGRL Bldg. 001, Room 130 10300 Baltimore Ave. Beltsville, MD 20705	
*	Gordon M. Prine	Univ. of Florida, Dept. of Agronomy 304 Newell Hall Gainesville, FL 32611	904/392-1811 FAX: 904/392-1840
*	Samuel R. Sanders	USDA - Soil Conservation Service 401 SE 1st Ave. Gainesville, FL 32601	904/377-0958 FAX: 904/377-1098
	Raymond J. Schnell	USDA/ARS Subtropical Hort. Res. Sta. 13601 Old Cutler Road Miami, FL 33158	305/238-9321
	Henry L. Shands	USDA/National Program Staff BARC-West, Bldg. 005, Room 140 Beltsville, MD 20705	301/344-3311 344-3191
*	James (Mac) Stewart	University of Arkansas Agronomy Department Fayetteville, AR 72701	501/575-5722
*	Norman Taylor	University of Kentucky Dept. of Agronomy Lexington, KY 40546-0019	606/257-5785

Francisco Vazquez	USDA/ARS Tropical Agric. Res. Sta. P. O. Box 70 Mayaquez, PR 00681	809/831-3435 831-3439

* Members of the S-9 Technical Committee.

3. **WELCOME**

Dr. J. M. Davidson, Dean of Research, Institute of Food and Agricultural Sciences (IFAS), University of Florida, welcomed the committee. He informed the group that IFAS had released over 340 cultivars in all and over 160 cultivars since 1975. He pointed out that most of the cultivars were traceable to plant introductions.

4. **APPROVAL OF MINUTES**

Bill Branch moved that the minutes of the 1990 meeting be approved as circulated. The motion was seconded and approved.

5. **APPROVAL OF AGENDA**

The 1991 agenda was approved as circulated except for some readjustments due to absence of CSRS representative. Dr. Arkin later covered some points on CSRS in his several addresses to the Committee. The GRIN Report and review were moved from Thursday morning to Wednesday morning.

6. **APPOINTMENT OF COMMITTEES**

1. Nominations - Gordon Prine and Francisco Vazquez

2. Time and Place. No Committee was appointed but Gil Lovell pointed out the addition of new building, personnel and programs at the Southern Regional Plant Introduction Station at Griffin, GA, since the last S-9 Technical Committee meeting there.

3. Resolutions - Phillip Ito and Bill Branch

7. **REMARKS BY ADMINISTRATIVE ADVISOR**

Dr. Gerald Arkin, Administrative Advisor, reviewed the present, past and possible future role of S-9 Technical Committee. He pointed to the historical role of S-9 as an information and exchange role. S-9 members as eyes and ears on germplasm for colleagues and directors. He stressed the need for committee interaction with all germplasm curators in Southern Region. He suggested a quarterly or biannual newsletter. The need for a strategy plan for S-9 with long and short objectives so results can be measured over time. He suggested need of several subcommittees to work with Regional Station on reports and in advisory roles. A quarterly or annual newsletter was proposed.

8. **NATIONAL PROGRAM STAFF REPORTS**

Dr. Henry Shands, National Program Leader for Plant Germplasm, reviewed the National Germplasm Resources Program covering both national and international situations including FAO activities.

He showed a copy of a pamphlet "Seeds for Our Future - The National Plant Germplasm System". 100,000 copies were printed and copies are available for distribution in states by S-9 representatives.

Dr. Shands announced the establishment of a sorghum curator in Puerto Rico. The sorghum seed storage will remain at the Southern Plant Introduction Station at Griffin, GA.

9. **NATIONAL SEED STORAGE LAB REPORT**

Dr. Steve Eberhart gave a report for the National Seed Storage Lab. Report is attached in Appendix I.

10. **GRIN REPORT AND UPDATE**

Jim Mowder, National Germplasm Research Laboratory, gave a talk on merits and use of GRIN system. He later gave a demonstration of the system on a computer in his room.

11. **SOUTHERN PLANT INTRODUCTION STATION RESEARCH**

Dr. Graves Gillaspie gave a report on research activities by personnel of the Southern Regional Plant Introduction Station (report attached in Appendix I).

12. **S-9 BUDGET REVIEW**

Advisor Arkin and Gillaspie then went over report of S-9 budget for germplasm for last year and proposed budget for new year. Written report is attached in Appendix I. Gil Lovell gave the status of Southern Station germplasm collection as consisting of 64,000 accessions, 266 genera, 1369 species collected from 160 countries.

13. **FIELD TRIP AND NIGHT MEETING**

The field trip featuring research and facilities at the University of Florida was followed by a night meeting on Thursday discussing the role and scope of the S-9 Committee and how the members might improve the service of the committee. Motions that arose out of the night meeting were:

1. Motion to change annual progress reports to a calendar year basis, copies of the progress reports to be furnished to S-9 members before each annual meeting so members can study prior to having annual meeting was moved and passed.

2. Motion to expand membership of S-9 Committee to all germplasm curators in Southern Region was moved. Gil Lovell to write letters inviting:

   a. Cotton germplasm workers
   b. Pennisetum curator
   c. Pecan Repository leaders
   d. Germplasm leaders at 1890 universities
   e. Others that may be germplasm curators

   Motion was discussed and ruled passed when there was no opposition.

14. **THURSDAY MORNING**

Continuing from previous evening, the S-9 Committee agreed to gather information on named cultivars and germplasm released or developed from plant introductions in Southern Region and publish a regional bulletin. There has been no similar publication since "Plant Introduction and Development of New Crops in the South", published in 1971. All committee members are asked to contribute with Gil Lovell, Editor, and Prine, Hons and others aiding him in writing and editing.

Advisor Arkin made discussion of relationships of NRSP (National Research Support Project) and NPGC (National Plant Germplasm Committee).

15. **NEW AND OLD BUSINESS**

A proposal by G. M. Prine that the S-9 Committee make a resolution to USDA and Directors calling for a lupine breeding and biotech program in the South to develop this forage, grain and green manure cool season crop was tabled until next meeting until a subcommittee could study the situation more. Another proposal by Raymond Schnell calling for a resolution by the committee for better germplasm exchanges with other countries, particularly on getting germplasm from India, was also tabled by the chairman until further study.

16. **COMMITTEE REPORTS**

a. Nominating Committee nominated Jorge A. Mosjidis, Alabama member, to be the next secretary. His nomination was seconded and passed by all present.

b. The Resolutions Committee made the following resolutions which were duly passed by the S-9 Committee:

1. Expresses its appreciation to Dr. Gordon Prine and the Institute of Food and Agricultural Sciences, University of Florida, for hosting the S-9 meeting.

2. Special thanks go to Drs. Ken Quesenberry, Paul Lyrene, and Carrol Chambliss for their presentation and the informative tour which followed.

3. Warm acknowledgement to Ms. Ellen Weintraub for graciously entertaining our families.

c. Time and Place. It was pointed out that Hawaii had offered to have the S-9 Committee for many years including a previous aborted-at-last-minute attempt. The National Horticultural Society is planning to meet in Hawaii on July 31-August 8, 1992. A motion was made and passed that the S-9 Committee should meet in Hawaii on July 28 and 29, 1992 and the Officers and Administrative Advisor should get permission for the Committee to go there. If approval is not obtained, the Committee would meet at Southern Regional Plant Introduction Station at Experiment, GA.

17. **REPORTS OF STATES AND OTHER AGENCIES**

The following state representatives presented brief oral reports and turned in written annual reports:

Representative	State
Jorge A. Mosjidis	Alabama
Mac Stewart	Arkansas
Gordon M. Prine	Florida
William Branch	Georgia
Phillip T. Ito	Hawaii
Norman Taylor	Kentucky
Ruben Velez Colon	Puerto Rico
Frank Hons	Texas,

Their written annual reports and those of other state representatives who did not attend this meeting but reported by mail are presented in Appendix I.

18. OTHER AGENCY REPORTS

The following additional agency reports were made and are included in Appendix I:

Representative	Agency
Michael L. Cagley	National Council Germplasm Repository for Citrus
Robert Kleiman	Northern Regional Research Center, New Crops Research
Samuel R. Sanders	USDA - Soil Conservation Service
Raymond J. Schnell	USDA Subtropical Hort. Res. Station
Francisco Vazquez	USDA Tropical Agri. Res. Sta.

19. REPORT OF PLANT EXPLORATION PROPOSALS AND TRIPS

Gil Lovell reported several exploration proposals are pending but not developed to stage that they could be reported to full Committee. These proposals, when complete, would be considered by S-9 Plant Exploration Proposal Subcommittee consisting of Lovell, Prine, Taylor and Ito, for their value and approval.

Dr. Ken Quesenberry, forage legume breeder at University of Florida, Gainesville, reported on his trip to Bulgaria in July, 1990 to collect Trifolium species.

Dr. James McD. Stewart reported on his trip in 1990 to Baja region of Mexico to collect wild species of Gossypium (cotton).

20. ADJOURNMENT

No further business new or old being before the Committee, the S-9 Committee was adjourned by Chairman Norman Taylor at 11:30 a.m., July 25, 1991.

APPENDIX I

STATE AND FEDERAL REPORTS

Written progress reports are attached in the following order:

Alabama

Arkansas

Florida

Georgia

Hawaii

Kentucky

Louisiana

Mississippi

North Carolina

Oklahoma

Puerto Rico

South Carolina

Tennessee

Texas

Virginia

Germplasm Resources Laboratory

National Clonal Germplasm Repository - Tropical Fruit - Hilo, HI

National Program Staff

National Seed Storage Laboratory

Northern Regional Research Center

Soil Conservation Service

Southern Regional Plant Introduction Station

Subtropical Horticultural Research Station
Miami, FL

Tropical Agricultural Research Station,
Mayaguez, PR

S-9 Technical Committee Report
July 1991

Agency: Auburn University and Alabama Agricultural Experiment Station
Submitted by: J. A. Mosjidis
Address: Department of Agronomy
Auburn University
Auburn, AL 36849-5412

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Accession User: J. A. Mosjidis
Address: Department of Agronomy
Auburn University
Auburn, AL 36849-5412

Nature of Research: Study of the breeding system of several *Vicia* spp.

Progress to Date: Plants of *Vicia articulata* (PI's 206390, 220879, and 449362), *Vicia benghalensis* (PI's 298001, 298003, and 449330), *Vicia lutea* (PI's 201994, 249880, and 250797), and *Vicia villosa* (PI's 201883, 206493, and 222217) were enclosed in cages when the first flower buds appeared to prevent pollinators from reaching the flowers. Flowers of each accession in each of two replications were subjected to the following manipulations: 1) tagged flowers with not further manipulation (tagged), 2) flowers were tripped with forceps to artificially self-pollinate them (tripped), 3) flowers emasculated and artificially cross-pollinated with other plants of the same population (PI), (crossed), 4) flowers emasculated (emasculated).

The three *Vicia articulata* accessions survived until flowering time, however, PI 220879 was the only one that set fruits. Flowers of the other two PI's were severely damaged by insects. Breeding system of this species has been deemed to be self pollinated because there were not differences in percentage of fruit set (PFS) between flowers tagged inside and outside the cage.

The three *Vicia benghalensis* accessions survived and set fruits. All these PI's (298001, 298003, and 449330) were deemed self pollinated because there were not differences in percentage of fruit set (PFS) between flowers tagged inside and outside the cage.

The three *Vicia lutea* accessions survived and set fruits. PI 249880 was deemed self pollinated whereas PI's 201994 and 250797 are mostly self pollinated but the data also indicate that some apomixis may be present because the emasculated flowers set some fruits.

The *Vicia villosa* accessions did not set any fruits inside the cage whereas the plants outside the cage had a 15-20% PFS. This species was demeed cross pollinated and probably dependent on insects for pollination.

Several morphological observations were taken on the plants of the different species. Stem, leaf, stipules, inflorescence, flower, and calyx characteristics have been recorded.

Publications: None

Cultivar releases: None

Accession User: C.S. Prakash
Address: Tuskegee University
School of Agriculture
Tuskegee, AL 36088

Nature of Research: We have to major goals: 1) to develop methods for efficient introduction of foreign genes into sweet potato (*Ipomoea batata* L.) to enable development of transgenic cultivar with improved agronomic performance; and 2) to identify DNA markers to enable construction of genetic markers and conduct evolutionary studies.

Progress to Date: We have been successful in introducing foreign DNA into sweet potato using *Agrobacterium* vectors. We have confirmed the presence of foreign DNA in in transgenic shoots by PCR and Southern Analysis.

We have developed a method to extract high-quality DNA from sweet potato. We are maintaining nearly 100 accessions in tissue culture. We have made a genomic library and currently screening several probes. Sweet potato cultivar and related species are being DNA fingerprinted.

Publications:

Varadarajan, G.S. and C.S. Prakash. 1991. A rapid and efficient method for the extraction of total DNA from the sweet potato ind its related species. Plant Molecular Biology Reporter 9:6-12.

Loretan, M. and Prakash, C.S. 1990. Plant Biotech.-New but old. Tuskegee Horizons 1:12-13.

Prakash, C.S., Varadarajan, U. and Kumar, A.S. 1991. Foreign gene transfer to sweet potato. Sweet potato Collaborators Annual Meeting. February 1991. Fort Worth, TX.

Prakash, C.S. and Varadarajan, U. 1991. Genetic Transformation of Sweet Potato (*Ipomoea batata* (L.) Lamk.). Golden Jubilee Symposium on Genetic Research and Education: Current Trends and the Next Fifty Years. Feb. 12-15, 1991, New Delhi, India.

Varadarajan, G.S., and Prakash C.S. 1991. Evolutionary biology of the sweet potato and its relatives: opportunities for molecular genetic studies. Sweet Potato Collaborators Annual Meeting. February 1991. Fort Worth, TX.

Thomas, I.D., Varadarajan, U. and Prakash, C.S. 1991. Effect of cytokinins on shoot regeneration in sweet potato. Sigma-Chi Symposium, Tuskegee University, March 22-23, 1991. Undergraduate Paper.

Prakash, C.S. et al. RFLP approaches to identify sweet potato cultivars. 1990. Abstracts of the IV International Symposium on Development and Applications of New Technologies for Varietal Identification. A.D. Knapp (Ed.) p. 23. Iowa State University, Ames.

Cultivar releases: None

Accession User: K.M. Soliman

Address: Department of Plant and Soil Science
Alabama Agricultural and Mechanical University
Normal, AL 35762

Nature of Research: Phylogenetic relationship in the tribe *Triticeae* based on chloroplast DNA variation.

Progress to Date: All the available species of seven genera representing the tribe *Triticeae* were selected for this study. They include the following species. Forty nine accessions of *Triticum* species, twelve accessions of *Hordeum* species and fifty accessions of *Aegilops* species obtained from the National Small Grains Collection USDA-ARS Aberdeen, Idaho. Two *Agropyron*, one *Elymus*, two *Elytrigia* and two *Psathyrostachys* accessions were obtained from Western Regional PI station USDA-ARS Pullman, Washington. Plants grown in the Alabama A&M University Green Houses and the total DNA was isolated from all the above species. The genetic variation in those species will be evaluated at chloroplast level through restriction endonuclease analysis. *Petunia* chloroplast DNA will be used as a probe to detect the polymorphism. Based on the variation a phylogenetic tree will be constructed.

Publications: None

Cultivar releases: None

Accession User: Joseph Norton/George Boyhan

Address: Department of Horticulture
101 Funchess Hall
Auburn University, AL 36849

Nature of Research: Evaluation of watermelon germplasm for resistance to gummy stem blight, race 2 anthracnose, root knot nematode, and zucchini yellow mosaic virus.

Progress to date: Several sources of resistance to ZYMV have been identified, the results have been submitted to Plant Disease for publication. Approximately 100 accessions have been screened thus far for resistance to GSB, anthracnose and root knot nematode, the results should be available on the GRIN network. Seed of these accessions has also been increased and should be available from the USDA.

Publications: None

Cultivar Releases: AW-82-50CS (AU-Sweet Scarlet) and AW-83-1001CSY (AU-Yellow Producer) both resulting in higher disease resistance due to a backcross program with resistant PIs.

1991 S-9 TECHNICAL COMMITTEE REPORT FOR ARKANSAS

AGENCY: Arkansas Agricultural Experiment Station
SUBMITTED BY: T.E. Morelock
ADDRESS: 316 Plant Science Bldg.
University of Arkansas
Fayetteville, AR 72701

ACCESSION USER: S.J. Scott and M. Stevens
Department of Horticulture & Forestry
316 Plant Science Bldg.
University of Arkansas
Fayetteville, AR 72701

NATURE OF RESEARCH: Breeding for resistance to tomato spotted wilt in tomato.

PROGRESS TO DATE: Diverse germplasm has been screened for resistance to tomato spotted wilt virus (TSWV). Lycopersicon species examined include L. esculentum, L. pimpinellifolium, L. hirsutum, L. chilense, L. parviflorum, L. pennellii and L. peruvianum var. glandulossum. Resistance has been identified and is being incorporated into adapted genotypes Inheritance, RFLP and isozyme studies are under way utilizing genes identified by screening work.

PUBLICATIONS: None

CULTIVAR RELEASES: None

ACCESSION USER: S.J. Scott and M. Stevens
ADDRESS: Department of Horticulture & Forestry
316 Plant Science Bldg.
University of Arkansas
Fayetteville, AR 72701

NATURE OF RESEARCH: Screening okra for verticillium wilt resistance.

PROGRESS TO DATE: A greenhouse screen for verticillium resistance was used to screen plant introduction. Three hundred and eighty PIs were screened with 'Jade' okra being one of the most tolerant of the varieties tested. A temperature gradient seed germination was initiated.

PUBLICATIONS: None

CULTIVAR RELEASES: None

ACCESSION USER: L.P. Brandenburger, J.C. Correll and T.E. Morelock
ADDRESS: Department of Horticulture & Forestry
316 Plant Science Bldg.
University of Arkansas
Fayetteville, AR 72701

NATURE OF RESEARCH: Spinach Breeding.

PROGRESS TO DATE: Spinach germplasm (707 accessions) from collections from six countries were screened for resistance to race 4 of the downy mildew pathogen, Peronospora farinosa f. sp. spinaciae. These collections contained germplasm which originated from 41 different countries. The predominate species examined was Spinacia oleracea, however, eight accessions of S. turkestanica and two accessions of S. tetrandra were also tested. Approximately forty seedlings of each accession were inoculated. The cultivar 'St. Helens' was included as a susceptible control in each test. Plants were inoculated when the first set of true leaves were 2cm in length. Disease incidence (DI) was recorded as the percentage of cotyledons and true leaves exhibiting evidence of sporulation. The majority of accessions tested (>98%) were susceptible to race 4. Nine accessions exhibited some resistance to race 4, (9-38% of the seedlings within an accession were resistant) and two accessions, CGNO 9546 and SPI 82/87, exhibited a high level of resistance (60 and 80% resistant, respectively). Resistance identified is several of the accessions in this study may be useful for breeding for race 4 resistance. Resistant plant introductions were 183246, 211632 and 220686.

PUBLICATIONS: None

CULTIVAR RELEASES: None

1991 S-9 TECHNICAL COMMITTEE REPORT FOR FLORIDA

University of Florida
Institute of Food and Agricultural Sciences
Florida Agricultural Experiment Stations
and USDA Cooperators

Submitted by: G. M. Prine
Agronomy Department
University of Florida
304 Newell Hall
Gainesville, FL 32611-0311
904-392-1811 or FAX 904-392-1840

Accession User: P. L. Pfahler
Agronomy Department
304 Newell Hall (0311 IFAS)
University of Florida
Gainesville, FL 32611-0311
904-392-6186 or 904-392-1811

Nature of Research: Crop: Sesame (Sesamum indicum L.). To examine the nature and extent of genetic variability in this crop for potential basic research involving all aspects of pollen formation, germination, and transmission studies.

Progress to Date: In August 1988, I received 984 sesame accessions from the Plant Introduction Station at Experiment, Georgia. These accessions were planted in the field in June 1989 and evaluated for genetic variability and useful genetic characters. Seeds from single plants or rows were harvested from 28 accessions whose PI numbers (country of origin) are as follows:

PI 154308 (Mexico)	PI 165593 (India
PI 158044 (China)	PI 165899 (India)
PI 158045 (China)	PI 170757 (Turkey)
PI 158056 (China)	PI 180481 (India)
PI 158062 (China)	PI 238455 (Turkey)
PI 158769 (Venezuela)	PI 240844 (Turkey)
PI 158770 (Venezuela)	PI 263446 (Japan)
PI 158771 (Venezuela)	PI 263448 (Japan)
PI 158906 (China)	PI 263456 (Soviet Union)
PI 159035 (China)	PI 263466 (Soviet Union)
PI 162563 (China)	PI 279539 (Mexico)
PI 279542 (Mexico)	PI 490035 (Korea)
PI 317383 (Korea)	PI 490044 (Korea)
PI 345670 (Soviet Union)	PI 490244 (Sudan)

These accessions were planted in the field in June 1990 for further evaluation and selection.

Publications: None

Accession User: M. J. Williams
USDA, ARS, STARS
P.O. Box 46
Brooksville, FL 34605
904-796-3385

Nature of Research: Evaluating tropical forage legumes and grasses for persistence, quality, and dry matter production for excessively well-drained soils in the subtropics. Genera being evaluated include: Leucaena, Stylosanthes, Arachis, Alysicarpus, Indigofera, Pennisetum, Paspalum, and Cynodon.

Progress to Date: 'Line 8400' stylo, Stylosanthes guianensis (Aubl.) SW., developed as a perennial pasture legume for south Florida, remains vegetative later in the year than do most common tropical annual legumes. This suggested that Line 8400 could be useful as a hay or stockpiled forage, even in those areas where it failed to perennate or reseed. A production trial was initiated to determine seasonal (August-November) dry matter (DM) production distribution, crude protein (CP) and in vitro organic matter digestibility (IVOMD) of June-planted stylo compared to common alyceclover, Alysicarpus vaginalis (L.) DC., and 'Flamingo' hairy indigo, Indigofera hirsuta L. In the first year of the production trial, peak DM yield for Line 8400 occurred in October 6.9 Mg/ha, the same as hairy indigo 6.1 Mg/ha and one month later than alyceclover 5.3 Mg/ha. Crude protein (9.9-16.5%) and IVOMD (47.3-64.7%) of Line 8400 was similar to or better than the other legumes at all harvest dates.

Publications:

Austin, M.T., M.J. Williams, A.C. Hammond, J.H. Frank, and C.G. Chambliss. 1990. Florida Leucaena Psyllid Trial (LPT) I: First year establishment, yield, chemical composition, and survival. Leucaena Res. Rep. 11:3-5.

Austin, M.T., M.J. Williams, and J.H. Frank. 1990. Florida Leucaena Psyllid Trial (LP) II: First year evaluation of psyllid damage. Leucaena Res. Rep. 11:6-8.

Baltensperger, D.D., S.G. Taylor, W.H. Anderson, R.L. Stanley, L.S. Dunavin, M.J. Williams, R.A. Dunn, and R.J. Glennon. 1990. Registration of 'Fl-3' Alyceclover. Crop Sci. 30:1367-1368.

Hammond, A.C., T.H. Elsasser, W.E. Kunkle, T.S. Rumsey, M.J. Williams, and W.T. Butts. 1990. Effects of winter nutrition and summer pasture or a feedlot diet on plasma insulin-like growth factor I (IGF-I) and the relationship between circulating concentrations of IGF-I and thyroid hormones in steers. Domestic Anim. Endocrinol. 7(4):465-476.

Hammond, A.C., M.J. Williams, L.C. Gabarre, and T.A. Olson. 1991. Effect of bahiagrass grazing management and sire influence on gastrointestinal nematode egg shedding rate in Angus calves. pp. 15-156. Proc. Forage Grassld. Conf., Columbia, MO. 284 pp.

concentrations. Kinggrass (PI 300086) conversely had the lowest IVOMD and CP, but the highest NDF concentrations. All of the intraspecific hybrids had intermediate values in these laboratory analyses. In addition, colchicine treatment of interspecific hybrids (pearl millet brown-midrib mutant x various elephantgrasses) has been accomplished, and the C_1 generation is under field evaluation in 1991.

Publications:

Schank, S.C., O.C. Ruelke, W.R. Ocumpaugh, J.E. Moore, and D.W. Hall. 1990. Registration of Survenola digitgrass. Crop Sci. 30:1369-1370.

Schank, S.C., F.T. Boyd, Rex L. Smith, E.M. Hodges, S.H. West, A.E. Kretschmer, Jr., J.B. Brolmann and J.E. Moore. 1990. Registration of Survenola digitgrass. Crop Sci. 30:1368-1369.

Schank, S.C., Diego Diz, and Rex L. Smith. 1990. Genetic advances in a new hexaploid *Pennisetum* (Pearl millet x napiergrass) hybrid for biomass and/or forage. Suncoast Biotech Conference. 1:19.

Schank, S.C., Rex L. Smith, and Jeff Seib. 1990. Evaluation of triploid and hexaploid derivatives from *Pennisetum glaucum x Pennisetum purpureum* crosses for biomass. Caribbean Food Crops Society Meeting, Mayaguez, PR. (In Press).

Schank, S.C. and D.P. Chynoweth. 1990. Comparisons of hexaploid, tetraploid and triploid napiergrasses for biomass and/or forage. Agron. Abst. 82:192.

Schank, S.C., D.P. Chynoweth, C.E. Turick and P.E. Mendoza. 1991. 1991 Southern Biomass Conference Abstracts. Abstract II.B.3.

Schank, S.C. and D. P. Chynoweth. 1991. Comparisons of nutritive value of triploid, tetraploid and hexaploid napiergrass derivatives for biomass and/or forage. Trop. Agric. 68:(in press).

Schank, S.C., D.P. Chynoweth, C.E. Turick and P.E. Mendoza. 1991. Napiergrass genotypes and plant parts for biomass. (Submitted to Bioresource Technology).

Accession User:

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904-392-1811

Nature of Research: Peanut (Arachis hypogaea L.) breeding and genetics, as well as molecular genetic work, are being conducted to understand and improve yield, quality, and pest resistance. PIs continue to be used in our program.

Progress to Date: PIs 221068, 268882, 315624, 315630, and 343365 were used in a series of crosses for home-garden peanut types, with upright plant growth

habit, large seed, and early maturity. These materiáls are now in the F_5 generation and selections will be made this summer for yield testing. Crosses with PI 476835, which has some resistance to late leafspot (Cercosporidium personatum (Berk. & Curt.(Deighton), are in the F_3 generation. PIs 362130 and 405915 are being used in crosses to understand the inheritance of a narrow leaf mutation.

PI 262090, as well as the wild species Arachis batizocoi (PIs 298639, 468325, 468327, 468328, and 468340), A. cardenasii (PIs 262141, 475998, 475999, 476011, and 476014), A. duranensis (PIs 219823, 468198, 468200, and 468201), and A. glandulifera (PIs 468336, 468341, 468342, and 468343), were used in RFLP work with considerable variability shown with cDNA and genomic probes, both within and among species. The PIs from the wild species were received courtesy of Dr. H. T.Stalker at North Carolina State University.

Publications: (Refereed articles from research with PI material.)

Knauft, D.A., W.D. Branch, and D.W. Gorbet. 1991. Two dominant genes for white testa color in peanut. J. Hered. 81:73-75.

Knauft, D.A., and D.W. Gorbet. 1991. Agronomic performance and genetic shifts of genotype mixtures in peanut. Euphytica 52:85-90.

Fiebig, W.W., D.G. Shilling, and D.A. Knauft. 1991. Response of peanut genotypes to interference from common cocklebur. Crop Sci. 31:in press.

Knauft, D.A., D.W. Gorbet, and F.G. Martin. 1991. Variation in seed size uniformity among peanut genotypes. Crop Sci. 31:(in press).

Accession User:

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Nature of Research: 1) Compare a 1 vs 2 wk pasture rotation on animal performance of Cynodon grasses; 2) test several St. Augustine (Stenotaphrum secundatum Walt.) entries on sandy flatwood soils; 3) test 5 Pennisetum entries for dry yield, quality, and other characteristics.

Progress to Date: Grazing studies were recently completed comparing Cynodon nlemfuensis Vanderyst var. nlemfuensis cultivars of Florico (Puerto rico #2341) and Florona with C. dactylon cv. Callie 35-3 hybrid and Brazas bermudagrass. A 3-yr study was conducted on stargrass and bermudagrass to compare a 1 vs 2 wk rotation on live weight gain (LWG) and average daily gain (ADG). Both rotation treatments were allowed a 4-wk regrowth period between grazings. Results indicate the stargrasses (Florico and Florona) (568 lb/A) produced 61% more LWG/A than bermudagrass. The average gain for the stargrasses (0.80 lb/d) was also 11% higher than for the bermudagrasses. Rotating cattle on a weekly schedule almost always resulted in higher LWG/A and ADG for both bermudagrasses and stargrasses.

A grazing study was initiated on three St. Augustine grasses consisting of Floralawn, roselawn, and FX 33. Grasses are being grazed at 2, 4, 6, and 8-wk frequencies. Variables recorded are dry yield, forage quality and specie persistence.

A pennisetum experiment was initiated in 1991 to study the influence of harvest treatments on five elephantgrass entries including PI 300086. Response variables are specie persistence, dry yield, leaf-stem components and quality.

Publications:

Brown, W.F. and P. Mislevy. 1990. Valor alimenticio del Pasto Estrella. Memorias, II Congreso Nacional de la Carne y Leche. Retalhuleu, Guatemala, Dec. 3 y 4.

Kalmbacher, R.S., P. Mislevy, and F. G. Martin. 1990. Evaluation of new stargrasses and bermudagrasses at Immokalee. AREC, Ona Research Report RC-1989-6. 6 pg.

Larbi, A., P. Mislevy, M.B. Adjei, and W.F. Brown. 1991. Seasonal herbage and animal production from three cynodon species. Tropical Grasslands. Vol. 25.

Mansfield, C.W., P. Mislevy, and L.C. Hammond. 1990. Yield and nutritive value of forages grown under irrigated and non-irrigated conditions. Tropical Grasslands 24:(1)55-60.

Mislevy, P., W.G. Blue, and C.E. Roessler. 1990. Productivity of clay tailings from phosphate mining: II Forage crops. J. Environ. Qual. 19:694-700.

Mislevy, P., F.G. Martin, B.J. Downs, and K.L. Singer. 1990. Influence of grazing management on forage quality of stargrass. Soil and Crop Sci. Soc. Fla. Proc. 49:162-166.

Mislevy, P., W.F. Brown, L.S. Dunavin, D.W. Hall, R.S. Kalmbacher, A.J. Overman, O.C. Ruelke, R.M. Sonoda, R.L. Stanley, Jr., and M.J. Williams. 1989. Florona stargrass. Fla. Agr. Exp. Stn. Circ. S-362.

Mislevy, P., W.F. Brown, R. Caro-Costas, J. Vicente-Chandler, L.S. Dunavin, D.W. Hall, R.S. Kalmbacher, A.J. Overman, O.C. Ruelke, R.M. Sonoda, A. Sotomayor-Rios, R.L. Stanley, Jr., and M.J. Williams. 1989. Florico stargrass. Fla. Agr. Exp. Stn. Circ. S-361.

Mislevy, P. 1990. Stargrass management. Florida Cattlemen 54:(9)28-29.

Mislevy, P. 1990. Tifton 9 compared with Pensacola bahiagrass. Florida Cattlemen 54:(10):54-55.

Mislevy, P., J.E. Rechcigl, and W.F. Brown. 1990. Manejo de pastorlo y rendimiento del animal en pasto de pasto estrella. Memorias, II Congreso Nacional de la Carne y Leche. Retalhuleu, Guatemala, Dec. 3 y 4.

Rechcigl, J.E., P. Mislevy, and G. G. Payne. 1990. Fertilizacion de Pasto Estrella. Memorias, II Congreso Nacional de la Carne y Leche. Retalhuleu, Guatemala, Dec. 3 y 4.

Accession User: D. S. Wofford and K. H. Quesenberry
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Nature of Research: Two hundred thirty-one plant introduction lines of Trifolium species were evaluated for resistance to Cylindrocladium crotalariae, a soil-borne fungus which infects clovers and other legume crops. A screening technique has been developed which allows for seedling evaluation for resistance to the pathogen. Seventy five individuals of each introduction line were inoculated with the fungus and an equal size group grown as a control treatment. Results were tabulated in terms of resistance as a percentage of the control for each entry. Entries included 100 lines of T. repens, 97 of T. pratense, 4 of T. ambiguum, 4 of T. diffusum, 11 of T. medium, and 7 of T. nigrescens. A wide range of resistance was detected among and within species, however, averaged over introduction lines most species had low to very low levels of resistance. Overall, T. repens had superior resistance to C. crotalariae compared to the other species evaluated, with an average of 32% resistance plants. The range of resistance levels in T. repens was from a low of 4% for PI 189395 to a high of 58% for PI 197830. The percent resistant means for entries of T. ambiguum, T. diffusum, T. medium, T. nigrescens and T. pratense were 26, 15, 18, 10, and 10, respectively. Most introductions of T. pratense had very low levels of resistance to this pathogen, with only 21 of the 97 evaluated having 15% or greater resistant plants. Currently, an additional 100 plant introduction of both T. repens and pratense are being evaluated for resistance to this fungus.

Publications: None

Cultivar Releases: None

Accession User: G. M. Prine
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Nature of Research: Developing new crops from plant introductions; research includes energy, forage, fiber, and grain crops.

Progress to Date: Elephantgrass (Pennisetum purpureum) accessions, PI 300086, N51, and Merkeron, and L79-1002 energycane (Saccharum sp.) have been shown to be effective high biomass-producing energy crops in Lower South USA.

The high production of these crops (over 40 Mg/ha) is due to their long linear growth period, 140 to 196 days at Gainesville, FL.

The commercial acreage of perennial rhizoma peanuts (Arachis glabrata) continue to climb at a rate of about 40% per year. The acreage of Florigraze is estimated to be in excess of 4,400 acres and Arbrook (PI 262817) at about 200 acres. PIs 262839 and 262840 are being increased for possible future release for ornamental purposes. Drs. Quesenberry and French have taken the on task of further evaluation and development of perennial peanut beyond the accessions named above.

Progress continues on developing a pigeonpea (Cajanus cajan) cultivar from random mating of numerous pigeonpea PIs evaluated over the years. Freeze damage from early frosts have been a problem in North Florida. Different growth habits under different environments have made it difficult to get stable and uniform growth. Lines 99 WW, 76WW and DOW are being increased for release of one or more of the lines as named cultivars.

Devastating freezes in the 1980's killed plantings of blue lupine (Lupinus angustifolius) until we are no longer seriously looking at this crop. This is a needed crop in southeast and it can be successful if greater cold tolerance is introduced and incorporated into the crop. There is need for a plant breeder on this crop in southeast to develop crop for grain, forage, and green manure.

I am continuing my annual ryegrass breeding program using both introductions and existing cultivars. By selecting for crown rust resistance in Florida and stem rust resistance in Oregon, we hope to develop cultivars with resistance to both diseases.

Publications:

Woodard, K.R., and G.M. Prine. 1991. Forage yield and nutritive value of elephantgrass as affected by harvest frequency and genotype. Agron. J. 83:547-551.

Woodard, K.R., G.M. Prine, and D.B. Bates. 1991. Silage characteristics of elephantgrass as affected by harvest frequency and genotype. Agron. J. 83:541-545.

Woodard, K.R., G.M. Prine, D.B. Bates, and D.P. Chynoweth. 1991. Preserving elephantgrass and energycane biomass as silage for energy. Bioresource Tech. 36:253-259.

Woodard, K.R., G.M. Prine, and D.B. Bates. 1990. Forage yield and silage characteristics of elephantgrass as affected by harvest frequency and genotype. p. A18-A27. In J.H. Conrad (ed.) Proc. Int. Conf. on Livestock in the Tropics. Gainesville, FL, 6-9 May 1990. IFAS, FCES, and CTA, Gainesville, FL.

Woodard, K.R., and G.M. Prine. 1991. Growth performance of elephantgrass and energycane in a colder subtropical region. p. II. B.4. In M. Buchart (ed.) Proc. 1991 Southern Biomass Conference, Louisiana State University, Baton Rouge, LA, 7-10 Jan. 1991. Louisiana Department of Agriculture and Forestry and LSU, Baton Route, LA.

Woodard, K.R., and G.M. Prine. 1991. Growth performance of full-season elephantgrass and energycane in north-central Florida. Fla. Sci. 54 (Suppl. 1):2.

Accession User: L. S. Dunavin
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Nature of Research: Evaluation of forage and biomass crops for Northwest Florida.

Progress to Date: The introduction, PI 300086, Pennisetum purpureum, produced 46.1 Mg ha^{-1} of dry biomass in 1990. The following introductions of Trifolium ambiguum were under observation in 1990-91: PI 277535, PI 440685, PI 405120, and PI 440682. Seed from crosses of a white-flowered rose clover with PI 120135, PI 311483, and PI 311484 rose clover were planted in 1990.

Publications: None.

Accession User: L. E. Sollenberger
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Nature of Research: Forage grass and legume management and utilization

Progress to Date: Response of 'Florigraze' rhizoma peanut (Arachis glabrata Benth.) to shade was evaluated in 1989 and 1990. When clipped every 5 to 6 wk and grown under 34, 54, 78, and 100% of incident sunlight, peanut seasonal yields increased at a decreasing rate as light increased from 34 to 100% (5.6 to 8.8 Mg ha^{-1} in 1989 and 3.3 to 11.3 Mg ha^{-1} in 1990). Measured at season end each year, rhizome mass and total nonstructural carbohydrate concentration decreased linearly with decreasing light. Results suggest that peanut merits evaluation in association with pines since light in pine understories is often in a range where peanut appears to persist. Peanut is unlikely to persist under defoliation in deeply-shaded conditions, however.

Effect of grazing management on Florigraze establishment was evaluated by planting rhizomes dug from pastures previously subjected to severe (S),

intermediate (I), and lenient (L) grazing stress. At 60 and 165 d after planting, L shoot counts were 2- and 8-fold greater than for I and S, while season-end forage DM was 2- and 6-fold greater. Season-end coverage for L, I, and S was 61, 32, and 13%. Performance of L rhizomes equalled or exceeded that of rhizomes dug from non-grazed nursery pastures. Higher carbohydrate concentration in L rhizomes was likely responsible for their superior establishment success.

In 1989 and 1990, Pennisetum purpureum by P. glaucum hybrids (triploid selections 4 and 41 and hexaploid 360) were evaluated under four clipping managements in small plots and compared to 'Mott' dwarf elephantgrass (P. purpureum). Hybrid yields and forage quality were similar to Mott, but persistence was poor. Hybrid stands were depleted by an average of 70 to 80% during the first winter after clipping was imposed, while Mott stands showed no plant loss.

Publications:

Cherney, J.H., D.J.R. Cherney, L.E. Sollenberger, J.A. Patterson, and K.V. Wood. 1990. Identification of a quinic acid ester in limpograss and its influence on fiber digestion. J. Agric. Food Chem. 38:2140-2143.

Sollenberger, L.E., C.S. Jones, Jr., K.A. Albrecht, and G.H. Ruitenberg. 1990. Vegetative establishment of dwarf elephantgrass: Effect of defoliation prior to planting stems. Agron. J. 82:274-278.

Chaparro, C.J., and L.E. Sollenberger. 1991. Productivity and persistence of Mott elephantgrass under clipping management. Agron. Abst. (in press).

Chaparro, C.J., L.E. Sollenberger, and S.B. Linda. 1991. Grazing management effects on aeschynomene seed production. Crop Sci. 31:197-201.

Flores, J.A., J.E. Moore, and L.E. Sollenberger. 1991. Forage quality characteristics of Mott dwarf elephantgrass and Pensacola bahiagrass. J. Anim. Sci. Suppl. (in press).

Holderbaum, J.F., L.E. Sollenberger, J.E. Moore, D.B. Bates, W.E. Kunkle, and A.C. Hammond. 1991. Protein supplementation of steers grazing limpograss pasture. J. Prod. Agric. (in press).

Holderbaum, J.F., L.E. Sollenberger, K.H. Quesenberry, J.E. Moore, and C.S. Jones, Jr. 1991. Canopy structure and nutritive value of rotationally-grazed limpograss pastures during mid-summer to early autumn. Agron. J. (in press).

Johnson, S.E., L.E. Sollenberger, and J.M. Bennett. 1990. Yield and physiological responses of rhizoma peanut to four levels of irradiance. Agron. Abst. p. 146-147.

Johnson, S.E., L.E. Sollenberger, J.M. Bennett, and C.S. Jones, Jr. 1991. Nutritive value of rhizoma peanut grown under four levels of irradiance. Agron. Abst. (in press).

Macoon, B., L.E. Sollenberger, J.E. Moore, S.C. Schank, and P.E. Hildebrand. 1991. Defoliation effects on yield, persistence, and quality-related characteristics of Pennisetum forage genotypes. Agron. Abst. (in press).

Mathews, B.W., L.E. Sollenberger, and C.S. Staples. 1991. Plant-animal-soil interrelationships under different grazing management systems. Agron. Abst. (in press).

Ortega-S., J.A., L.E. Sollenberger, and K.H. Quesenberry. 1990. Physiological responses of rhizoma peanut to grazing management. Agron. Abst. p. 153.

Rice, R.W., G.M. Prine, E.C. French, L.E. Sollenberger, and K.H. Quesenberry. 1991. Rhizome characteristics and establishment performance of rhizoma peanut as influenced by grazing management. Agron. Abst.

Sollenberger, L.E., M.J. Williams, and C.S. Jones, Jr. 1991. Vegetative establishment of dwarf elephantgrass: Effect of planting date, density, and location. Soil Crop Sci. Soc. Fla. Proc. 50: (in press).

Sollenberger, L.E., C.S. Jones, Jr., K.A. Albrecht, and G.H. Ruitenberg. 1990. Vegetative establishment of dwarf elephantgrass: Effect of defoliation prior to planting stems. Agron. J. 82:274-278.

Accession User: K. H. Quesenberry
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Nature of Research: Breeding and genetics of clovers and special purpose legumes.

Progress to Date: Evaluation of over 500 plant introductions of *Trifolium pratense, T. repens*, and other spp. closely related *Trifolium* species for response to four root-knot nematode species (*Meloidogyne arenaria* race 1, *M. hapla, M. incognita* race 3, and *M. javanica* was completed in 1990-91. In general all species were susceptible to all root-knot species. Root gall and egg mass scores were usually lower in response to *M. hapla* than to other root-knot spp. The strongly rhizomatous perennial species *T. medium* had intermediate gall and egg mass scores in response to root-knot nematodes and some accessions of *T. diffusum* also had lower gall and egg mass scores. One introduction (PI 271627) of *T. pratense* had significantly lower scores than all others; however, selected breeding lines of *T. pratense* from the University of Florida were significantly lower than this PI. *T. carolinianum* (PI 516273) a *Trifolium* species native to the U.S. Southeastern Coastal Plains was highly resistant to all root-knot species. Results of this evaluation have been submitted to the National Plant Germplasm System for inclusion in GRIN.

A semi non-dormant southern U. S. adapted red clover which partially traces to a group of PIs which reseeded in Florida in 1976 and 77 was officially released

as the cultivar 'Cherokee' in 1991. This cultivar underwent five cycles of recurrent selection for early vigor and field pest resistance including field selection for root-knot nematode tolerance.

A germplasm collection expedition to Bulgaria was carried out in July 1990. This trip was in cooperation with the Institute of Introduction and Plant Genetic Resources at Sadovo. Dr. G. R. Smith, Texas A & M University, Overton, TX also participated. The trip focused primarily on annual *Trifolium* spp. and resulted in over 150 collections representing about 40 different species.

Four *Aeschynomene americana* selections from crosses between PI 421680 (Florida common) and other PIs are in regional trials in 1991. These lines were selected for later flowering and good seed production in late fall. Twenty pedigree selections from hybrids of *Desmodium heterocarpon* PI 217910 ('Florida' carpon desmodium) and plant introductions from CIAT are being evaluated for seed yield and forage production in 1991. These lines were selected for root-knot nematode resistance, forage yield, and seed production.

Advanced evaluation of forage production and establishment of a group of perennial *Arachis* plant introductions is in the second year. Fifteen selections were made from an original group of over 100 plant introductions. The larger collection is also being evaluated in at Isabela, Puerto Rico in cooperation with Dr. A. Sotomayor-Rios at the Tropical Agricultural Research Station.

Publications:

McKellar, M.A., C.W. Deren, and K.H. Quesenberry. 1991. Outcrossing in aeschynomene. Crop Sci. 31:476-478.

Accession User: Rex L. Smith, S. C. Schank, J. C. Seib,
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Nature of Research: Development and Use of RFLP and RAPD Genetic Markers in Pennisetum.

Progress to Date: RFLP genetic markers using both random cDNA and genomic probes, and random amplified polymorphic DNA (RAPD) have been developed in the biomass and forage grass species, Pennisetum purpureum (L.) Lam. (elephantgrass). Elephantgrass is a very high yielding biomass species often producing in excess of 40 Mg ha^{-1} of biomass in the Southeastern U. S. region, and having high potential as a biomass and forage species. Consequently, elephantgrass has been targeted for genetic improvement and an RFLP marker program has been initiated to assist that program. The species had no genetic data base, no genetic stocks or inbred lines, and is an allotetraploid. We shortened the time required to establish predictable segregating progenies for linkage and mapping studies to

one generation by using P. purpureum X P. glaucum interspecific hybrid progenies. Those progenies give expected segregation ratios of 1:1 for monogenic inheritance of the elephantgrass RFLPs. P.I. 300086 elephantgrass was the source of genomic and cDNA random clones used as probes. Two interspecific progenies were used with P.I. 300096 and 'Mott' as the elephantgrass parents and inbred Tift 23DA and Tift 239DB as the pearl millet parents.

We have used the genetic markers to 'fingerprint' genotypes, study genetic relationships among 25 elephantgrass introductions and related species. The markers have been instrumental in developing efficient hybridization methods and using frozen pollen in the hybridization program. A main objective of the marker program is to map quantitative trait loci. To date 64 markers have been found associated (linked) with 26 plant traits most of which are quantitative in nature. Those markers are dissecting those complex traits and are giving insights into their genetic nature. Of special interest are the winter survival and quality traits. Markers have been found linked to four genes affecting winter survival, a very important trait since lack of cold hardiness is a major constraint limiting the northern boundary of perennial production. Of the RFLP markers linked to quality trait genes, seven have been found linked to genes affecting IVOMD (*in vitro* organic matter digestibility). Seven markers are linked with genes affecting neutral detergent fiber (cell wall material), five with nitrogen concentration genes and six with phosphorous concentration genes. Further research is needed to find and map markers linked to additional genes of those and other traits and to find markers that are more tightly linked to those genes. We aim to use those genetic markers to identify and maximize the expression of the major genes affecting those traits.

This research was partially funded by the Gas Research Institute, Chicago, IL.

Publications: None

1990-91 GEORGIA S-9 TECHNICAL COMMITTEE REPORT

SUBMITTED BY: Wm. D. Branch
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NATURE OF RESEARCH: Peanut Breeding and Genetics.

PROGRESS TO DATE: Several new crosses were again made this past winter in the greenhouse, and numerous plant selections were made during the 1990 season which had PI's in the pedigree. These are predominantly being utilized for disease and insect resistance as well as drought tolerance.

The University of Georgia Peanut Breeding Program at the Coastal Plain Experiment Station developed and released one new cultivar and a germplasm population during 1990.

'GEORGIA RUNNER' is a new peanut cultivar that is intended for the runner-type market in the southeast U.S. It is highly productive, genetically diverse, and has a large percentage of jumbo seed. In 30 field tests conducted during the past five years, Georgia Runner was found to be significantly higher in yield and dollar return by approximately 5% over the popular Florunner cultivar.

'CPES' is an unselected broad-base germplasm population that was developed by bulk compositing early-generation progenies from a 16 parental-line, convergent hybridization scheme involving disease and/or insect resistant PI's. One-kilogram samples of heterogeneous F_3 seed will be available for research screening purposes upon written request.

SELECTED PUBLICATIONS:

Branch, W. D. 1991. Registration of 'Georgia Runner' peanut. Crop Sci. 31: 485.

Branch, W. D. and C. C. Holbrook. 1991. Registration of CPES peanut germplasm population. Crop Sci. 31:497-498.

Branch, W. D., T. Nakayama, and M. S. Chinnan. 1990. Fatty acid variation among U.S. runner-type peanut cultivars. JOACS 67 (9):591-593.

Branch, W. D., J. S. Kirby, J. C. Wynne, C. C. Holbrook, and W. F. Anderson. 1991. Sequential vs. pedigree selection method for yield and leafspot resistance in peanut. Crop Sci. 31:274-276.

CULTIVAR RELEASES: 'Georgia Runner' Peanut (PI 542960)

GERMPLASM RELEASES: CPES Population (PI 542961)

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ACCESSION USER: R. Harold Brown
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NATURE OF RESEARCH: Studies of Water Use Efficiency (WUE)-Predition

PROGRESS TO DATE: Differences among peanut genotypes, including PI's, have been determined, and WUE was found to be correlated with $^{13}C/^{12}C$ ratios.

SELECTED PUBLICATIONS: None

CULTIVAR RELEASES: None

GERMPLASM RELEASES: None

XXXXXXXXXXXXXXXXXXXXXXX

ACCESSION USER: J. Ernest Harvey, Dir.
Agronomic Research
AgraTech Seeds, Inc.
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NATURE OF RESEARCH: Cultivar Development

PROGRESS TO DATE: Preliminary work has indicated that some PI's evaluated may have characteristics desirable to incorporate into the peanut breeding program, and crosses have been made.

SELECTED PUBLICATIONS: None

CULTIVAR RELEASES: None

GERMPLASM RELEASES: None

XXXXXXXXXXXXXXXXXXXXX

ACCESSION USER:

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NATURE OF RESEARCH:

The development of techniques and the identification of germplasm for use in developing peanut cultivars with resistance to the peanut root-knot nematode (Meloidogyne arenaria), late leafspot (Cercosporidium personatum), white mold (Sclerotium rolfsii), tomato spotted wilt virus and preharvest aflatoxin contamination.

PROGRESS TO DATE:

Peanut root-knot nematode. Approximately one-half of the U.S. germplasm collection has been examined in a preliminary three replication greenhouse screen. Additional greenhouse tests using the most promising entries from the preliminary screen have identified six P.I.'s which support 1/10th the nematode reproduction per gram of fresh root weight as Florunner. Field studies have been conducted which confirm these results. Additional screening is ongoing to identify other sources of resistance.

Late leafspot. Over three-fourths of the U.S. germplasm collection has been examined in a preliminary field screen. Over 50 P.I.'s have been identified which have high levels of resistance to late leafspot. Additional field and greenhouse tests have shown that one of these P.I.'s has resistance to infection, a response which has never before been observed in peanut. Field studies are ongoing to gather additional information on these resistant selections which will be useful in parental selection. Additional field screening is also ongoing to identify other sources of resistance.

White mold. Five hundred P.I.'s have been examined in a preliminary field screen. The most promising genotypes are undergoing additional field and greenhouse studies.

Preharvest aflatoxin contamination. Research is ongoing to develop effective and efficient field and greenhouse mass screening techniques for identifying resistance to preharvest aflatoxin contamination.

Core Collection. With the cooperation of R. N. Pittman, a core collection has been developed for peanut, and seed of these genotypes have been increased. Research is ongoing to test the utility of this core collection in identifying pest resistance in peanut.

SELECTED PUBLICATIONS:

Anderson, W. F., C. C. Holbrook, D. M. Wilson, Jr. and M. E. Will. 1991. Greenhouse screening methodology for pre-harvest Aspergillus parasiticus invasion. Abstr. Proc. Amer. Peanut Res. and Educ. Soc., Vol. 23: (in press).

Holbrook, C. C., W. F. Anderson and R. N. Pittman. 1991. Selection of a core collection from the U.S. germplasm collection of peanut (Arachis hypogaea). Agron. Abstr. (in press).

Holbrook, C. C., J. P. Noe and N. A. Minton. 1991. Resistance to Meloidogyne arenaria in Arachis hypogaea. Abstr. Proc. Amer. Peanut Res. and Educ. Soc., Vol. 23: (in press).

Matheron, M. E., C. C. Holbrook, D. M. Wilson, W. F. Anderson, M. E. Will and A. J. Norden. 1991. Field systems for evaluating peanut germplasm for resistance to preharvest aflatoxin contamination. Abstr. Proc. Amer. Peanut Res. and Educ. Soc. Vol. 23: (in press).

CULTIVAR RELEASES: None

GERMPLASM RELEASES: None

XXXXXXXXXXXXXXXXXXXXX

ACCESSION USER: Robert E. Lynch
USDA-ARS Insect Biol. & Pop.
Management Res. Laboratory
Tifton, GA 31793-0748

NATURE OF RESEARCH: Screening Peanut Genotypes for Insect Resistance

PROGRESS TO DATE: Identified germplasm sources of resistance for several insects, which included several PI's.

SELECTED PUBLICATIONS:

Lynch, R. E. 1990. Resistance in peanut to major anthropod pests. Florida Entomologist 73:422-445.

CULTIVAR RELEASES: None

GERMPLASM RELEASES: None

XXXXXXXXXXXXXXXXXXXXX

ACCESSION USER: Wayne A. Parrott
University of Georgia
Department of Agronomy
Athens, GA 30602

NATURE OF RESEARCH: Genetic Transformation of Peanut

PROGRESS TO DATE: Determined susceptibility of various peanut tissue to antibiotic selection, and obtained foreign-gene expression in peanut tissue.

SELECTED PUBLICATIONS: None

CULTIVAR RELEASES: None

GERMPLASM RELEASES: None

XXXXXXXXXXXXXXXXXXXXX

ACCESSION USER: James W. Todd
University of Georgia
Department of Entomology
Coastal Plain Experiment Station
Tifton, GA 31793-0748

NATURE OF RESEARCH: Screening PI and wild Arachis accessions for multiple insect and virus resistance.

PROGRESS TO DATE: Approximately 120 entries out of over 1700 screened show promising levels of resistance to foliage feeding Lepidoptera and Thysanoptera as well as leafspot and tomato spotted wilt virus.

SELECTED PUBLICATIONS: None

CULTIVAR RELEASES: None

GERMPLASM RELEASES: None

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ACCESSION USER: Billy R. Wiseman
USDA-ARS Insect Bio. & Pop.
Management Res. Laboratory
Tifton, GA 31793-0748

NATURE OF RESEARCH: Plant Resistance to Helicoverpa zea

PROGRESS TO DATE: Evaluated the Eldredge popcorn collection for anbitiosis against corn earworm larval feeding and leaf feeding against fall armyworm and European corn borer. Found PI 340856 to be high in maysin and antibiotic to corn earworm larvae.

SELECTED PUBLICATIONS:

Wilson, R. L., B. R. Wiseman, and G. L. Reed. 1991. Evaluation of J. C. Eldredge popcorn collection for resistance to corn earworm, fall armyworm (Lepidoptera: Noctuidae), and European corn borer (Lepidoptera: Pyralidae). J. Econ. Entomol. 84:693-698.

CULTIVAR RELEASES: None

GERMPLASM RELEASES: None

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ACCESSION USER: Ronny R. Duncan
University of Georgia
Department of Agronomy
Georgia Experiment Station
Griffin, GA 30223-1797

NATURE OF RESEARCH: Evaluation of Sorghum PI's for Acid Soil Tolerance

PROGRESS TO DATE: Among 6000 accessions evaluated, less than 1% had a level of tolerance better than the best check (SC 283 = PI 533869) for aluminum toxicity tolerance in the field.

SELECTED PUBLICATIONS:

Duncan, R. R., P. J. Bramel-Cox, and F. R. Miller. 1991. Contributions of introduced sorghum germplasm to hybrid development in the USA. p. 69-102. In H. L. Shands and L. E. Wiesner (eds). Use of Plant Introductions in Cultivar Development, Part I. CSSA Spec. Publ. No. 17, Crop Sci. Soc. Amer., Inc., Madison, WI.

CULTIVAR RELEASES: None

GERMPLASM RELEASES: None

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ACCESSION USER: Glenn W. Burton
USDA-ARS
Department of Agronomy
Coastal Plain Experiment Station
Tifton, GA 31793-0748

NATURE OF RESEARCH: Grass Breeding

PROGRESS TO DATE: Starting in 1991 to evaluate 55 new introductions of bahiagrass, Paspalum notatum. Continuing to evaluate and use 300 pearl millet landraces from Burkina Fasco in the pearl millet breeding program.

SELECTED PUBLICATIONS:

Wilson, J. P. and G. W. Burton. 1990. Phyllosticta penicillariae on pearl millet in the United States. Plant Dis. 74:331.

Wilson, J. P., G. W. Burton and K. Bondari. 1990. Inheritance of height and maturity in crosses between pearl millet landraces and inbred Tift 85DB. Theor. Appl. Genet. 80:712-718.

CULTIVAR RELEASES: None

GERMPLASM RELEASES: Rust resistant selections from the pearl millet landraces were grouped in Tift #3 and Tift #4 pearl millet germplasms and were released by USDA-ARS and University of Georgia in October, 1990.

XXXXXXXXXXXXXXXXXXXXX

ACCESSION USER: Wayne W. Hanna
USDA-ARS
Department of Agronomy
Coastal Plain Experiment Station
Tifton, GA 31793-0748

NATURE OF RESEARCH: Grass Breeding and Genetics

PROGRESS TO DATE: Methods being developed for using wild germplasm. Species relationships being better understood.

SELECTED PUBLICATIONS:

Hanna, W. W. 1990. Transfer of germplasm from the secondary to the primary gene pool in Pennisetum. Theor. Appl. Genet. 80:200-204.

Hanna, W. W. 1990. Registration of Tift #2 S-1 pearl millet germplasm. Crop Sci. 30:1376.

Hanna, W. W., G. W. Burton, and A. W. Johnson. 1990. Registration of 'Tifton 10' turf bermudagrass. Crop Sci. 30:1355-1356.

Lagudah, E. S. and W. W. Hanna. 1990. Patterns of variation for seed proteins in the Pennisetum gene pool. J. Hered. 81:25-29.

Nakagawa, H. and W. W. Hanna. 1990. Morphology, origin, and cytogenetics of a 48-chromosome Panicum maximum. Cytologia 55:471-474.

CULTIVATED RELEASES: 'Tifton 10' Turf Bermudagrass (PI 539857)

GERMPLASM RELEASES: Tift #2, S-1 Pearl Millet (PI 538413)

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ACCESSION USER: Rowan F. Sage
Botany Department
University of Georgia
Athens, GA 30602

NATURE OF RESEARCH: Assay of Ribulose-1,5,-bisphosphate Carboxylase (rubisco) Regulation in C_3 and C_4 Plants.

PROGRESS TO DATE: Determination that rubisco is deactivated in low light in Panicum antidotales (PI 331180) and Panicum miliodes (PI 285220).

SELECTED PUBLICATIONS: None

CULTIVAR RELEASES: None

GERMPLASM RELEASES: None

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ACCESSION USER: Doyle A. Smittle
University of Georgia
Department of Horticulture
Coastal Plain Experiment Station
Tifton, GA 31793-0748

NATURE OF RESEARCH: Melon Breeding

PROGRESS TO DATE: Several lines with good disease resistance and a variety of flavors are being developed.

SELECTED PUBLICATIONS: None

CULTIVAR RELEASES: None

GERMPLASM RELEASES: None

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ACCESSION USER: A. Graves Gillaspie, Jr.
USDA-ARS Southern Regional
Plant Introduction Station
Griffin, GA 30223-1797

NATURE OF RESEARCH: Screening of watermelon germplasm for watermelon mosaic virus 2 resistance in greenhouse and field tests. Tests are also being run to assess virus infection of cowpea seed and to clean up any infected seed lots.

PROGRESS TO DATE: A more aggressive virus inoculation procedure was developed for the greenhouse studies so that these tests would be more like field inoculum pressure. Several lines showed promise under field conditions at Byron, Georgia in 1990 and more were found in greenhouse tests in the winter months. All will be tested in the field in 1991 at Byron.

Vigna seed lot samples were grown in the greenhouse and examined for virus symptoms by ELISA. Healthy plants were then transplanted in the field for seed production where they were watched for virus infection.

SELECTED PUBLICATIONS: None

CULTIVAR RELEASES: None

GERMPLASM RELEASES: None

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ACCESSION USER: Harbans L. Bhardwaj
Fort Valley State College
Agricultural Research Station
Fort Valley, GA 31030-3298

NATURE OF RESEARCH:

1) Analysis of Growth and Production Potential of Guar (Cyamopsis tetragonoloba)

2) Development of Seedless Watermelon

3) Evaluation of New Legume Crops

PROGRESS TO DATE:

1) Ten cultivars and 396 PI accessions were evaluated during 1990. It seems that Guar can be successfully developed as an alternate cashcrop in southeastern U.S.

2) Plans were made for evaluation of exotic accessions for their ability to improve the germination and desirability of the seedless watermelon. This experiment has been abandoned due to many constraints, but will be tried again in 1992.

3) Production feasibility, ideal planting time, and related aspects of faba bean, pigeonpea, cranberry bean, kidney bean, chickpea, etc., are under evaluation during 1991 season.

SELECTED PUBLICATIONS:

Bhardwaj, H. L. and R. R. Eitenmiller. 1991. Guar bean production in Georgia. HortScience 26(5):491 (Abstract).

Bhardwaj, H. L. 1991. Evaluation of Guar as an alternate cash crop for Southeastern U.S. To be presented at Second National Symposium on New Crops, October 6-9, 1991 at Indianapolis, Indiana

CULTIVAR RELEASES: None

GERMPLASM RELEASES: None

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ACCESSION USER: Jack E. Jolley
279 Peeples Valley Rd.
Cartersville, GA 30120

NATURE OF RESEARCH: Pepper Production

PROGRESS TO DATE: Capsicum baccatum plants were planted in the field and in pots under partial shade to determine if they will grow successfully in northern Georgia.

SELECTED PUBLICATIONS: None

CULTIVAR RELEASES: None

GERMPLASM RELEASES: None

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S-9 TECHNICAL COMMITTEE REPORT
FOR HAWAII - JULY 1991

AGENCY: Hawaii Institute of Tropical Agriculture and Human Resources

SUBMITTED BY: P. J. Ito

ADDRESS: Beaumont Research Lab
461 W. Lanikaula Street
Hilo, Hawaii 96720

ACCESSION USER: James L. Brewbaker
Department of Horticulture

ADDRESS: University of Hawaii
3190 Maile Way, R, 102
Honolulu, Hawaii 96822

NATURE OF RESEARCH: Breeding Leucaena spp.

PROGRESS TO DATE: "Highland" tropical cultivars have been develope, based largely on:
cv. K156 PI 324356 Leucaena diversifolia
2n=104, Self-fertile "pureline" (Schlecht.) Berth
cv. K376 PI (currently being assigned) L. pallida Britton & Rose
2n=104, Self-sterile

K156 is being grown as is for fuelwood, shack, and other uses (poles, folder) in places like Nepal an E. Africa. Modest psylbid tolerance.

K376 is now used largely as a parent for psylbid-resistant populations designated KX2, primarily for fodder.

PUBLICATIONS:

Brewbaker, J. L. & C. T. Sorensson. 1989. New tree crops from interspecific Leucaena hybrids. Proc. of First Nat. Symp. New Crops. Research, Development, Economics. Oct. 23-26, 1988. Advances in New Crops. pp. 283-288.

Pan, F.J. & J. L. Brewbaker. 1988. Cytological Studies in the Genus Leucaena (Benth.) cytologia 53:393-399.

ACCESSION USER: P. J. Ito & L. Chia

ADDRESS: 461 W Lanikaula Street
Hilo, HI 96720

NATURE OF RESEARCH: Introduction, Maintenance and Evaluation of Germplasm

PROGRESS TO DATE:

A total of 34 new introductions from seven genera were made from Thailand, Colombia and Costa Rica. All scionwood brough in were unsuccessful but some seeds germinated. Two of the pulasan selections produced good quality fruits and are considered for naming. The cron protested linaes in Kona and Poamoho are producing heavily. Two spodella selections produced good quality fruits in number and size. Five mango selections from China have been propagated and will be field planted.

PUBLICATIONS:

Ito, P. J. 1988. Sapodilla. World Book Encyclopedia Vol. 17, page 121.

Ito, P.J. & R. A. Hamilton. 1990. Fruits and nuts for the topics with potential improvement and increased importance. Tropical Fruit and International Trade Symposium, University of Hawaii, June 4-9, 1989. ISHS Acta Horticultura No. 269, pp 113-117.

Ito, P. J., F. Zee, R. A. Hamilton & R. Paull. 1990. Genetic resources in tropical agriculture fruit and nut crops in Hawaii. Tropical Frui in International Trade Symposium, University of Hawaii, June 4-9, 1989. ISHS. Acta Horticultura No. 269, pp 125-130.

1991 S-9 TECHNICAL COMMITTEE REPORT FOR KENTUCKY

University of Kentucky
Department of Agronomy
N 122 Agricultural Science Center

Submitted by:

N.L. Taylor
Agronomy Department
University of Kentucky
N 222 Agricultural Science Center - North
Lexington, KY 40546-0091

Accession Users:

J.E. and S.H. Woods
Agronomy Department
University of Kentucky
N 222 Agricultural Science Center
Lexington, KY 40546-0091

Nature of Research: In Vitro Propagation of Mexican Weeping Bamboo

Progress to Date: An efficient protocol was developed for the in vitro propagation of Mexican Weeping Bamboo through somatic embryogenesis form zygotic embryo explants. Mature seeds and excised embryos were cultured in the light and in the dark on both Murashige and Skoog's and Gamborg's B5 basal media with various supplements. Optimal somatic embryogenesis and plant regeneration were obtained by culture in the dark on Murashige and Skoog's basal medium supplemented with 3 mg/1 2,4-dichlorophenoxyacietic acid, 0.5 mg/1 6-benzylaminopurine and 2.0% sucrose. More than 95% of the germinating somatic embryos developed shoots and roots and were transferred to soil with 85% success. This investigation has led to the identification of highly regenerative genotypes. Somatic embryogenesis has also been induced from vegetative explants of ornamental bamboos for the first time. Another first in bamboo research was achieved when plants were recovered from embryogenic callus which had been bombarded by DNA-coated tungsten particles in a biolistic particle delivery system. A preliminary experiment was also conducted which successfully yielded normal bamboo plants from liquid suspension culture; this also is a first in the biotechnological applications for bamboo.

The following accessions of bamboo utilized, screened or maintained in thee greenhouse or field sites and their P.I. numbers are as follows:

Phyllostachys viridis	PI 77257
Phyllostachys vivax	PI 82047
Phyllostachys aurea	PI 55975
Phyllostachys nidularia	PI 63757
Phyllostachys purpurata	PI 128805
Phyllostachys dulcis	PI 73452
Phyllostachys elegans	PI 128778
Phyllostachys bambusoides	PI 66785
Phyllostachys pubscens	PI 80034
Phyllostachys bissetii	PI.143540

Publications: None

Cultivars Released: None

Accession User: Norman L. Taylor
Address: Department of Agronomy
University of Kentucky
Agr. Sci. Bldg. North
Lexington, Kentucky 40546-0091

Nature of Research: Evaluation of *Trifolium* germplasm

Progress to Date: Somatic chromosome numbers of *Trifolium* species recently received from Yugoslavia were as follows: *T. alpestre*, 16; *T. pratense*, 14; *T. pignatii*, 16; *T. patulum*, 16; *T. repens*, 16; *T. montanum*, 16; *T. pannonicum*, 132; *T. velebiticum*, 64; and *T. noricum*, 48. The counts for *T. pignatii* and *T. velebiticum* are new and represent important additions to the *Trifolium* curator collection. Seeds of all species are being increased. Other species counted were *T. reflexum*, 16; *T. carolinanum*, 16; *T. stoloniferum*, 16; *T. bejariense*, 16; *T. polymorphum*, 16; and a new provisionally-named species from Tennessee, *T. calcaricum*, 16. All Eastern United States species have 16 chromosomes.

Data on *Trifolium medium* accessions evaluated in 1990 were correlated with chromosome number and latitude of origin. Performance was not correlated with origin but spread, flower color and leaf mark were all strongly correlated with chromosome number. Higher chromosome numbered accessions were stronger spreaders, more strongly leaf marked and had more intensely red flower colors the lower numbers.

Publications:

Williams, E. G., N. L. Taylor, J. Van Den Bosch and W. M. Williams. 1990. Registration of a tetraploid hybrid from the cross of *Trifolium ambiguum x T. repens*. Crop Sci. 30:427.

Anderson, J. A., N. L. Taylor and E. G. Williams. 1991. Cytology and fertility of the interspecific hybrid *Trifolium ambiguum x T. repens* and backcross populations. Crop Sci. 31:683-687.

Anderson, J. A., S. A. Ghabrial and N. L. Taylor. 1991. Natural incidence of peanut stunt virus infection in Hybrid populations of *Trifolium ambiguum x T. repens*. Plant Dis. 75:156-159.

Taylor, N. L. Registration of Ky-1 kura clover germplasm. 1991. Crop Sci. 31:237.

Taylor, N. L. 1990. The True Clovers. In New Crops - Research, Development and Economics. First National New Crop Symp. Eds. J. Janich and J. E. Simon. Timber Press, Portland, OR.

Taylor, N. L. and R. R. Smith. 1990. Collection and identification of *Trifolium* germplasm in Yugoslavia, 1988. Abst. *Trifolium* Conf. 11:42. Sublimity, OR.

Reid, J. L. and N. L. Taylor. 1990. 'Rhizo' kura clover - a new forage legume for pasture. Abst. *Trifolium* conf. 11:12. Sublimity, OR.

Cultivar Releases: None

Louisiana S-9 Technical Report

Agency: Louisiana Agricultural Experiment Station
Louisiana State University Agricultural Center

Submitted by: Don R. La Bonte

Address: Horticulture Department
Louisiana State University
Baton Rouge, LA 70803

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1. Accession User: James Fontenot
Horticulture Department
Julian C. Miller Hall
Louisiana State University
Baton Rouge, LA 70803

2. Nature of Research: Okra breeding and production

3. Progress to date: Seventy new lines derived from plant introductions are being used as parents to confer desirable horticulture traits including spinelessness, good culinary quality, and very green pod color; disease, nematode, and drought resistance, high yield, improved pod shipping and storage quality.

4. Publications: None

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1. Accession User: James Fontenot
Horticulture Department
Julian C. Miller Hall
Louisiana State University
Baton Rouge, LA 70803

2. Nature of Research: Pepper (Capsicum) breeding and production.

3. Progress to date: Plant introduction materials are being used to confer early maturity, high yield, ease of abscission, improved fruit shape, color, cooking quality; shipping and storage quality; and disease, insect, and stress resistance. Twenty-two Chinense plant introductions and 35 frutescens introductions were evaluated in 1990 and 71 new PI's are being researched in 1991.

4. Publications: None

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1. Accession User: William J. Blackmon
Horticulture Department
Louisiana State University
Baton Rouge, LA 70803

2. Nature of Research: Domestication of Apios americana

3. Progress to date: In vitro systems have been developed for clonal propagation of A. americana. Positive evidence for transformation of A. americana has been obtained. Experiments to produce tetraploids are being conducted. Accessions have been identified for use as breeding lines and considerable progress has been made in the quality of germplasm identified.

4. Publications:

Articles

Reynolds, B.D., W.J. Blackmon, E. Wickremesinhe, M.H. Wells, and R.J. Constantin. 1990. Domestication of Apios americana. p. 436-442. In: J. Janick and H. Shands (eds.) Advances in new crops. Timber Press. Portland, Oregon.

Wickremesinhe, E.R.M., W.J. Blackmon, and B.D. Reynolds. 1990. Adventitious shoot regeneration and plant production from Apios americana. HortScience 25:1436-1438.

Wickremesinhe, E.R.M., W.J. Blackmon, and B.D. Reynolds. 1990. In vitro propagation of Apios americana. HortScience 25: 1439-1440.

Abstracts and proceedings:

Blackmon, W.J. and B.D. Reynolds. 1990. Broad-based strategy for domestication of Apios americana - five years of progress. Abstract of XXIII International Horticultural Congress. 1:1202.

Blackmon, W.J. and B.D. Reynolds. 1990. Domestication research with Apios americana. Proc. Louisiana Acad. Sci. 53:55.

Standifer, M.S., S.C. Tucker, and W.J. Blackmon. 1990. A SEM study of baked and charred Apios americana medicus tubers. Proc. Louisiana Acad. Sci. 53:56.

Standifer, M.S., S.C. Tucker, and W.J. Blackmon. 1990. The identification of charred apios tubers. Abstracts of the Southeastern Archeological Conference in Mobile.

5. Cultivar Releases: None

1. Accession User: Galen D. Mooso
Rosepine Research Station
Louisiana Agricultural Experiment Station
P.O. Box 26
Rosepine, LA 70659

2. Nature of Research: The goal of this project is to evaluate available Trifolium pratense L. cultivars for adaptation, persistence and yielding ability when no-till seeded into permanent Cynodon dactylon (L.) Pers. pastures.

3. Progress to Date: T. repens L. and T. pratense L. cultivars listed in the Southern Regional variety test distributed from the Regional Plant Introduction Station were no-till planted into a Cynodon dactylon (L.) Pers. sod in the fall of 1990 for evaluation during 1991. Clover-grass mixtures are being evaluated for botanical composition and forage yield. Subsamples from each plot will be collected and analyzed for N concentration. Total N production for each cultivar will be estimated by subtracting the amount of N produced by the grass without a clover.

4. Publications: None

5. Cultivar Releases: None

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1. Accession user: Lowell L. Black, Vidal Rivelli, and Mark M. Jones
Dept. of Plant Pathology and Crop Physiology
302 Life Sciences Building
Louisiana State University
Baton Rouge, Louisiana 70803

2. Nature of Research: Currently, plant introduction accessions (PIAs) and advanced inbred lines of Capsicum spp. are being screened to identify sources of resistance to Fusarium oxysporum f. sp. capsici, the causal agent of Fusarium wilt of pepper.

3. Progress to date: Fusarium wilt of Capsicum frutescens 'Tabasco' was first observed in 1978 on Avery Island, Louisiana, and has been observed since then during growing seasons with high rainfall. Six species of Capsicum have been represented in greenhouse screenings. Nearly all cultivars and PIAs of C. annum, C. frutescens, and C. chinense were susceptible to the isolates used. Most accessions from C. baccatum and C. chacoense were resistant or segregating for resistance to the isolates used. A single accession of C. pubescens was found to be susceptible to the isolates. Accessions from the Asian Vegetable Research and Development Center (AVRDC) Capsicum germplasm collection, and the 1991, accessions from the

1. Accession User: James Fontenot
Horticulture Department
Julian C. Miller Hall
Louisiana State University
Baton Rouge, LA 70803

2. Nature of Research: Potato breeding

3. Progress to date: Plant introduction materials are being evaluated for wide adaptability, high yield, tolerance to drought, air pollution, heat, and frost; for disease and insect resistance, high solids, and improve culinary quality. Sixty-one new plant introductions were evaluated in 1990 and 40 in 1991.

4. Publications:

   a. Fontenot, J.F., G. Shaver, P.W. Wilson, W.A. Young and W.A. Meadows. 1990. National potato germplasm evaluation and enhancement report, 1989. Sixtieth Annual Report, USDA-ARS Beltsville MD, 99-103.

   b. Fontenot, J.F., ET AL. 1991. LaBelle a widely adapted high yielding white skin potato cultivar. Am. Potato Journal. 68:13-18.

5. Cultivar Releases: LaBelle

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1. Accession User: Stephen A. Harrison
Agronomy Department
Louisiana State University
Baton Rouge, LA 70803

2. Nature of Research: Wheat breeding

3. Progress to date: The program has about 30,000 lines representing over 1,300 crosses made since 1985. The lines are all in segregating generations (F1-F6). Sources of parents include: 1) USDA regional nurseries, 2) CIMMYT nurseries, and 3) germplasm obtained in cooperative exchanges with other breeders.

4. Publications: None relevant to germplasm.

5. Cultivar Releases: None

International Hot Pepper Trial Network (INTHOPE) have also been screened.

4. Publications:

Black, L.L., and Rivelli, V. 1991. Fusarium oxysporum f. sp. capsici forma specialis nov. identified as the causal agent of a wilt in pepper. Plant Disease 75:0000-0000 (In Press).

Rivelli, V., and Black, L.L. 1991. Pathogenicity of Fusarium oxysporum f. sp. capsici to Capsicum spp. and the effect of temperature and seedling age on disease severity. Plant Disease 75:0000-0000 (In Press).

Rivelli, V. 1989. A wilt of pepper incited by Fusarium oxysporum f. sp. capsici forma specialis nova. M.S. Thesis. Louisiana State University. Baton Rouge. 71 pp.

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1. Accession User: Don R. LaBonte
Horticulture Department
Louisiana State University
Baton Rouge, LA 70803

2. Nature of Research: Sweetpotato breeding and genetics

3. Progress to date: Plant introductions are currently being evaluated for reaction to several insect pests (Cylas formicarus elegantulus, Phyllophaga ephilida, and Dibrotica balteata) and to the reniform nematode, Rotylenchulus reniformis. Resistant plant introductions will be incorporated into the breeding program.

4. Publications:

5. Cultivar Releases: 'Hernandez', previously tested as L82-66, is a multiple disease resistant cultivar with superior baking and canning quality.

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1. Accession User: H. Y. Hanna
Citrus Research Station
Rt. 1, Box 628
Port Sulphur, LA 70083

2. Nature of Research: The goal of the project was to evaluate and develop tomato germplasm capable of setting fruits under high temperature conditions in the summer and early fall to provide commercial, roadside markets, and home gardeners with year round source of locally produced fresh tomatoes.

3. Progress to date: Three heat tolerant inbred lines were developed. One of them is very promising and under consideration for release as a heat tolerant tomato germplasm. The mentioned line had good general combining ability. It was

used as a male parent in the production of several F_1 heat tolerant hybrids. the yields of these hybrids were comparable to the yield of the best commercial cultivar available.

4. Publications: None

5. Cultivar Releases: None

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1. Accession User: D. Steven Calhoun
   Agronomy Department
   Louisiana State University
   Baton Rouge, LA 70803

2. Nature of Research: Cotton breeding and genetics

3. Progress to date: In 1990, a new cotton breeder replaced retiring Jack Jones at LSU. Breeding objectives will continue to emphasize fiber quality, and resistance to insects, nematodes and diseases. In addition to numerous advanced strains and segregating populations developed at LSU, 26 strains from the Stoneville and Texas cotton germplasm collection (SA series) are being evaluated in the field for expression of qualitative morphological characters, agronomic performance and fiber quality. Two LSU strains, LA870222HG and LA870210HG were entered in the Regional Bollworm/Tobacco Budworm Test.

4. Publications:

   Jones, J.E., J.I. Dickson, W. Aguillard, W.D. Caldwell, S.H. Moore, R.L. Hutchinson, and R.L. Rogers. 1990. Stoneville LA 887: a new cotton variety. Louisiana Agriculture. 33:5.

5. Cultivar Releases: None

6. Need for additional germplasm collections: Tolerant to acid soils.

1991
MISSISSIPPI
S-9 TECHNICAL COMMITTEE REPORT

AGENCY: Mississippi Agricultural & Forestry Experiment Station
SUBMITTED BY: C. E. Watson, Jr.
ADDRESS: Department of Experimental Statistics, P. O. Box NZ,
Mississippi State, MS 39762

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ACCESSION USER: W. P. Williams and G. E. Scott,
ADDRESS: USDA-ARS Crop Science Research Laboratory, P. O. Box 5248, Mississippi State, MS 39762
NATURE OF RESEARCH: Evaluation of corn, Zea mays L., for insect, nematode, and disease pests.
PROGRESS TO DATE: One hundred S_1 lines of corn derived From Antigua germplasm and obtained from Guadeloupe were evaluated for resistance to leaf feeding by the fall armyworm. Only one line appeared to have resistance to this pest.
PUBLICATIONS: Aung, T., W. P. Williams, G. L. Windham, and F. M. Davis. 1991. Characterization of open-pollinated corn varieties. Mississippi Agric. & For. Exp. Stn. Res. Rpt. 16(3):1-6.
CULTIVAR RELEASES: Mp420

ACCESSION USER: T. P. Wallace
ADDRESS: Agronomy Department, P. O. Box 5248, Mississippi State, MS 39762
NATURE OF RESEARCH: Evaluation of a Gossypium hirsutum L. race accession as a potential parent for germplasm enhancement.
PROGRESS TO DATE: Cotton germplasm lines M-8834-0188, M-8834-0239, and M-8834-0121 are primitive race accessions which have been converted to day neutrality through the race conversion program conducted by Dr. Jack McCarty at the USDA-ARS Crop Science Research Lab at Mississippi State, MS. Line M-8834-0188 was selected for its fiber strength and was crossed with three adapted cultivars. Little variability was observed for plant type in F_2 populations. No selection was practiced in the F_2 due to late maturity and rank growth. Additional crosses will be made to recover fiber strength and improve earliness.
PUBLICATIONS: None
CULTIVAR RELEASES: None

ACCESSION USER: C. E. Watson and L. R. M'Ragwa
ADDRESS: Department of Agronomy, Mississippi State University, Mississippi State, MS 39762
NATURE OF RESEARCH: Evaluation of seedling traits of pearl millet
PROGRESS TO DATE: Divergent selection for seedling root development and coleoptile length was practiced on two populations of pearl millet. The objective is to see if these traits can be used to improve seedling vigor and rate of establishment. One of these populations, Tift S-1, is a composite of S_1 seed from 700 PIs mainly of African origin. These selections will be evaluated for stand establishment, seedling vigor and yield components under field conditions at Mississippi State and at two locations in Kenya.
PUBLICATIONS: None
CULTIVAR RELEASES: None

ACCESSION USER: C. E. Watson and H. W. Philley
ADDRESS: Department of Agronomy, Mississippi State University, Mississippi State, MS 39762
NATURE OF RESEARCH: Evaluation of St. Augustinegrass plant introductions
PROGRESS TO DATE: Twenty eight PIs of St. Augustinegrass (Stenotaphrum secundatum) were planted in the field at Mississippi State, MS in the spring of 1991. These PIs will be evaluated for various turf characteristics and cold tolerance. These lines are also being evaluated for cold tolerance in the laboratory to determine if laboratory measures of cold tolerance correlate with field observations. Promising lines will be used in the development of cultivars with improved levels of cold tolerance.
PUBLICATIONS: None
CULTIVAR RELEASES: None

S-9 TECHNICAL COMMITTEE REPORT
University of Florida
Gainesville, Florida
July 24 and 25, 1991

Agency: North Carolina State University

Submitted by: W. T. Fike

Address: Crop Science Department,
North Carolina State University,
Raleigh, NC 27695-7620
(919-515-3331)

Twelve persons from a pool of 25 cooperators received 153 PI's from eight species of 7 genera since the last report. Five of these recipients received ornamental peppers for their homes.

Many accessions are being used at the University but reports were received from only two cooperators.

1. Assceesion User - Dr. T. C. Wehner, Horticulture Department, NCSU, Raleigh, NC 27695-7609

   Nature of Research - Improving cultivar development from cucumber PI accessions.

   Not much has changed in the PI area this year. I am maintaining the following lines of *Cucumis* in my cucumber breeding and research program. In future explorations and exchanges, it would be useful if we could obtain cucumber germplasm from India, China, and the U.S.S.R.

   There have been no recent cucumber releases from this program that contain PI germplasm.

Good fruit keeping ability (*Cucumis sativus*)
PI 220171
PI 279469
PI 321006
PI 211962
PI 422177

Gummy stem blight resistant
PI 200818

Good combining ability for yield
PI 174172
PI 169397
PI 339250
PI 175696
PI 206425
PI 205995
PI 342950
PI 178888

Belly rot resistant
PI 109063
PI 109483
PI 165509
PI 105340
PI 414159
PI 105263
PI 197085
PI 197086
PI 197087
PI 197088
PI 357852
PI 280096
PI 271328

Nematode resistant (*Cucumis metuliferus*)
PI 414716
PI 482435
PI 482439
PI 482441
PI 482443
PI 482446
PI 482448
PI 482450
PI 482451
PI 482452
PI 482453
PI 482454
PI 482456
PI 508300

Anthracnose resistant
PI 163216
PI 163218
PI 167223
PI 164433

2. Update of Blueberry Exploration - Dr. J. R. Ballington, Horticulture Department, NCSU, Raleigh, NC 27695-7609.

   Nature of Research - Collection and breeding of Vaccinium and Rubus species.

Report is attached.

ATTACHMENT

PLANT EXPLORATION REPORT
(Summary, not to exceed 1 page)

Participants:

Dr. James R. Ballington
Professor
Hort. Sci. Dept.
Box 7609
N. C. State Univ.
Raleigh, NC 27695-7609
(919)737-3132

Dr. James L. Luteyn
Senior Curator of Botany
The N.Y Botanical Garden
Bronx, NY 10458
(212)220-8645

Dr. Maxine Thompson
Professor Emeritus
Dept. of Horticulture
Oregon State Univ.
Corvallis, OR 97331
(503)745-7266

Countries visited: Andean region of Ecuador

Dates of travel: October 29, 1990 - November 26, 1990

Objectives:

To collect seed, clonal and herbarium specimens of Vacciniaceous genera and Rubus species which are potential sources of genes for frost tolerance during bloom and/or large fruit size, improved fruit quality and small seed size, or have potential as new ornamental floriculture crops; for maintenance at the NCGR/Corvallis, and for potential utility in plant breeding, genetics, and phylogenetic studies.

Accomplishments:

Ninety-three seed and clonal accessions of small fruit taxa, plus an additional 44 herbarium vouchers where seed and clonal collections were not feasible, for a total of 137 accessions.

Vacciniaceous genera. (8 genera, 32 species, and a total of 45 accessions - seed and clonal). All accessions were vouched except three market samples of V. floribundum. An additional 14 herbarium vouchers of Vacciniaceous taxa were also collected.

Rubus. (11 known species, plus 12 unknown taxa, and a total of 46 accessions - all seed). Subgenus Orobatus; 4 species, plus 3 unknowns (22 accessions); subgenus Idaeobatus escapes; 2 species (2 accessions); Rubus glaucus (4 accessions). All Rubus collections were vouchered with herbarium specimens, except for the 4 seed accessions of R. glaucus and the one of R. nivens, in which case the seeds came from market samples. An additional 23 herbarium vouchers of Rubus taxa were also collected.

Other genera. Fragaria vesca - one popl. collection of O.P. seeds, plus one additional herbarium voucher: Ribes spp. - one small seed sample from an unknown species, plus 6 additional herbarium vouchers.

1991 S-9 TECHNICAL COMMITTEE REPORT

AGENCY: Oklahoma Agricultural Experiment Station
SUBMITTED BY: Brett F. Carver
ADDRESS: Department of Agronomy, Oklahoma State University, Stillwater, OK 74078

* * * * * * *

ACCESSION USERS: Brett F. Carver, Bjorn C. Martin, and Eviatar Nevo
ADDRESS: Dept. of Agronomy, Oklahoma State University, Stillwater, OK 74078
NATURE OF RESEARCH: Utilization of wild emmer wheat for photosynthetic improvement of bread wheat.
PROGRESS TO DATE: The wild emmer accession, PI428109, was used in recurrent backcrosses with TAM W-101 to improve the photosynthetic efficiency of adapted wheats without sacrificing leaf size. Individual BC_3F_2 plants are currently being increased which offer a 40% improvement in photosynthetic efficiency (ca. 36 μmol CO_2 $m^{-2}s^{-1}$ at 8 wk post-germination) over TAM W-101, with no noticeable difference in leaf morphology. Agronomic performance is currently under investigation. These germplasms were also crossed with other hard red winter cultivars to broaden the level of introgression.
SELECTED PUBLICATIONS: Nevo, E., B.F. Carver, and A. Beiles. 1991. Photosynthetic performance in wild emmer wheat, Triticum dicoccoides: Ecological and genetic predictability. Theor. Appl. Genet. 81:445-460.
CULTIVAR RELEASES: None

ACCESSION USERS: Darold L. Ketring
ADDRESS: USDA-ARS, Plant Science Research Laboratory, 1301 N. Western, Stillwater, OK 74075
NATURE OF RESEARCH: Physiology of seed quality as affected by storage time and temperature.
PROGRESS TO DATE: Several peanut genotypes were tested for germination and vigor after storage periods of 19, 7, and 0 months (fresh seeds). There was the least germination and seedling growth in the 19-month storage treatment, but there was a wide range of genotype tolerance to this exposure. When comparisons were made across treatments for individual genotypes, the data indicated a significant storage effect, which resulted in different seed quality. Field emergence was significantly different among genotypes, highly correlated with germination, negatively correlated with slow growing, and positively correlated with rapidly growing seedlings.

Peanut genotypes were significantly different in extent of seed quality reduction and field emergence both within and across storage treatments. Genotype tolerance to storage (time and temperature) could be a useful genetic trait to improve longevity of seed quality during storage and, hence, stability of field emergence.

SELECTED PUBLICATIONS: Ketring, D.L. 1991. Physiology of oil seeds IX. Effects of water deficit on peanut seed quality. Crop Sci. 31:459-463.

Ketring, D.L. 1990. Tolerance of germination and seedling vigor among peanut genotypes to storage time and temperature. Agron. Abstr. p. 165.

CULTIVAR RELEASES: None

ACCESSION USERS: H. A. Melouk, K. E. Jackson, J. S. Kirby
ADDRESS: USDA-ARS, Department of Plant Pathology and Department of Agronomy, Oklahoma State University Stillwater, OK 74078-9947

NATURE OF RESEARCH: Reaction of peanut cultigens to Sclerotinia minor.

PROGRESS TO DATE: Reaction of peanut cultigens to Sclerotinia minor was evaluated in field plots at Perkins, Oklahoma in 1989. Seeds of 36 entries were planted on June 16 in a randomized complete block design with four replications per entry. The field had a history of sclerotinia blight and a sandy loam soil with sclerotial density of 2-4 sclerotia per 100 g of soil. Blocks were separated by 1.5-m alleys and rows were 6.05-m long and 0.91-m apart. About 3 cm of water was applied to the plots as needed on a weekly basis by an overhead sprinkle system to provide adequate moisture for plant and disease development throughout the growing season. Maximum sclerotinia blight incidence (%) was recorded on October 12. The disease was evaluated based on two criteria: 1) the presence of characteristic lesions on the main stems and/or side branches, and 2) the occurrence of blighted plants.

Based on maximum disease incidence using both evaluation criteria, two large seeded Spanish peanut lines (SA-78-32-K-80-5 and SA-78-32-F-80-2) were identified as the most promising entries with resistance to sclerotinia blight. Runner type cultivars (Florunner, Okrun, and Tamnut 88) and lines derived from Florunner were the most susceptible. Generally, peanut cultigens with an upright growth habit seem to exhibit more resistance to S. minor than those with a spreading growth habit.

SELECTED PUBLICATIONS: None

CULTIVAR RELEASES: Tamspan 90

ACCESSION USERS: LeRoy V. Peters
ADDRESS: 1921 El Camino, Ponca City, OK 74604-2711

NATURE OF RESEARCH: Adaptation of selected P.I. accessions of finger millet, Eleusine coracana, and pearl millet, Pennisetum glaucum to the growing season and conditions in north central Oklahoma.

PROGRESS TO DATE: 1990 was the first year for the planting (near Kildare, Oklahoma) of 19 finger millet P.I.'s from three countries, and 26 pearl millet P.I.'s from five countries. In addition to the comments reported in last years report, notes were taken on days to heading and anthesis, head size, type and color, mature plant height, and plant lodging on the finger millet accessions. Three of the early flowering finger millet accessions were well adapted to the 1990 growing season. Additional notes taken on the pearl millet accessions were: days to first boot, heading and anthesis; range in head size (diameter and length) at maturity; and range in plant height at maturity. Considerable variation existed within most of the pearl millet accessions.

SELECTED PUBLICATIONS: None

CULTIVAR RELEASES: None

ACCESSION USERS: D.R. Porter, J.A. Webster, C.A. Baker, D.W. Mornhinweg, and R.L. Burton
ADDRESS: USDA-ARS, Plant Science Research Laboratory, 1301 N. Western St., Stillwater, OK 74075
NATURE OF RESEARCH: Evaluation of small grains accessions and subsequent use of identified sources of resistance for enhancing resistance to the Russian wheat aphid (RWA) (*Diuraphis noxia* (Mordvilko)) and the greenbug (*Schizaphis graminum* (Rondani)) in cultivated wheat (*Triticum aestivum* L.) and barley (*Hordeum vulgare* L.).
PROGRESS TO DATE: The entire working barley collection, triticale (*X Triticosecale* Wittmack) collection, and a large portion of the wheat collection of the USDA-ARS National Small Grains Collection has been evaluated for resistance to feeding damage caused by the Russian wheat aphid. Varying degrees of resistance have been detected in accessions from these three collections. Characterization of mechanisms of resistance, genetic control of resistance, and transfer of resistance genes from identified sources of resistance to adapted cultivars is underway.
SELECTED PUBLICATIONS:
Porter, D.R., C.A. Baker, R.A. Veal, D. Mornhinweg, and J.A. Webster. 1990. Russian wheat aphid resistance germplasm enhancement. Proc. Aphid-Plant Interactions: Populations to Molecules, Stillwater, OK. p. 274.

Porter, D.R., D.W. Mornhinweg, J.A. Webster, S.D. Kindler, and R.L. Burton. 1991. Increasing Russian wheat aphid resistance genetic diversity in barley. Proc. 28th Barley Imp. Conf. Minneapolis, MN. p. 51-52.

Porter, D.R., J.A. Webster, R.L. Burton, G.J. Puterka, and E.L. Smith. 1991. New sources of resistance to greenbug in wheat. Crop Sci. (In press).

Webster, J.A. 1990. Resistance in triticale to the Russian wheat aphid (Homoptera: Aphididae). J. Econ. Entomol. 83:1091-1095.

Webster, J.A., Baker, C.A., and D.R. Porter. 1991. Detection and mechanisms of Russian wheat aphid (Homoptera: Aphididae) resistance in barley. J. Econ. Entomol. 84:669-673.
CULTIVAR RELEASES: None

University of Puerto Rico
College of Agricultural Sciences
AGRICULTURAL EXPERIMENT STATION
Río Piedras, Puerto Rico

S-9 Technical Committee Report

July 24-25, 1991
Gainesville, Florida

Submitted by:
Rubén Vélez Colón
Fortuna Agricultural Experiment Substation
HC 02 Box 7115
Juana Díaz, PR 00795

Progress Report
Project H-94-B

PROJECT NUMBER : H-94-B

ACCESSION USERS : Sonia L. Martínez and Alvaro Acosta

ADDRESS : Fortuna Substation
HC 02 Box 7115
Juana Díaz, PR 00795

NATURE OF RESEARCH : To obtain throught plant introduction, evaluation and preservation, better fruit crops. (Soursop - Annona muricata L., Avocado - Persea Americana Mill.) with high yielding ability, resistant to prevalent maladies and adapted to our climatic conditions.

PROGRESS TO DATE : Data of production per tree was recorded in the soursop six clones experiment. Also fruit evaluation of these clones was performed by personnel of the food Technology Laboratory for 1) brix, 2) acidity %, 3) reduced sugars and 5) total sugars. Results obtained show that mean values of the five criteria evaluated for each clone were (respectively): Clone VI-2 (3.77, 18.03, 0.92, 9.34 and 11.05), Clone IV-3 (3.76, 19.83, 0.95, 10.83 and 12.80), Clone IV-10 (3.89, 15.75, 0.83, 9.79 and 11.40), Clone IV-16 (3.93, 17.01, 0.82, 8.78 and 13.31), Clone VI-1 (3.95, 17.43, 0.80, 9.75 and 14.00) and for Clone VII-14 (3.96, 17.08, 0.76 and 12.62). Soursop is one of the most promising tropical fruits grown in Puerto Rico. This information will be valuable specially for those farmers interested in growing soursop for fruit processing. Preliminary data of production per tree was recorded in the avocado (7 var.) experiment. Data of mean fruit weight was obtained from four of the seven varieties included in the experiment were a sample of 20 fruits was available. Results showed Candelaria as the variety with the highest fruit weight (0.55 kg.) and Avila as the one with the lowest fruit weight (0.40 kg.). A new avocado pest record was observed this year in all the avocado orchards at Fortuna substation. The insect pest is Pseudacysta persea (Hemiptera - Tingidae) a very aggresive, dark colored lacebug that feeds in the underside of the leaves causing irregular brown spots with a clorotic surrounding. Damage levels and possible ways of control need to be evaluated promptly.

PUBLICATIONS : None.

CULTIVAR RELEASES : None.

Progress Report
Project H-94-C

PROJECT NUMBER : H-94-C

ACCESSION USER : José A. Chavarría

ADDRESS : Corozal Agricultural Experiment Station
HC 02 Box 10322
Bo. Padilla
Corozal, PR 00643

NATURE OF RESEARCH : Plantains and bananas, their introduction, multiplication, evaluation and preservation.

PROGRESS TO DATE : Plant germplasm of 14 plantain cultivars and 44 bananas cultivars were evaluated and preserved at the Corozal Substation. No significant differences were found between five banana cultivars (1A, 2A, 3A, 4A and Grand Naine) and its yield and yield components in the plant crop and the first ratoon crop. Also no significant difference was found in the pseudostem heigh and diameter for the different clones evaluated. Averaged heigh was 2.0 m with 15 cm in diameter. Practically was no damage ocasionalted by the corm-weevil (C. sordidus), in the five clones. Plants showed an average of one tunnel/rhizome and less than 5% of the rhizome area affected by the corm weevil. All banana clones were affected by nematodes and Yellow Sigatoka. No significant difference was found between the difference was found between the different clones and the degree of infestation of this pest and disease.

PUBLICATION : González, A., M. Santiago and L. Figueroa, 1990. Comportamiento hortícola de siete clones de plátano. J. Agric. Univ. of P. R. 74 (3): 267-72.

CULTIVAR RELEASES : None.

Progress Report
Project H-94-D

PROJECT NUMBER : H-94-D

ACCESSION USERS : Agenol González and Angel Bosques

ADDRESS : Corozal Agricultural Experiment Station
HC 02 Box 10322
Bo. Padilla
Corozal, PR 00643

NATURE OF RESEARCH : Root crops their introduction, multiplication, evaluation and preservation.

PROGRESS TO DATE : Binugus and Gunung cultivars of yams showed less acceptability when were harvested at 7 months than when were harvested at 9 and 11 months in a sensorial test performed. Both yams cultivars showed no deterioration symtoms up to 3 months after being harvested and stored at environment conditions. Palma tanier cultivar and two cultivars from Venezuela were found to be tetraploid and pentaploid, respectively on a chromosome study. These three cultivars showed resistance to root rot disease during the last two years of germplasm evaluation. These cultivars could be used in a breeding program, especially the palma cultivars.

PUBLICATIONS : None.

CULTIVAR RELEASES : None.

Progress Report
Project H-94-G

PROJECT NUMBER : H-94-G

ACCESSION USERS : Elvin Caraballo, Rubén Vélez and Octavio Colberg

ADDRESS : Agricultural Experiment Station
Fortuna Substation
HC 02 Box 7115
Juana Díaz, PR 00795

NATURE OF RESEARCH : To introduce and evaluate under local conditions cultivars of the Solanaceae family, in order to find germplasm with outstanding characteristics, such as higher yield and superior produce quality.

PROGRESS TO DATE : Replicated trials (4 plots/cv.) on tomatoes (18 cultivars) and bell peppers (12 cultivars) were run during our usual vegetable growing season (November, 1990 to May, 1991). Data were taken on yield, size, quality and other characteristics and is being analized.

PUBLICATIONS : None.

CULTIVAR RELEASES : None.

Progress Report
Project H-94-P

PROJECT NUMBER : H-94-P

ACCESSION USER : Pedro Márquez

ADDRESS : Isabela substation
Box 506
Isabela, PR 00662

NATURE OF RESEARCH : Introduction and evaluation of pineapple cultivars.

PROGRESS TO DATE : The pineapple collection is at the Isabela Substation since September 1990. This collection is made up of 16 varieties and the plants are in good conditions. New material is going to be added to this collection.

No experimental data is being produced at this time.

PUBLICATIONS : None.

CULTIVAR RELEASES : None.

Progress Report
Project H-94-Q

PROJECT NUMBER : H-94-Q

ACCESSION USERS : Agenol González and Félix M. Román

ADDRESS : Corozal Agricultural Experiment Station
HC 02 Box 10322
Bo. Padilla
Corozal, PR 00643

Agricultural Experiment Station
Adjuntas Substation
HC 01 Box 4508
Adjuntas, PR 00601-9717

NATURE OF RESEARCH : Citrus-their introduction, multiplication, evaluation and preservation.

Evaluation of orange selections in terms of fruits production, quality and rootstock influence on production. Evaluation of effect of drip irrigation system on valencia orange production and the evaluation of valencia orange grafted in eight rootstocks.

PROGRESS TO DATE : At Corozal, differences were not found between prunned and no prunned chironja clones 26 years old during three years data collection. Trees of Orlando Tangelo show an excellent growth on the central area of Puerto Rico, especially at Corozal. In spite of this, these citrus are showing Mg deficiency symtoms. During the first year of an experiment using differents Mg levels, the Mg soil content increased as Mg application to the soil increased. Nevertheless, Mg leaf content showed practically no difference between the different Mg levels application. This could be related to a poor Mg absortion provocated by low pH levels.

At Adjuntas, during this year (fourth year of evaluation) 12 orange selections have been evaluated in Adjuntas. Data indicate that trees grafted on Cleopatra mandarin produce more number of fruit than those grafted on sour orange. The selections 20 Hamlin, 32 St. Just, 376 Rico 5, 374 Rico 1, 82 Lares, 24 Rico 2 and 334 Pietri produced more fruits than the others evaluated. There was no difference in fruit size between rootstock. Neverless, the selections 78 and 42-10-10 Washington Navel produced fruits with more weight. The best selections with suitable characteristic such as none or small amount of seeds, high juice weight per fruit and percent of juice per fruit are 376 Rico 2, 24 Rico 2, 78 and 42-10-10 W. Navel, 333 and 334 Pietri, 82 Lares and 32 St. Just.

The evaluation of drip irrigation system on valencia showed no difference in treatment during 1990. The yield obtained during this year has not been analized to determine diffrences between treatments.

There were not data available in the experiment for evaluation of eight rootstocks in valencia orange.

PUBLICATIONS : None.

CULTIVAR RELEASES : None.

Progress Report
Project H-94-R

PROJECT NUMBER : H-94-R

ACCESSION USER : Octavio Colberg

ADDRESS : Lajas Substation
PO Box 940
Lajas, PR 00667

NATURE OF RESEARCH : Plant germoplasm introduction, increase, evaluation, documentation, maintenance and distribution: Cucurbits.

PROGRESS TO DATE : Following last year (1990) trials, we are currently evaluating fifteen varieties of watermelon in replicated trials, at the Lajas Substation. Some parameters measured or being measured are yield, brix and performance.

PUBLICATIONS : None.

CULTIVAR RELEASES : None.

Progress Report
Project H-94-T

PROJECT NUMBER : H-94-T

ACCESION USERS : Lucas V. Ramírez, Alvaro Acosta and Jaime Escudero

ADDRESS : Agricultural Experiment Station
Box 306
Gurabo, PR 00658

and

Agricultural Experiment Station
HC - 02 Box 7115
Juana Díaz, PR 00795

NATURE OF RESEARCH : To obtain through introduction, increase, evaluation documentation and maintenance of the papaya plant, better papaya trees of Cariflora cultivars (Carica papaya L.) and Cariflora hibrids with high yielding ability, tolerant to papaya viruses and diseases, and adapted to local climatic conditions.

PROGRESS TO DATE : Two cultivars of Carica papaya L.: Cariflora and Sunrise Solo, were evaluated in terms of tolerance to papaya ringspot virus (PRV) at the substations of Gurabo and Juana Díaz (Fortuna).

At the Gurabo Substation, Cariflora papaya demonstrated to be very tolerant to PRV; it rapidly recovered to the infection and producing flowers and fruits, contrary to the Sunrise Solo variety which produced few flowers and fruits, deformed in its majority.

At Juana Díaz Substation (Fortuna) a similar tendency was observed, where the Cariflora variety presented a tolerance and fast recuperation to the virus infection.

PUBLICATIONS : Tolerancia de las Variedades Cariflora y el híbrido F. Cariflora X Sunrise al virus de las manchas anulares de la papaya en P. R., Escudero, J., Acosta, A. and L. V. Ramírez. Presentation at SOPCA meeting 1990.

Susceptibilidad Relativa de las Variedades Cariflora y Sunrise Solo al virus de las manchas anulares y distorsión de la papaya en P. R. Presentation at SOPCA meeting 1990.

CULTIVAR RESEASES : None.

Progress Report
Project H-94-W

PROYECT NUMBER : H-94-W

ACCESSION USER : Hernán Ruiz

ADDRESS : Fortuna Agricultural Experiment Substation
HC 02 Box 7115
Juana Díaz, PR 00795

NATURE OF RESEARCH : To introduce and evaluate cultivars of the Solanaceae and/or Cucurbitaceae family as related to plant diseases.

PROGRESS TO DATE : Five commercial cultivars of sweet pepper (Capsicum annuum L.) from Harris Moran, Ferry Morse, Petoseed and the Agricultural Experiment Station of the University of Puerto Rico, were evaluated for their resistance or tolerance to the powdery mildew caused by Leveillula taurica. The trial was conducted at the Experiment Station of Juana Díaz, under field conditions. The cultivars were replicated four times in a randomize complete block design plot. It consisted of double fows with plants 30 cm apart and 30 cm between plants (600 meters long). In spite that all the cultivars were attacked by the disease, we were not able to demonstrate any significant reduction in yield in none of them, due to the disease. In general powdery mildew appeared at or near the time of flowering stage. Severity of the disease has been related with soil compaction and defficiency of irrigation water. These two factors were not present in this trial. The experiment must be repeated in order to get satisfactory results.

PUBLICATIONS : None.

CULTIVAR RELEASES : None.

1991

S-9 Technical Committee Report

Agency: Clemson University
Submitted By: D.W. Bradshaw
Address: Department of Horticulture, Clemson University, Clemson, S.C. 29634-0375

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Accession User: Ellis L. Jourdain & Claude E. Thomas
Address: U.S. Vegetable Laboratory
2875 Savannah Highway
Charleston, S.C. 29414
Nature of Research: Evaluation of U.S. P.I. collection of Cucumis melo for resistance to downy mildew (Pseudoperospora cubensis) to generate data for entry into GRIN.
Progress to Date: Field and growth chamber/greenhouse evaluations have been completed on 1237 accessions. A field evaluation of 277 more has also been completed.
Publications: See attached.
Cultivar Releases: None

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Accession User: Billy B. Rhodes
Address: Department of Horticulture
Clemson University
Clemson, S.C. 29634-0375
Nature of Research: 'Congo' watermelon, developed at the USDA Vegetable Laboratory in Charleston, S.C. from a PI from South Africa, was screened for restistance to a pathogen similar to Pseudomonas. This pathogen is believed to be the cause of the Watermelon Fruit Blight which devastated fields in 1989.
Progress to Date: Advanced lines from PI 189225 and PI 299379 have been provided to other watermelon breeders. R309 (origin unknown) from the US Vegetable Laboratory in Charleston has been identified as resistant to race 2 anthracnose.
Publications: See attached.
Cultivar Releases: None

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Accession User: Perry E. Nugent
Address: US Vegetable Labroatory
2875 Savannah Highway
Charleston, S.C. 29414
Nature of Research: Develop multiple resistant germplasm with superior nutritional, consumer acceptance and keeping qualities which will help reduce losses in muskmelon and watermelon caused by diseases, insects,

nematodes, and environmental stresses.

Progress to Date: Several disease and stress resistant miniloup plants with 8-10 small uniform ripe, fair quality, 10-14% soluable solids, fruit were selected. Another plant had 120 4-6 ounce poor quality fruit and was still flowering and setting fruit when first ripe fruit were harvested. Accession N continued production of 3-5 high quality sutureless 3 pound netted melons on plants that survived drought followed by heavy rain and severe downy mildew infestation. A downy mildew test was conducted on F4 populations from the 'Mainstream' X MR-1 cross. Resistant selections were backcrossed to both parents and the resultant populations grown in field plots but were lost in Hurricane Hugo. F3 populations were grown from crosses of C931 edible rind melons with cultivars and PI's to develop greater diversity in our eat-all lines. Work continues on watermelon germplasm with development of several nice yellow, orange, and red fleshed lines. A family of glabrous watermelons segregated for plants with tennisball ot baseball sized fruit that have potential for snack melons.

Publications: None.

Cultivar Releases: Four sets of germplasm are being prepared for release.

CABBAGE (Brassica oleracea var. capitata)
Downy mildew; Peronospora parasitica

C. E. Thomas and E. L. Jourdain
USDA, ARS, U. S. Vegetable Laboratory
2875 Savannah Highway
Charleston, SC 29414

EVALUATION OF CABBAGE PLANT INTRODUCTIONS FOR RESISTANCE TO DOWNY MILDEW, 1988: All available cabbage plant introductions (PI) and five check cultivars were evaluated for resistance to Peronospora parasitica race 2. The test was conducted as a randomized complete block design with four replicates. The number of plants per replicate varied depending on availability and viability of seeds of each entry. Total plants tested per entry ranged from 4 to 355. Plants were inoculated at the two expanded leaf stage by spraying the adaxial leaf surfaces with 5 x 10^3 sporangia per ml. After inoculation plants were placed in a dark 16 C dew chamber for 24 hr, then transferred to a 22 C growth room with a 12 hr photoperiod. On the seventh day after inoculation, plants were returned to the dew chamber for 30 hr. Ratings for downy mildew interaction phenotypes (IP) were made at nine days on a 0 - 9 scale of increasing disease severity. A disease index (DI) was calculated for each entry.

Some accessions had either a low DI* or contained plants with IPs ≤3, or both, indicating the presence of possibly useful levels of resistance.

PI/cv	DI	% Plants ≤3	PI/cv	DI	% Plants ≤3	PI/cv	DI	% Plants ≤3	PI/cv	DI	% Plants ≤3	PI/cv	DI	% Plants ≤3	PI/cv	DI	% Plants ≤3	PI/cv	DI	% Plants ≤3
141572	6.5**	0	194069	6.7	0	245016	5.6	2	250420	7.0	0	275007	7.0	0	343529	6.2	0	357400	6.6	0
141574	8.3	0	199948	0.6	100	245017	5.8	11	250421	6.8	0	277278	7.2	0	343537	5.7	0	357401	6.8	0
143351	7.0	0	199949	1.1	100	245018	5.8	2	250422	6.3	2	280065	5.2	23	343533	6.1	0	357403	6.7	0
143358	7.0	0	204562	6.8	0	245020	5.6	2	250423	6.5	0	280066	5.4	19	343539	6.4	0	357404	6.7	0
156702	7.0	0	204563	6.2	0	245021	6.3	6	250424	6.8	0	280067	6.8	0	343540	5.9	3	368381	6.8	0
163488	5.9	0	204679	6.3	4	245023	5.8	3	255558	6.5	0	280068	7.0	0	343545	6.7	0	368385	6.1	8
163489	5.4	0	204680	6.0	0	246046	7.1	0	255559	6.4	0	281547	6.7	7	343550	6.8	0	368386	6.1	0
163490	5.6	0	204681	6.5	0	246047	6.7	0	255560	6.5	0	281548	6.8	0	343551	6.4	4	368387	6.3	0
164275	6.1	0	205992	5.9	0	246050	7.0	0	255561	6.3	0	281549	7.0	0	343557	6.8	0	368388	6.0	0
165067	6.4	0	205993	6.0	0	246051	6.6	0	255562	6.3	0	281550	7.4	0	343558	6.8	0	370359	6.0	3
165086	6.7	0	205994	6.4	0	246052	6.9	0	255581	6.6	0	281551	7.1	0	343559	5.6	0	379104	5.7	0
169039	5.4	0	206942	5.9	0	246053	5.6	2	261600	6.6	0	281552	6.6	0	343564	6.5	0	379105	6.5	0
169040	5.0	7	209942	6.6	0	246054	6.2	0	261601	6.6	0	285597	6.5	0	343565	6.5	0	379106	6.0	3
169041	6.6	0	211581	6.7	0	246055	6.3	0	261602	6.3	0	285598	6.7	0	343572	6.3	4	379108	5.9	0
169045	6.7	0	211718	7.1	0	246056	6.5	0	261603	6.7	0	285599	6.4	0	343576	6.1	0	414935	6.6	0
169046	6.8	0	212080	7.0	0	246057	5.9	0	261604	6.7	0	285600	6.0	0	343578	6.6	0	414936	6.4	0
169047	6.1	3	212971	6.7	0	246058	5.6	5	261605	5.1	24	285601	6.4	0	343584	6.4	0	418984	1.0	100
169048	6.5	0	214148	6.6	0	246059	6.6	0	261627	6.0	2	288229	5.9	0	343586	6.2	0	418985	1.2	97
169049	6.9	0	215514	6.7	0	246060	6.7	0	261642	6.4	2	288230	5.5	0	343592	6.2	0	418986	1.0	100
169050	6.2	0	225854	6.1	0	246062	6.2	0	261643	6.9	0	291998	5.5	0	343593	6.3	0	418987	1.0	100
169051	5.8	0	225855	6.0	0	246063	1.3	95	261757	5.8	0	296133	6.5	0	343597	6.5	0	418988	1.0	100
169052	5.4	3	225857	6.5	0	246064	6.7	0	261758	5.4	7	296330	6.3	0	343598	6.6	0	419065	6.2	0
169053	6.0	0	225860	7.0	0	246065	5.7	4	261769	6.4	2	296331	6.4	0	343599	6.1	0	419066	6.1	0
169054	5.2	11	225861	6.0	0	246066	5.8	4	261771	6.1	2	302442	6.2	0	343600	6.4	0	419067	6.5	0
169055	7.0	0	225862	6.5	0	246067	5.7	0	261772	5.6	2	302984	6.6	0	343603	6.1	0	419104	5.5	6
169056	6.2	0	227232	7.3	0	246068	5.3	4	261773	6.5	6	302986	5.8	2	343606	6.7	0	419125	6.4	0
171529	6.0	0	229470	6.2	3	246071	6.2	0	261774	6.4	0	303629	5.7	0	343607	5.3	13	419172	6.2	0
171530	6.3	0	229747	6.9	0	246072	5.2	9	263056	1.3	100	320914	5.7	2	343610	6.2	3	419174	5.4	9
171531	6.5	0	230721	5.6	0	246073	5.5	2	263057	2.0	64	329196	5.8	0	343611	6.8	0	419175	5.7	0
171532	6.0	0	233194	6.6	0	246075	5.6	6	263058	6.9	0	329197	6.0	0	343619	6.3	0	419176	6.7	0
171533	6.3	0	235042	6.3	0	246077	3.2	62	263059	6.6	0	329198	6.0	0	343629	5.6	5	419177	6.1	0
171536	7.0	0	235043	6.8	0	246078	5.6	5	263060	6.6	0	329199	5.2	24	343630	6.4	0	419178	6.4	0
172743	5.6	0	235045	5.8	4	246080	5.6	8	263061	6.8	0	329200	6.1	3	343636	6.8	0	430603	6.4	0
172752	6.1	0	244987	6.5	0	246082	5.5	5	263062	6.9	0	329201	6.2	0	343664	6.3	0	430604	6.1	0
172753	7.0	0	244990	6.8	0	246083	6.6	0	263063	6.6	0	330390	6.8	0	343666	5.5	0	Rio		
173643	7.1	0	244991	6.6	0	246086	7.0	0	263064	7.1	0	330396	6.2	3	343668	6.5	5	Verde	6.9	0
174070	6.9	0	244993	6.8	0	246087	6.0	0	263065	7.0	0	343485	6.6	0	357372	6.7	0	Headstart		
175606	6.6	0	244997	7.0	0	246090	6.1	2	263066	6.6	0	343488	6.6	0	357373	6.0	3		6.0	0
176435	6.4	0	244998	7.0	0	246095	5.9	0	263067	7.0	0	343489	6.6	0	357374	1.4	100	Market		
176438	6.5	0	245000	7.0	0	246097	6.2	0	263070	7.0	0	343500	6.3	0	357379	5.3	9	Prize	6.8	0
176439	6.3	0	245001	6.8	0	246098	6.2	0	263071	6.8	0	343507	6.0	0	357380	5.5	5	Bravo	6.6	0
176440	6.0	0	245009	6.0	0	246102	6.1	0	263072	7.0	0	343512	6.1	0	357385	5.9	0	Sanibel		
176442	6.2	0	245010	7.0	0	246103	6.3	0	263867	6.6	0	343514	6.6	0	357388	5.7	0		6.4	0
181720	6.5	0	245011	5.9	0	246108	6.2	0	269433	7.0	0	343515	5.6	0	357389	5.4	0			
182148	7.0	0	245012	6.0	0	246111	5.1	23	275003	5.6	20	343516	6.1	0	357390	6.0	3			
182149	5.8	3	245013	2.7	67	246113	5.9	0	275004	6.4	0	343519	5.9	0	357395	6.6	3			
182150	7.6	0	245014	5.3	11	249557	6.7	0	275005	6.8	0	343520	6.1	0	357398	6.7	0			
187232	5.6	0	245015	6.3	10	250419	6.4	0	275006	6.8	0	343524	6.5	0	357399	6.8	0			

* Resistance classes based on disease indices (DI) calculated by Williams' formula: very resistant = DI of 0 - 3, moderately resistant = DI of 3.1 - 5, lowly resistant = DI of 5.1 - 6, susceptible = DI of 6.1 - 7, very susceptible = DI of 7.1 - 9.
** LSD for mean = 0.5, C.V. = 5.9%.

BRUSSELS SPROUTS (Brassica oleracea var. gemmifera)
KOHLRABI (Brassica oleracea var. gongylodes)
Downy mildew; Peronospora parasitica

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EVALUATION OF BRUSSELS SPROUTS AND KOLHRABI PLANT INTRODUCTIONS FOR RESISTANCE TO DOWNY MILDEW, 1988: All available Brussels sprouts and kohlrabi plant introductions (PI), and three susceptible Brussels sprouts check cultivars were screened for resistance to Peronospora parasitica race 2. Plants were grown in Jiffy Mix® in No. 812 Com-Packs® cut apart to produce four replicates of three cells each. The study was conducted as a randomized complete block design. The number of plants per replicate varied depending on availability and viability of seeds of each entry. Total plants tested per entry ranged from 2 to 90. Plants were inoculated at the two expanded leaf stage by spraying the adaxial leaf surfaces with 5 x 10^3 sporangia per ml to incipient run-off using a Paasche® Type H airbrush at 138 kPa. After inoculation plants were placed in a dark 16 C dew chamber for 24 hr, then transferred to a 22 C growth room with a 12 hr photoperiod. On the seventh day after inoculation, plants were returned to the dew chamber for 30 hr. Ratings for downy mildew interaction phenotypes (IP) were made at nine days on a 0 - 9 scale of increasing disease severity. A disease index (DI) was calculated for each entry.

Within the Brussels sprouts group, PIs 343673, 365147, 365150, and 365151 were classified as lowly resistant (DI = 5.1 - 6.0). None of the tested entries exhibited a moderate or high level of resistance. However, in some accessions 3 - 9% of the tested plants were classified as highly resistant (IP ≤3). No plants with any degree of resistance were identified in any of the kohlrabi accessions.

PI/cv	DI[1]	% Plants ≤3	PI/cv	DI	% Plants ≤3	PI/cv	DI	% Plants ≤3
Brassica oleracea var. gemmifera (Brussels sprouts)								
209942	7.2[2]	0	365156	6.8	0	365174	6.8	0
243050	6.6	0	365157	6.5	8	365175	7.1	0
244839	7.3	0	365158	6.2	3	365176	7.1	0
261775	7.0	0	365160	6.4	0	365177	6.8	0
312902	7.2	0	365162	6.6	0	365178	6.6	0
343669	7.0	0	365163	6.9	0	365179	7.0	0
343670	6.6	0	365164	6.9	0	365181	7.1	0
343671	6.8	0	365166	6.6	0	365182	7.7	0
343673	6.0	0	365167	6.9	0	365183	7.0	0
365147	5.1	9	365169	6.5	0	365186	6.8	0
365150	5.6	8	365170	6.9	0	365187	7.0	0
365151	5.7	0	365171	6.4	0	365188	7.0	0
365154	7.2	0	365172	7.2	0	365189	6.6	0
365155	6.7	0	365173	6.5	0	385957	8.1	0
Jade Cross	7.1	0	Lunet	6.5	0	Valiant	6.4	0
Brassica oleracea var. gongylodes (kohlrabi)								
211908a	7.0[3]	0	227232	8.0	0	344394	7.0	0
211908b	9.0	0	344393	8.0	0			

[1] Resistance classes based on disease indices (DI) calculated by Williams' formula: very resistant = DI of 0 - 3, moderately resistant = DI of 3.1 - 5, lowly resistant = DI of 5.1 - 6, susceptible = DI of 6.1 - 7, very susceptible = DI of 7.1 - 9.
[2] LSD for mean = 0.6, C.V. = 5.8%.
[3] No statistical analysis was performed on kohlrabi data.

MUSKMELON (*Cucumis melo*)
Downy Mildew; *Pseudoperonospora cubensis*

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EVALUATION OF MUSKMELON PLANT INTRODUCTIONS FOR RESISTANCE TO DOWNY MILDEW, 1988-90, PART I: *Cucumis melo* ("muskmelon") plant introductions (PIs) were tested for resistance to *Pseudoperonospora cubensis* pathotype 1, the incitant of downy mildew of muskmelon. This report gives the results of tests on 289 PIs and four check cultivars. Field plots of two to five 10-leaf-stage plants of each entry were inoculated by spraying the adaxial leaf surfaces with 2.0×10^4 sporangia per ml using a Micro Ulva^R. The number of plants per plot varied depending on the viability of seeds of each entry. Ratings for downy mildew reaction type* (RT) were made approximately 19 days post-inoculation using a 1 - 4 scale of increasing resistance. Those entries in which one or more plants had a reaction type of 2 or greater were retested in replicated glasshouse trials. Four replicates of six plants each were inoculated at the two-expanded-leaf-stage with 5.0×10^3 sporangia per ml using a Paasche^R Type H airbrush at 40 psi. After inoculation, plants were placed in a dark 20C dew chamber for 18 hr, then transferred to a glasshouse bench for five days. On the sixth day after inoculation, plants were returned to the dew chamber for 18 hr to enhance sporulation. Ratings were made on the seventh day post-inoculation.

The replicated tests showed PI 124112 highly resistant with 75% of the plants having a RT of 4 and 25% a RT of 3. PIs 124111, 122847, and 124210 were classified as resistant with 100% of the plants having a RT $\geq$1. Resistant (RT 3) plants were identified in 17 accessions, and 12 accessions had moderately resistant (RT 2) plants. The table below gives the most resistant reaction type identified in field plot or replicated tests on each accession.

PI/ Cv.	Reaction Type	PI/ Cv.	Reaction Type	PI/ Cv.	Reaction Type	PI/ Cv.	Reaction Type	PI/ Cv.	Reaction Type	PI/ Cv.	Reaction Type	PI/ Cv.	Reaction Type
93438	1	123517	1	124441	1	125918	1	125993	1	126080	1	126166	1
93799	1	123680	1	124443	1	125919	1	125994	1	126081	1	126167	1
93800	1	123682	1	124449	1	125921	1	125997	1	126082	1	126169	1
102077	1	123683	2	124550	1	125922	1	126000	1	126083	1	126170	1
108902	1	123684	2	124552	3	125923	1	126004	1	126084	1	126174	1
109479	1	123685	1	124553	1	125924	1	126008	1	126086	1	126176	1
116479	1	123689	3	125860	1	125925	1	126012	1	126088	1	126179	1
116482	1	123821	1	125861	1	125926	1	126013	1	126089	1	126180	1
116487	1	123822	1	125862	1	125927	1	126016	1	126090	3	126185	1
116489	1	123823	3	125868	1	125928	1	126018	1	126095	1	126190	1
116490	1	123824	2	125869	1	125929	1	126019	1	126096	1	126195	1
116659	1	124092	2	125870	1	125930	1	126020	1	126099	1	126197	1
116660	1	124096	1	125874	1	125931	1	126021	1	126105	1	126198	1
116661	1	124098	1	125875	3	125933	1	126027	1	126106	1	126199	1
116664	1	124099	1	125876	1	125935	1	126030	2	126111	1	126200	1
116666	3	124100	1	125877	1	125937	1	126032	1	126112	1	126202	1
116667	2	124101	1	125878	1	125939	1	126033	1	126113	1	127519	1
116736	1	124102	2	125879	1	125940	1	126034	1	126114	1	127528	1
116738	1	124103	3	125880	1	125942	1	126036	1	126116	1	127530	1
116824	1	124105	1	125882	1	125943	1	126037	1	126117	1	127532	1
116826	1	124106	1	125884	1	125944	1	126040	1	126118	1	127534	1
116827	1	124107	1	125885	1	125948	1	126042	1	126123	1	127535	1
116828	1	124108	1	125886	1	125949	1	126044	1	126125	1	127536	1
116915	1	124109	3	125887	1	125952	1	126045	1	126126	1	127538	1
116917	1	124111	4**	125890	1	125953	1	126051	1	126127	1	127540	1
117158	1	124112	4	125891	1	125956	1	126053	1	126129	1	127544	1
117162	1	124113	1	125892	1	125957	1	126054	1	126132	1	127546	1
118584	1	124114	1	125893	1	125960	1	126056	1	126133	1	127560	1
122847	3	124206	3	125895	1	125961	1	126057	1	126134	1	127565	1
123187	1	124207	1	125896	1	125963	1	126058	1	126136	1	127566	1
123188	3	124208	2	125897	1	125964	1	126059	1	126138	1	127567	1
123493	3	124210	3	125901	2	125967	1	126060	1	126140	1	127570	1
123494	2	124214	2	125902	1	125969	1	126063	1	126143	1	127575	1
123495	1	124429	1	125903	1	125970	1	126064	1	126145	2	127577	1
123496	1	124430	1	125904	1	125971	1	126065	1	126146	1	127578	1
123498	3	124431	1	125906	1	125973	1	126068	1	126150	1	128901	1
123499	1	124432	1	125908	1	125974	1	126069	1	126151	1	134196	1
123500	3	124433	1	125909	1	125981	1	126071	1	126152	1	MR-1	4
123501	1	124435	1	125911	1	125982	1	126072	1	126153	1	Seminole	3
123502	3	124436	3	125913	1	125986	1	126073	1	126160	1	Cinco	2
123504	1	124439	1	125914	1	125991	1	126076	1	126162	1	Ananas	
123505	1	124440	1	125915	1	125992	1	126077	1	126165	1	Yokneam	1

*Reaction type classification:
RT 1 = Susceptible. 10 - 15 mm, irregular, chlorotic lesions with abundant sporulation that may extend beyond the apparent margins of the lesions.
RT 2 = Moderately resistant. Type "1" lesions, above, mixed with type "3" lesions, below.
RT 3 = Resistant. 3 - 4 mm, irregular to circular, chlorotic lesions with water-soaked margins beneath and sparse sporulation.
RT 4 = Highly resistant. 1 mm, circular, chlorotic lesions with necrotic centers and water-soaked margins beneath and extremely limited or no readily apparent sporulation.
**Not obtained from the U. S. Plant Introduction Station.

A Strategy Toward Varietal Resistance to Watermelon Fruit Blotch

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The disease called watermelon fruit blotch (WFB) appeared in the summer of 1989, first in Florida and subsequently in South Carolina and in other states on the eastern seaboard as the summer progressed. It was also reported in Indiana. It was particularly devastating in Florida and South Carolina, sometimes spoiling large fields of fruit. Hopkins (1) described the disease. The disease also appeared in recent years on 'Charleston Sweet' and 'Xin Hong Bao' varieties under humid conditions in China. Observations by Zhang suggest that the disease was transferred to China by seed.

A grower in South Carolina realized a high yield of marketable fruit from the triploid variety 'Tri-X 313' despite the fact that the fruit of the pollinator variety, 'Prince Charles', was completely ruined by watermelon fruit blotch. The tetraploid parent of 'Tri-X 313' reputedly came from the USDA variety, 'Congo'. In 1979, Sowell and Schaad (2) screened 740 plant introductions and several varieties for seedling resistance to a pathogen similar to that described for WFB. The three most resistant hosts possessed genes from 'South Africa' and 'Congo' was the third most resistant host.

One hundred 3-week old seedlings from each of nine sources of 'Congo', 'PI 295843', 'PI 299378' and 'Tri-X 313' were sprayed with a solution of 10^6 cells ml^{-1} from a WFB culture obtained from Hopkins and left covered with polyethylene for two days. Two unrelated lines, one from the CU breeding program and one from Gansu Agricultural University, were used as checks.

Visual ratings of seedlings two weeks later (Table 1) suggested that 'PI 295843' was virtually immune and 'PI 299378' was susceptible to the pathogen. Lots of 'Congo' varied somewhat in resistance. Original breeders' seed from Charleston appeared to be the most resistant. 'Tri-X 313' also showed resistance. Numerous plants on the perimeters of the flats did not acquire the disease and were not included in the ratings.

Some selections were made from lots of the variety 'Congo' within flats where inoculations were obviously successful. These selections were grown to maturity in the greenhouse. Only one of these selections eventually developed a characteristic blotch on a fruit. Plants from seed recovered from resistant selections did not show WFB symptoms under similar greenhouse conditions.

"Escapes" were primarily plants from peat cups that became desiccated between waterings due to the wicking effect of an exposed portion of the peat cup. Older plants behaved in a similar fashion. Under our greenhouse conditions, only after foliage of the entire plant was kept wet every day did WFB lesions appear on fruit. These observations are consistent with all the reports of WFB symptoms being associated with high humidity or rainfall.

In summary, initial observations suggest that resistance does exist in the variety 'Congo' and in a triploid hybrid derived from 'Congo'. If these observations are correct, then triploid hybrids, and perhaps diploid hybrids derived from 'Congo' can be synthesized quickly to take advantage of this resistance. A long-term strategy would be to attempt to transfer the higher level of resistance from 'PI 295843' to commercially acceptable lines and varieties.

Table 1. Severity of Foliage Destruction of Watermelon Seedlings Inoculated with the WFB Pathogen

Identification	Severity of Disease
PI 295843	1 (least affected)
USDA WR Congo	1
USDA Congo	1
Coffey Congo	2
Hollar Congo	2
Shumway Congo	2
Harris Moran Congo	2
Tri-X 313	2
Coffey WR Congo	3
90.7 CU	3
Early GAU	3
Musser Congo	3
PI 299378	4 (most affected)

Literature Cited

1. Hopkins, D. L. 1989. Bacterial Fruit Blotch of Watermelon: A New Disease in the Eastern USA. Proc Cucurbitaceae 89:74-75.

2. Sowell, Grower, Jr. and N. W. Schaad. 1979. *Pseudomonas pseudoalcaligenes* subsp. Citrulli on Watermelon: Seed Transmission and Resistance of Plant Introductions. Plant Disease Reporter 63:437.

R309, A Selection of *Citrullus colocynthis* with Multigenic Resistance to *Colletotrichum lagenarium* race 2

S. L. Love and B. B. Rhodes
Assistant Professor, University of Idaho, Aberdeen ID 83210 and Professor, Clemson University, Clemson, SC 29632, respectively

Anthracnose, caused by *Colletotrichum lagenarium* (Pass.) Ell. and Halst., is a widespread disease of curcurbits (5). It is especially destructive on watermelon (*Citrullus lanatus* (Thunb.) Matsum and Nakai) in humid growing regions of the world. The discovery of anthracnose resistant watermelon germplasm and the nature of inheritance of anthracnose resistance has been reported (5,7,8,9). In 1980, Sowell et al. (7) screened 450 plant introductions of *C. colocynthis* for resistance to race 2 *C. lagenarium*. Suvanprakorn et al. (8) concluded that three of these, PI 271778, PI 326515 and PI 189225, had a single dominant gene for resistance.

Seven races of *C. lagenarium* have been described (2,3,4). Resistance to races 1, 3 and 7 have been incorporated into commercial watermelon cultivars. The predominant race of *C. lagenarium* in the Southeastern United States is now race 2. A shift in race prevalence from race 1 has made the use of expensive fungicides the only effective control measure (4).

The use of single gene resistance to eliminate the threat of anthracnose invites the same sequence of events, namely a rapid change in race prevalence, as occurred previously (1). This paper introduces the selection R309, a new source of resistance to race 2 *C. lagenarium* with multigenic resistance.

R309, the resistant line characterized in this study, is a selection of *C. colocynthis*. *Citrullus colocynthis* crosses easily with *C. lanatus* and only occasionally results in sterility or genetic abnormality. Two additional genotypes, the resistant PI 189225 and the susceptible cultivar New Hampshire Midget were included as parents. PI 189225 was included to provide direct comparison with previous work (8,9). The study was conducted in the field in 1983. Seed from, each parent, reciprocal F_1 , F_2 and BC generations, were planted in a randomized complete block with four replications.

An isolate of *C. lagenarium* was obtained from naturally infected watermelons at the Edisto Research and Education Center in Blackville, SC. Using hot differentials (4), the isolate was determined to be race 2. Methods used for culture of the fungus and spore production were adapted from Littrell and Epps (6). The plots were inoculated at sundown by spraying six-week old plants with a suspension of 20,000 conidia^{-1}. After five weeks, the mature vines were rated for resistance using a two-part rating system. The rating system combined the percent defoliation with the percent of remaining leaves showing lesions. This resulted in a zero to 200 scale (0=immune, 200=dead). Plants with a score of 70 or less were considered resistant; plants with scores greater than 70 were considered susceptible.

Chi-square analysis was used to determine if resistance was simply inherited. Orthogonal contrasts were also used to clarify the relationships among parents and F_1 populations.

In the inheritance study R309 demonstrated the same level of resistance for which it had been selected at the Edisto Research and Education Center. A mean rating score of 48.7 was recorded, which was slightly higher (more susceptible), than the score of 25.5 for PI 189225 and much lower than the 115.2 recorded for New Hampshire Midget. This level of resistance is more than adequate for commercial production of watermelons without the use of fungicides.

Chi-square analysis of progeny from PI 189225 x New Hampshire Midget confirmed the conclusion of Suvanprakorn et al. (8) that resistance from this source is due to a single dominant gene.

Chi-square analysis revealed a poor fit for a single dominant gene hypothesis in the progeny of R309 (Table 1). Neither did the data fit a two dominant gene model. From the observed ratios, it was concluded that the resistance of R309 is multigenic in nature. This type of resistance has not been available for breeding resistance to race 2 C. lagenarium and may prove valuable.

The actual inheritance of the resistance expressed by R309 has not been determined but orthogonal contrasts were used to provide more information (Table 2). Reciprocal F_1 (R309 x NHM) populations were not significantly different indicating that resistance is due to nuclear rather than cytoplasmic genes. The parent R309 and the F_1 (R309 x NHM) were not significantly different, but the F_1 was significantly more resistant than the midparent, indicating that resistance in R309 is due to complete dominance.

Due to the small difference in resistance between PI 189225 and R309, Chi-square analysis could not define the genetic relationship of the resistance fouind in each line. Comparison of progeny means from R309 x PI 189225 indicated that the level of resistance displayed by PI 189225 is higher and is also due to dominance (Table 3). The gene(s) that impart a higher level of resistance to PI 189225 is presumably the same dominant factors described previously (8).

In conclusion, R309 is a selection of C. colocynthis with intermediate resistance to race 2 C. lagenarium. The genes conditioning resistance in R309 are different from any previously reported. Multiple dominant genes are responsible for the resistance expressed by R309 and the use of an appropriate breeding scheme should make it possible to successfully exploit this new source. It is likely that this multigenic source of resistance will be more stable than single gene sources.

Table 1. Reaction of R309, 'New Hampshire Midget' (NHM) watermelon and progeny to inoculation with C. lagenarium race 2 in the field. Chi-square test for single gene resistance.

Poplulation	Total Plants	Resistant[a]	Susceptible	Expected ratio	x^2	p
NHM	49	3	46	0:49		
R309	9	9	0	9:0		
F_1	45	43	2	45:0		
F_2	69	24	45	3:1	14.880	.01
BC x NHM	34	6	18	1:1	0.059	20 -.50
BC x R309	10	6	4	10:0		

[a]All plants were rated on a 0 to 200 scale (0 = no symptoms; 200 = dead). Plants with a score from 0 to 70 were considered resistaant; those above 70 susceptible.

Table 2. Disease rating of R309, New Hampshire Midget (NHM), F_1 and midparent in the 1983 field study.

Populations	Rating[a]
NHM	115.2
R309	48.7
F_1	45.9
Midparent	82.0
Contrast	**Significance[b]**
NHM vs R309	**
R309 vs F_1	ns
F_1 vs midparent	**

[a]Plants were rated on a) to 200 scale (0 = no symptoms; 200 = dead). Plot means are given.

[b]Nonsignificant (ns) or significant at the 5% (*) or 1% (*) level. Comprisons were made using orthogonal contrasts.

Table 3. Disease rating of R309, PI 189225, F_1 and midparent in the 1983 field study.

Populations	Rating[a]
R309	53.3
PI 189225	33.0
F_1	34.0
Midparent	43.2
Contrast	**Significance[b]**
R309 vs PI 189225	**
PI 189225 vs F_1	ns
F_1	**

[a]Plants were rated on a 0 to 200 scale (0 = no symptoms, 200 = dead).

[b]Nonsignificant (ns) or significant at the 5% (*) or 1% (**) level. Comparisons were made using orthogonal contrasts.

Literature Cited

1. Crall, J. M. 1953. History and present status of watermelon improvement by breeding. Proc. Soil Sci. Soc. Florida 13:71-74.

2. Dutta, S. K., C. V. Hall and E. G. Heyne. 1960. Observations on the physiological races of Colletrotrichum lagenarium. Bot. Gaz. 121:163-170.

3. Goode, M. J. 1958. Physiological specialization in Colletotrichum lagenarium. Phytopathology 48:79-83.

4. Jenkins, S. F., Jr., N. N. Winstead and C. L. McCombs. 1964. Pathogenic comparisons of three new and four previously descibed races of Glomerella cinqulata var. orbiculare. Plant Dis. Rep. 48:619-622.

5. Layton, D. V. 1937. The parasitism of Colletotrichum lagenarium (Pass.) Ell and Halst. Iowa Agr. Exp. Stat. Bull. 223.

6. Littrell, R. H. and W. M. Epps. 1965. Standardization of a procedure for artificial inoculation of cucumbers with Colletotrichum lagenarium. Plant Dis. Rep. 49:649-653.

7. Sowell, G., Jr., B. B. Rhodes and J. D. Norton. 1980. New sources of resistance to watermelon anthracnose. J. Amer. Soc. Hort. Sci. 105:197-199.

8. Suvanprakorn, K. and J. D. Norton. 1980. Inheritance of resistance to race 2 anthracnose in watermelon. J. Amer. Soc. Hort. Sci. 105:862-865.

9. Winstead, N. N., M. J. Goode and W. S. Barham. 1959. Resistance in watermelon to Colletotrichum lagenarium races 1, 2, and 3. Plant Dis. Rep. 43:570-576.

1991

S-9 TECHNICAL COMMITTEE REPORT

AGENCY: Tennessee Agricultural Experiment Station
SUBMITTED BY: D. L. Coffey
ADDRESS: Department of Plant and Soil Science, University of Tennessee, P.O. Box 1071, Knoxville, Tennessee 37901-1071

* * * * *

ACCESSION USER: D. R. West

ADDRESS: Department of Plant and Soil Science, University of Tennessee, P.O. Box 1071, Knoxville, Tennessee 37901-1071

NATURE OF RESEARCH: Breeding and improvement of corn (Zea mays)

PROGRESS TO DATE: Lenha, a South American race of maize, was crossed to adapted populations Iowa Stiff Stalk Synthetic and Jellicorse. The hybrid population was backcrossed to each parent to form populations containing 0, 25, 50, 75, and 100% exotic germplasm. Yield trials are underway to evaluate the adapted x exotic populations for optimum level of exotic germplasm for improving the US maize germplasm base.

PUBLICATIONS: None.

CULTIVAR RELEASES: None.

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Seeds of Capsicum spp. were requested of and freely distributed by the Southern Regional PI Station to four persons in the private sector in the State of Tennessee. Seeds of PI 159235 baccatum var. pendulum, PI 238061 baccatum var. baccatum and PI 355811 pubescens were distributed to Shirley Luther and Larry Schweizer. Seeds of PI 159235 var. pendulum and PI 238061 var. baccatum were distributed to Gary M. Westley and D. A. Beasley.

Seeds of Caragana frutex PI 13812 were distributed by the North Central Regional PI Station to Edric C. Owen III.

Selected researchers at the University of Tennessee were supplied with listings and catalogs of germplasm available at Regional Plant Introduction Stations. They were also supplied with a current Directory of the National Plant Germplasm System.

1991
S-9 Technical Committee Report

AGENCY: The Texas Agricultural Experiment Station
SUBMITTED BY: Frank M. Hons
ADDRESS: Soil and Crop Sciences Department
Texas A&M University
College Station, Texas 77843-2474
PHONE: (409)845-4620
FAX#: (409)845-0456

****

ACCESSION USER: Michael C. Lenz
ADDRESS: Agrigenetics Company
P.O. Box 68
Highway 87 South
Tulia, TX 79088
NATURE OF RESEARCH: Sorghum (Sorghum bicolor L. Moench.)
PROGRESS TO DATE: PI 266965 is currently being used in breeding programs to increase greenbug biotype I resistance. PI 510988 and PI 511835 are being evaluated in hybrid combination for possible use as forage sorghum pollinators.
PUBLICATIONS: None reported.
CULTIVAR RELEASES: None reported.

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ACCESSION USER: David Picou
1845 S. Saunders
Aransas Pass, TX 78336
NATURE OF RESEARCH: Capsicum baccatum var. baccatum
Capsicum baccatum var. Pendulum
PROGRESS TO DATE: Baccatum variety (PI 238061) had less than 20% germination, while Pendulum (PI 159235) had almost 100% germination. Both seeds were released to home gardeners in the area.
PUBLICATIONS: None reported.
CULTIVAR RELEASES: None reported.

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ACCESSION USER: David D. Turner, Park Superintendent
ADDRESS: Caddoan Mounds State Historical Park
Rt. 2, Box 85-C
Alto, TX 75925
NATURE OF RESEARCH: Corn (Zea mays)
PROGRESS TO DATE: Four PI's (217463, 217405, 213742, 213740) of traditional Native American corns were to be planted and used as an interpretive program at the Park. Due to funding and personnel limitations, the seeds were not planted and currently are in cold storage.
PUBLICATIONS: None reported.
CULTIVAR RELEASES: None reported.

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ACCESSION USER: Patrick Conner
ADDRESS: Texas A&I University
P.O. Box 218
Kingsville, TX 78363

NATURE OF RESEARCH: Vetiver grass (Vetivera zizanoides) and lablab bean (Dilichos purpureus)

PROGRESS TO DATE: Four accessions of vetiver grass (PI #'s 196257, 213903, 271633, 302300 A7026) from India and one (9054943) from Brooksville, FL were planted in March 1990. Performance of all accessions has been excellent. Plants will be separated in an attempt to increase total numbers of plants. Interest has been expressed in using these plants for sand dune stabilization and each accession will be planted this fall in an active dune test plot on the Kenedy Ranch. Fifty-seven PI's of lablab beans from various countries were planted this spring for seed increase. A performance ranking will also be conducted.

PUBLICATIONS: None reported.

CULTIVAR RELEASES: None reported.

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ACCESSION USER: G. Ray Smith
ADDRESS: Texas A&M University Agricultural Research and Extension Center
P.O. Box E
Overton, TX 75684

NATURE OF RESEARCH: Trifolium, Vigna, and Alysicarpus germplasm

PROGRESS TO DATE: Traveled to Bulgaria with K.H. Quesenberry (Univ. of FL.) and collected seed of 42 different Trifolium species. Seed increases of 9 T. hirtum and 15 T. vesiculosum introductions from Bulgaria were made at Overton in 1990-91. Two hundred and thirty-one cowpea (V. unguiculata) PI's were evaluated in summer 1990 for forage/hay potential. Seed were harvested from 82 of the better lines. Thirty-three rose clover (T. hirtum) and 227 subterranean clover (T. subterraneum) PI's were evaluated for estrogenic isoflavones. Eight PI's of Alysicarpus vaginalis, 6 of A. rugosus, and 1 of A. ovalifolius were evaluated for resistance to root-knot mematodes (Meloidogyne hapla and M. incognita race 3.

PUBLICATIONS: Gildersleeve, Rhonda R., G.R. Smith, Indre J. Pemberton, and C.L. Gilbert. 1991. Detection of isoflavones in seedling subterranean clover. Crop Sci. (accepted).

Gildersleeve, Rhonda R., G.R. Smith, Indre J. Pemberton, and C.L. Gilbert. 1991. Screening rose and subterranean clover germplasm for isoflavones. Crop Sci. (accepted).

Mowrey, D.P., S.P. Hart, and G.R. Smith. 1990. Evaluation of cold tolerant rose clover. Proceedings of the Eleventh Trifolium Conference.

CULTIVAR RELEASES: 'Overton R18' rose clover has been approved by the TX Agric. Exp. Stn. as a variety release cooperative with SCS. This variety is a single plant selection from PI 311483.

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ACCESSION USER: Harold Coombs
ADDRESS: Route 1, Box 94C
Karnes City, TX 78118
NATURE OF RESEARCH: Guar (Cyamopsis Tetragonoloba L. Taub.)
PROGRESS TO DATE: Eight accessions of guar were sent to a "homeland" in South Africa and were selected for early maturity, resistance to disease and weathering, and high yield potential. These introductions, if successful, will be used in mining, paper, and food industries.
PUBLICATIONS: None reported.
CULTIVAR RELEASES: None reported.

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ACCESSION USER: Charles G. Cook
ADDRESS: USDA Conservation and Production Systems Research Unit
2413 East Highway 83
Weslaco, TX 78596
NATURE OF RESEARCH: Hibiscus cannabinus and H. sabdariffa
PROGRESS TO DATE: Fifteen H. cannabinus and 2 H. sabdariffa PI's show promise for production and/or genetic traits for the Rio Grande Valley of Texas.
PUBLICATIONS: Cook, C.G., and M.V. Hickman. 1990. Response of kenaf and sunn crotalaria to the presence of Phymatotrichopsis omnivora. AAIC-El Guayulero 12:4-9.

Cook, C.G., 1991. Evaluation of ten kenaf genotypes for resistance to charcoal rot. (Abstr.) Proceedings, International Kenaf Association Conference 3:(in press).

Cook, C.G. and M.V. Hickman. 1991. 1990 Kenaf variety evaluations in the Lower Rio Grande Valley of Texas. (Abstr.) Proceedings, International Kenaf Association Conference 3:(in press).

Bhangoo, M.S., T.A. Jacobson, and C.G. Cook. 1991. Regional Uniform Kenaf Variety Trial in the San Joaquin Valley, California (1990). (Abstr.) Proceedings, International Kenaf Association Conference 3:(in press).
CULTIVAR RELEASES: None reported.

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ACCESSION USER: Charles E. Simpson
ADDRESS: Texas A&M University Agricultural Research
and Extension Center
Rt. 2, Box 00
Stephenville, TX 76401
NATURE OF RESEARCH: Peanut (Arachis sp.)
PROGRESS TO DATE: Materials have been obtained through collection and plant introductions to be used in a peanut breeding program. Thirty-two accessions of A. hypogaea L., 6 accessions of A. batizocoi, Krap. et Greg., 2 accessions of A. monticola, 1 accession of A. pusilla, and 20 accessions of other A. spp. currently show promise.
PUBLICATIONS: Smith, O.D., S.M. Aguirre, T.E. Boswell, W.J. Grichar, H.A. Melouk, and C.E. Simpson. 1990. Registration of TxAG-4 and TxAG-5 Peanut germplasms. Crop Science 30:429.

Nelson, S.C., J.L. Starr, and C.E. Simpson. 1990. Expression of resistance to Meloidogyne arenaria in Arachis batizocoi and A. cardenasii. Journal of Nematology 22:423-425.

CULTIVAR RELEASES: Tamspan 90 peanut cultivar released in 1990 having PI 161317 and PI 221057 in its pedigree.

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ACCESSION USER: Kay S. Porter
ADDRESS: Pioneer Hi-Bred International, Inc.
Box 1506
Plainview, TX 79073-1506
NATURE OF RESEARCH: Sorghum (Sorghum bicolor L. Moench)
PROGRESS TO DATE: Pioneer evaluates all available sorghum PI's. Conversion of promising lines is occurring for use in hybrid combinations. Forty-one accessions look promising and are undergoing further evaluation.
PUBLICATIONS: None reported.
CULTIVAR RELEASES: None reported.

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ACCESSION USER: Robert S. Mowery
ADDRESS: 3554 Valley Ridge
Dallas, TX 75220
NATURE OF RESEARCH: Capsicum spp.
PROGRESS TO DATE: Capsicum pubescens (PI 355811) from Ecuador did not germinate. C. baccatum var. baccatum (PI 238061) from Bolivia is healthy and well leafed as is C. baccatum var. Pendulum (PI 159235) from the U.S. These plants will be further evaluated for vegetative and reproductive growth.
PUBLICATIONS: None reported.
CULTIVAR RELEASES: None reported.

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ACCESSION USER: W.R. Ocumpaugh
ADDRESS: Texas A&M University Agricultural Research Station
HCR-2
Box 43-C
Beeville, TX 78102-9410
NATURE OF RESEARCH: Rhizoma peanut (Arachis glabrata Benth.)
PROGRESS TO DATE: Five accessions (262819, C-9618, 262821, 262828, 262820) have been identified which have potential for forage production and 2 accessions (338261, 338296) show turf/ground cover potential.
PUBLICATIONS: Reed, R.L. and W.R. Ocumpaugh. 1991. Screening rhizoma peanut for adaptation to calcareous soils. J. Plant Nutr. 14:(2)(In press).
CULTIVAR RELEASES: None reported

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ACCESSION USER: A. Bruce Maunder
ADDRESS: Dekalb Plant Genetics
Rt. 2, Box 56
Lubbock, TX 79415
NATURE OF RESEARCH: Sorghum (Sorghum bicolor L. Moench)

PROGRESS TO DATE: Accession IS 2238 is being used for resistance to biotype I greenbug and the hybrid FS-2 (GPR168xSC170-6-17)1-1 shows tolerance to high Al saturation and low pH.
PUBLICATIONS: Maunder, A.B. 1991. Identification of useful germplasm for practical plant breeding programs. In Proc. of the Plant Breeding for the 90's Symposium, (ed.) T. Stalker. North Carolina State University Press (In press).
CULTIVAR RELEASES: Dekalb FS-2.

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ACCESSION USER: M.A. Hussey and E.C. Bashaw
ADDRESS: Soil & Crop Sciences Department
Texas A&M University
College Station, TX 77843-2474
NATURE OF RESEARCH: Apomictic Grasses
PROGRESS TO DATE: Buffelgrass (Cenchrus ciliaris) 409164: This accession was used as the male parent in a cross with sexual buffelgrass TAM-B1S to produce an experimental hybrid designated T-1754. This hybrid combines excellent vegetative vigor with good seed production and an extensive rhizome system. T-1754 is currently being evaluated in Texas, Mexico, and South America for potential release as a cultivar.
409287 & 409338: Currently being evaluated for potential release as ornamental grasses. 409704: Pentaploid accession (2N=45) which has been extensively evaluated throughout Texas and Mexico for release as either a germplasm or a cultivar. This PI has the potential to reduce the risk (winter damage) associated with growing buffelgrass in south central Texas.
Flaccidgrass (Pennisetum flaccidum) - This species should receive high priority for future plant collections. 220606 (Carostan): This facultative apomict has been successfully used as a female parent in crosses with P. mezianum. Hybrid progeny which have resulted from the fertilization of unreduced eggs, have good vegetative vigor, excellent winterhardiness, and superior seed production when compared with 'Carostan'. Selected hybrids are currently being evaluated throughout Texas, Mexico, and the southern United States.
315868: This facultative apomict has been successfully used as a female parent in crosses with P. mezianum. Hybrid progeny which have resulted from the fertilization of unreduced eggs have good vegetative vigor, excellent winterhardiness and seed production. Selected hybrids are currently being evaluated throughout Texas, Mexico, and the Southern United States.
91S000001: Sexual genotype derived from PI 271602 (a facultative apomict). Offers promise as germplasm for use in genetic studies and the improvement of P. flaccidum.

Pennisetum mezianum 214061: Only accession of this species currently in plant introduction system. It has excellent pollen quality and appears to be an excellent male parent for crosses within Cenchrus - Pennisetum agamic complex. This species should receive top priority for future plant collections.
Pennisetum orientale - This species should receive high priority for future plant collections. 269961: This facultative apomict is currently being evaluated for potential release as an ornamental grass.

PUBLICATIONS:

Bashaw, E.C. and K.W. Hignight. 1990. Gene transfer in apomictic buffelgrass through fertilization of an unreduced egg. Crop Sci. 30:571-575.

Bashaw, E.C. and W.W. Hanna. 1990. Apomictic reproduction pp. 100-130. In G.P. Chapman, editor. Reproductive versatility in the Grasses. Cambridge University Press. Cambridge, Great Britain.

Craig, J. and K.W. Hignight. 1991. Control of ergot in buffelgrass with Triadimefon. Plant Disease. 75:627-629.

Hignight, K.W., M.A. Hussey, and E.C. Bashaw. 1991. Cytological and morphological diversity in apomictic buffelgrass. Bot. Gaz. (In press).

Hussey, M.A. and E.C. Bashaw. 1990. Buffelgrass germplasm for central Tamaulipas. In: Proceedings of Conferencia International De Ganaderia Tropical. Universidad Autonoma de Tamaulipas, Cd. Victoria, Mexico. pp. 12-15.

Hussey, M.A., E.C. Bashaw, K.W. Hignight, and M.L. Dahmer. 1991. Influence of photoperiod on the expression of sexuality in facultative accessions of buffelgrass. Euphytica (In press).

CULTIVAR RELEASES: None reported.

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ACCESSION USER: Frank M. Hons
ADDRESS: Texas A&M University
Soil & Crop Sciences Department
College Station, TX 77843-2474

NATURE OF RESEARCH: New and alternative crops

PROGRESS TO DATE: Twenty pigeonpea (Cajanus cajan L.) introductions from ICRISAT are being evaluated for grain yield, while a diverse group of 5 introductions are being evaluated for forage yield and quality based on clipping frequency. Sixteen chickpea (Cicer arietinum L.) introductions are being evaluated for grain yield and iron deficiency. Three introductions appear to be very iron deficiency susceptible. Six of the 24 sesame (Sesamum indicum L.) introductions screened in the field for Phytophthora parasitica resistance last year are undergoing further field evaluation.

PUBLICATIONS:

McBee, G.G., and C.E. Bolton. 1990. Pigeonpea evaluation trials, 1988, College Station, TX. Progress Rept. TX. Agric. Exp. Stn.

CULTIVAR RELEASES: None reported.

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ACCESSION USER:	Richard H. McMaster 8607 Bell Mountain Drive Austin, TX 78730-2833
NATURE OF RESEARCH:	Capsicum spp.
PROGRESS TO DATE:	C. baccatum var. Pendulum (PI 159235, origin - U.S.) had excellent germination, but leaves and stems were not as well formed as plants grown from commercially available seeds. C. baccatum var. baccatum (PI 238061, origin-Bolivia) only had 8% germination, but its leaves and stems were better formed than the Pendulum variety. C. pubescens (PI 355811, origin-Ecuador) had 0% germination.
PUBLICATIONS:	None reported.
CULTIVAR RELEASES:	None reported.

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1991

S-9 TECHNICAL COMMITTEE REPORT

Agency: Virginia Agricultural Experiment Station
Submitted by: Richard E. Veilleux
Address: Department of Horticulture, VPI & SU, Blacksburg, VA 24061

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Accession User: M. P. Timko and E. Buckler

Address: Dept. of Biology
University of Virginia
Charlottesville, VA 22901

Nature of Research: Accessions (100) of *Zea mays* representing both primitive and cultivated forms were acquired to analyze variation in intergenic spacer regions to try to track progress toward selection of cultivated forms by molecular analysis.

Progress to Date: Intergenic sequences have been analyzed, some have been cloned, and variation has been demonstrated.

Publications: none

Cultivar Releases: none

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Accession User: A. Esen and K. Hilu

Address: Biology Department
Virginia Polytechnic Institute and State University
Blacksburg, VA 24061

Nature of Research: Studies of evolutionary relationships among grass species.

Progress to Date: Species in the Aristideae and Arundinoideae subfamilies of Poaceae have been characterized by prolamine analysis.

Publications:

Esen, A. and K. Hilu. 1991. Electrophoretic and immunological studies of prolamines in the Poaceae: II. Phylogenetic affinities of the Aristideae. Taxon 40:5-17.

Hilu, K. W. and A. Esen. 1990. Prolamines in systematics of Poaceae subfamily Arundinoideae. Plant Systematics and Evolution 173:57-70.

Cultivar Releases: none

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Accession User: John Reynolds

Address: Scientific Testing Associates
Topping, VA 23169

Nature of Research: Lectins were extracted from various bean accessions and used to try to sex exotic birds by agglutination reaction.

Progress to Date: The procedure has not yet been successful.

Publications: none

Cultivar Releases: none

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Accession User: G. E. Welbaum

Address: Department of Horticulture
Virginia Polytechnic Institute and State University
Blacksburg, VA 24061-0327

Nature of research: Seed physiology - study of seed dormancy.

Progress to Date: Seed has been increased. A genotype has been identified that has greater seed dormancy than commercial cultivars.

Publications: none

Cultivar Releases: none

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Accession User: Wondi Mersie

Address: Virginia State University
Petersburg, VA 23803

Nature of Research. Evaluation of bean plant introductions (PI's) for ozone insensitivity.

Progress to Date: Bean seedlings were grown in an environmentally controlled room and exposed to ozone 21 days after planting. Seedlings had fully developed first trifoliate leaves and were exposed to O_3 at 0.6 μL L^{-1} for two hours in an exposure chamber. One plant from each line was left unexposed and 'Bush Blue Lake' a cultivar sensitive to ozone, was used for comparison of each 20 PI exposure group over time. In 1991, 472 accessions were evaluated for their insensitivity to ozone and 28 were found insensitive ($\leq$ 35% average plant injury).

Publications: none

Cultivar Releases: none

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REPORT OF THE
NATIONAL GERMPLASM RESOURCES LABORATORY
TO THE
REGIONAL TECHNICAL COMMITTEES ON PLANT GERMPLASM

June 1991

'As aromatic plants bestow
No spicy fragrance while they grow;
But crush'd, or trodden to the ground
Diffuse their balmy sweets around.'
"The Captivity"

LABORATORY LEADER OFFICE
Allan K. Stoner

In July 1990 the former Germplasm Services and National Plant Germplasm Quarantine Laboratories at the Beltsville Agricultural Research Center were merged to form the National Germplasm Resources Laboratory. This merger placed the Plant Introduction Office, the Plant Exploration Office, the Germplasm Resources Information Network Database Management Unit, the National Germplasm Quarantine Office, the ecogeographic research unit and the facilitation of Crop Advisory committees in a single management unit. As a result of the merger we have an opportunity to better coordinate all of the above activities that must work together to support the entire National Plant Germplasm System (NPGS).

The individual reports presented below describe the scope of our Laboratory's activities during the past year. It is our goal during the next year to continue to improve our support of the NPGS and the germplasm users. Specifically we hope to complete the purchase of a new GRIN computer and operating system and begin the rewriting of all GRIN software; improve our ability to more rapidly detect pathogens in quarantined germplasm and to conduct therapy to eliminate pathogens from infected material; more rapidly respond to requests for germplasm or information about germplasm from NPGS and other sources; and better focus the use of our limited resources for plant exploration to fill the highest priority needs.

Crop Advisory Committees — Mark A. Bohning

The National Plant Germplasm System (NPGS) is currently supported by 40 Crop Advisory Committees (CAC) which provide crop specific advice on plant genetic resources. The CAC's are involved in numerous activities, including 1) compiling lists of germplasm sources in the U.S. and worldwide (both collected and wild); 2) determining the needs for additional germplasm and developing proposals to obtain material either through exchange or exploration; 3) advising germplasm curators on maintenance and

increase techniques, etc.; 4) determining evaluation and enhancement priorities for their crops and developing proposals to accomplish these tasks; 5) working with the GRIN DBMU and germplasm curators to ensure that evaluation data entered into the database is accurate and standardized; 6) developing special reports for the ARS National Program Staff (NPS), the National Plant Germplasm Committee (NPGC), etc. Several committees are developing Core Collections for their crops. Once established, the Core Collection will become the focus for future evaluation activities and be used by the Curators to respond to general requests for germplasm. Allan Stoner and Mark Bohning of the NGRL continue to serve as a link between the CAC's and other components of the NPGS and to work with the CAC's to facilitate their activities.

GERMPLASM RESOURCES INFORMATION NETWORK (GRIN)

Jimmie D. Mowder and Staff

Data Entered into GRIN:

Major loads of characterization/evaluation data included 146,000 small grains records, 5,000 sugarcane records, 4,500 tobacco records and 1,800 lettuce records.

Verification of important GRIN tables and data fields: country table, collector names, donor countries, Crop Science Registrations and Plant Variety Protection information.

Provide daily assistance to 22 sites.

GRIN Training Sessions:

Training sessions were held in Beltsville for the National Arboretum, National Seed Storage Lab and PGQO, Glenn Dale.

Training was held at the following sites: NE-9/CR-GEN, and National Small Grains Collection.

GRIN Demonstrations:

ASA Meeting in San Antonio, TX
ASHS Meeting in Tucson, AZ
American Society of Seed Technologists
Ameriacan Oil Chemists Society
Caribbean Food Crops Society
National Oat Workers Conference
North American Alfalfa Improvement Conference
Beltwide Cotton Conference

Database Activities:

Developed software to print CSR certificates

Generated the requirements and test specifications for the purchase of a new germplasm computer based on the industry standard UNIX operating system, C language and relational DBMS.

Completed the solicitation and evaluation of the proposals for the computer purchase. Target data for installation is early 1992.

Personnel:

Gorm Emberland joined the DBMU on January 27, 1991 as a senior programmer/analyst. Gorm is currently involved with the design and development of the "Quarantine Information System". The QIS tracking system will serve to automate and centralize quarantine activicty for the Plant Germplasm Quarantine Office (PGQO). The QIS tracking system will be housed and supported on a Novell Local Area Network (LAN) and will support remote access via a communications server. Gorm has also provided support to the Plant Introduction Office (PIO) by developing an in-house tracking system for received material and is currently working on a system that will track shipment of material to requestors. He will also be actively involved in the design and development of the new GRIN (GRIN 3-0).

Hardware:

Installed and are ready to operate an Internet connection to GRIN.

Converted Telenet to X.25 standards, effectively increasing the number of user ports from 17 to 40.

Began the conversion to FTS2000 with preliminary analysis of equipment needs.

A VHS (video tape) backup system was purchased to provide faster and more reliable system saves.

Visitors:

Dr. Sigeyuki Sendo, Hokkaido PGRC, Japan

Dr. Ed Bird visited the Soviet Union and spent several weeks analyzing the emerging Soviet Germplasm Information System. Preliminary evaluations and recommendations were completed, paving the way for further collaboration.

PLANT INTRODUCTION OFFICE (PIO)
George A. White & Staff

Personnel - Several staff changes occurred during 1990 and 1991. Grace Garner, computer assistant, retired. David Manning, Shipping Assistant, recently accepted a position with APHIS. Debbie Fulcher, clerk typist, joined our office staff on April 22, 1991. Dan Harmon has assumed the Shipping Assistant responsibilities.

Exchanges - During 1990, the number of items sent to other countries increased to 43,350, up from 1989. One hundred and one countries received plant materials via 1,358 shipments. Items consisted of 53% cereals, 18% oilseeds, 11% vegetables, and 6% forage. We received 196 shipments of 5,817 items that were sent domestically to curators and individual scientists.

If you request plant materials from other countries, feel free to use the flow channel through the Beltsville Quarantine Center. However, use the quarantine center address, not Dr. White's office address. The proper address is:

USDA Plant Germplasm Quarantine Center
Bldg. 320, BARC-East
Beltsville, MD 20705
Attn: D. Harmon/G. White

We do request that export shipments be sent to PIO so that "order processing" can be accomplished at our main offices. Materials are then taken to Bldg. 320 for inspection, issuance of phytosanitary certificates, and final preparation.

Primarily through the efforts of Vicki Binstock, all of our shipments for 1991 have been handled under order processing on GRIN.

Quarantine Alert - More stringent import requirements of foreign countries have caused many more shipments passing through the Plant Germplasm Quarantine Center to be held up pending requests for import permits. Much of the problems we encounter are caused by the fact that many of the curators/researchers providing germplasm still are not having their fields inspected for the presence of disease organisms on the parent plants. Staff of the Animal and Plant Health Inspection Service (APHIS) offices in your state or local area will periodically inspect the fields, free of charge, and will list any diseases found during the inspections on an official document. Should an importing country's quarantine regulations specify that their shipment be certified free from a specific disease, the sites will be able to provide a copy of the inspection report as proof of the inspection and disease freedom.

While we realize that current seed stocks will not be affected by these field inspections, eventually these stocks will be depleted and have to be increased.

Some of the curators/researchers have been fortunate enough to have local university pathologists check their fields for specific diseases and have provided this office with disease-free statements when possible. Recent discussions with our APHIS inspectors have revealed that in the near future new APHIS standards will require that ONLY officially-documented APHIS inspections will be acceptable proof of disease-freedom. When this change goes into effect even fewer shipments will be cleared for export unless the field inspections are begun and continued on a regular basis.

PIO sent out a memo on February 6, 1991 that detailed the crops and countries for which import regulations cause difficulty in exporting plant materials.

Plant and Seed Materials Project (AID-funded) - During 1990, 95 shipments of 734 accessions were made to 35 countries with the main recipients being Ecuador, Nepal, and Haiti. Forages (66.2%), cereals (13.0%), and vegetables (7.85%) accounted for most of the accessions. Our records reflect developed countries receiving plant materials through this project; these items were requested from us by AID Ag-Forestry Unit.

In 1991 through May 22, 56 shipments of 437 accessions were made to 22 countries. We have pending efforts with Haiti, Dominican Republic, Ecuador, Bolivia, Madagascar (waiting for import permits), and Pakistan. Dr. White, the project leader visited Haiti and Dominican Republic during September 1990. He plans to participate in the XII International Congress of Plant Protection, Rio de Janeiro, Brazil and visit cooperating sites in Bolivia and Ecuador during August. Quarantine restrictions pose the major impediment to rapid dissemination of plant materials to developing countries.

An article entitled "The Plant Introduction Office: Supplying Essential Plant Biodiversity" will be appearing in the next STAR (AID) publication.

Information about all distributions of plant materials under this project is automated through order processing on the GRIN system. This enables rapid movement of materials to recipients and expedites generation of reports.

During 1981-1990, a total of 16,629 items were provided under the Plant and Seed Materials Project. The average annual number of shipments and countries was 152 and 44 respectively.

Future plans include automating information on reliable sources of plant materials for AID mission countries that are not readily

available via NPGS or U.S. Scientists. Interactions with AID missions in Bolivia & Ecuador are expected to follow project leaders trip in August. Cooperation with missions in Haiti, Pakistan, and Madagascar will continue at a high level throughout 1991.

Documentation of PI's - Becky Norris, Germplasm Specialist, has assumed the position of coordinating and documenting PI number assignment. A high priority has been given to assigning PI numbers in a timely manner. Mrs. Norris has many years experience with documentation of passport data and assignment of plant introduction numbers using the GRIN system.

During 1990, 9,704 PI numbers were assigned. Crop Science Registration (CSR) and Plant Variety Protection (PVP) germplasm is now routinely being documented and assigned PI numbers. During 1990, 310 PVPs were assigned PI numbers and the number of CSRs rose to 483 representing 33 out of 54 crop groups. The CSR categories breakdown as follows:

No. of CV - 143
No. of GP - 273
No. of PL - 43
No. of GS - 24

A barcode program was implemented in 1990. A barcode label with the assigned PI number is now placed on all seed envelopes prior to their shipment to the base or working collections in order to facilitate handling and minimize errors.

Several large collections at NSSL and other sites were assigned PI numbers in 1990 and early 1991. Examples of field collections and these large collections are listed below:

Grasses, etc. from USSR donated by K. H. Asay
Sugarbeets from France donated by D. Doney
Misc. vegetables from Bolivia donated by D. E. Williams
Forage-legumes from various countries donated by A. E. Kretschmer
Blueberries and brambles from Ecuador donated by J. R. Ballington
Rye collection at NSGC (331 PIs)
Allium, lettuce, and beans at NSSL (1,451 PIs)
Soybean collection at SOY-N (1,059 PIs)
Solanum at IR-1 (322 PIs)
Pyrus at CR-COR (1,120)
Citrus Variety Collection at Riverside, CA (715)

The Plant Inventory No. 199 was submitted for publication in April 1990. The editing process was greatly streamlined from that used previously.

PLANT EXPLORATION OFFICE

Calvin R. Sperling

The Plant Exploration Office (PEO) continues to provide expertise in planning, coordinating, and executing USDA/ARS supported plant explorations. A list of explorations undertaken in FY1990 and undertaken or approved for FY1991 is presented below. Collaborative projects with the USDA Office of International Cooperation and Development continued to increase. This allows PEO and the National Plant Germplasm System (NPGS) to participate in more collecting expeditions through shared funding arrangements than would otherwise be possible. Restrictions on international travel necessitated the delay or cancellation of several trips that had been planned for this year. In continuing efforts to revise exploration priorities for the NPGS, PEO has compared listings of NPGS holdings from several countries with germplasm recorded from these countries to effectively target collection of underrepresented species.

A US/AID-funded PEO project in collaboration with the Nature Conservancy, Universidad Catolica in Quito, Ecuador and Ecuador's national plant germplasm program is well underway. Dr. Sperling went to Ecuador this year to inventory research sites for use in this study of how in situ preservation in nature preserves can complement ex situ preservation of wild crop relatives. PEO installed and delivered two Dell 386SX computers to Ecuador to be used in data management for this project. While in Ecuador, Dr. Sperling also presented lectures at a one week training course for Latin Americans on collection of genetic resources and conducted field training on how to collect wild and cultivated species at a research site in northern Ecuador.

More contacts are being developed with national and international conservation organizations to coordinate efforts where the goals of conserving biodiversity overlap the NPGS goals of conserving wild crop relatives. The use of databases from such organizations in conjunction with existing NPGS databases was explored as an aid to the coordination of efforts. Mapping capabilities to visually represent information in these databases were expanded.

Dr. Sperling gave 10 presentations this year on plant exploration and conserving plant genetic resources. These presentations were given to audiences of professionals and non-professionals with a wide range of interests and expertise.

PEO is anticipating that a postdoctoral botanist will be joining the office in the summer of 1991. This person will assess the potential impact of the global loss of biodiversity on an important U.S. crop.

USDA/ARS Plant Explorations Undertaken in FY1990

Plant Exploration	Country	Principal Contacts
Cuphea spp.	Brazil	W. Roath, G. Christenson (observers)
Fragaria chiloensis	Chile	J. Cameron, C. Shanks, T. Sjulin
Solanum spp.	Argentina, Chile	D. Spooner, A. Clausen, A. Contreras
Food and forage legumes	PRC	OICD/F. Muehlbauer, W. Kaiser, C. Liu, H. Blain
Medicago spp.	PRC	OICD/T. Campbell, L. Teuber
Phaseolus spp.	Colombia,Ecuador	P. Gepts, D. Debouck
Trifolium spp.	Bulgaria	K. Quesenberry, G. Smith
Fruits and nuts	USSR	C. Sperling, M. Thompson, D. Ramming
Arachis spp.	Bolivia	D. Williams
Mangifera spp.	Malaysia	R. Schnell, R. Knight, F. Zee
Forage grasses and legumes	PRC	M. Rumbaugh, D. Johnson
Beta spp.	USSR	G. Seiler
Juglans regia	PRC	OICD/G. McGranahan
Carya spp.	PRC, Vietnam	L. Grauke, B. Wood, J. Payne
Vaccinium and Rubus spp.	Ecuador	J. Ballington, J. Luteyn, M. Thompson

USDA/ARS Plant Explorations Planned/Undertaken in FY1991

Plant Exploration	Country	Principal Contacts
Solanum spp.	Ecuador	D. Spooner, R. Castillo T.
Gossypium spp.	NW Mexico	A. Percival, J. Stewart, A. Jasso
Food legumes	USSR	C. Sperling
Cuphea spp.	Mexico	W. Roath
Arachis spp.	Brazil	R. Pittman
Solanum spp.	Mexico	D. Spooner, L. Villarreal de Puga

BIODIVERSITY

James A. Duke

Jim duke collected exotic germplasm in Ecuador and Peru, the latter trip being his first exposure to ecotourism as a means of helping save tropical forests and their biodiversity. With about twenty other lecturers, Duke lectured on various aspects of tropical economic botany, to classes in the rain forest. On hundred forty people paid $1,300 each for a roundtrip Miami-Iquitos, Explorama Camp (4 hours down the Amazon from Iquitos) where they were well fed, housed, and instructed. Many returned with increased anxiety about the fragility of tropical biodiversity. From this one week trip, $60,000 returned to the forest. Plans are to develop a Field Guide for Amazonian Medicinals, in collaboration with a publisher, all profits to revert to the rain forest.

Jim expanded his database on phytochemical diversity, to nearly 750 species, for which he has quantitative data on the phytochemicals therein. Additionally, he compared his data base with the famed NAPRALERT data base (U. Chicago), merging data from both for the NCI's Designer Food Program. This final tabulation submitted to NCI in May, 1991, was a 200-page report detailing the chemical constitution of the 50 species the NCI deems most important in its new cancer-preventive program.

An earlier database on ecological amplitudes of economic plants was dusted off for possible application in crop diversification programs (alternative crops) in Latin America, with predictive potential in various global warming projections. The ecosystematic database can be used to show which crops will be better adapted to a globally-warmed region, under its new climatic parameters, other things being equal.

QUARANTINE (GLENN DALE/Bldg 580)

Bruce Parliman

Rice Quarantine Processing - The operations manual for rice quarantine processing has been updated. Previously, accessions were planted in a spring or fall cycle. Now new accessions are placed in greenhouses as space becomes available during any month of the year. This continuous processing protocol should allow a more efficient use of greenhouse space and thereby increase processing potential.

Quarantine procedures for identification, processing, and labelling/flagging of noxious weed rices (red rice) have been revised. Until a better system is defined, 50 seed of each accession are dehulled and evaluated for red bran color. Accessions containing seed with red bran are being assumed to be noxious weeds, are flagged, are not grown out, but are held in quarantine storage until recipients/CAC members can evaluate each suspect accession. A rapid and accurate procedure for identification of noxious weed rice species is needed and several suggestions for solutions are being evaluated.

No backlog exists for quarantine processing new rice accessions. Two hundred twenty old non-quarantine processed accessions were identified at Aberdeen and now are being quarantine processed at PGCO as resources permit. Passport and range data collection/entry procedures for quarantined rice being shipped directly to permit-holding scientists in the U.S. are proceeding successfully. Recently, the technician in charge of processing rice resigned but procedures to fill this vacancy have been implemented.

Development and Use of New Orchard Site - The National Plant Germplasm Quarantine Center orchard site is being readied for planting in the spring of 1992. Drip irrigation has been constructed on one third of the land and funding has been allocated

to construct drip irrigation for the remaining land. One third of the land has been fenced against deer and a proposal for fencing the remaining land has been made. Procedures to develop the soil with cover crops and to develop permanent sod boundary areas are being implemented now. It is expected that some Glenn Dale orchard plots will remain in use for at least the next 3 to 5 years.

Tissue Culture - The tissue culture laboratory is operational. Plans to adapt tissue culture procedures to Solanum and Ipomoea quarantine pathogen testing procedures have been developed and are ready for full implementation. Tissue culture procedures already are being used to attempt to rescue and secure quarantined accessions in poor/threatened condition. An operations manual has been drafted.

Information System - Quarantine data entry onto GRIN is currently being pursued on three levels. Since June 1990, a total of 962 Prunus accessions and 325 Rice accessions were loaded onto GRIN by the Information System (IS) team. The IS team is currently filling in gaps in the Glenn Dale GRIN records by alphabetically loading missing data for genera of accessions received since 1983. Since January, data for 957 accessions, 362 supporting ranges and 313 geographical supplement records have been loaded. As of November 1990, the IS technician assumed responsibility for entering all data onto GRIN for incoming quarantined accessions destined for Glenn Dale and for selected rice accessions destined for quarantine by permit holders. This has significantly reduced the lag time required for receiving incoming quarantined germplasm, and has resulted in more original (received with the shipment) data being made available to the GRIN. To date data for 227 rice accessions (of which at least 163 were passed to other permit holders after data entry), 22 Solanum, 21 small fruits, 10 Prunus, 8 Pyrus, 2 Malus, and 3 sugarcane accessions have been entered.

The IS team has implemented in-house bar-code production for use on quarantined germplasm. The Zebra 130 Thermal Transfer printer is being used for bar-code production to support inventory tracking of quarantined plants both in field and greenhouse. "Order processing" also was implemented for the Office. An in-house Lan-based information system continues to be developed. This system will allow access by all support staff to existing crop databases, will streamline data exchange with GRIN and will provide technicians with easy-access system for report generation.

QUARANTINE (GLENN DALE/Bldg 580)

Howard E. Waterworth

Stonefruits - Approximately 125 new accessions of stone fruits were received during the past year; 110 of these the result of a Prunus collection trip to the USSR in July 1990. Approximately 475 accessions of Prunus are in various stages on being tested for the 25 or so viruses that may be present in foreign germplasm. Another

175 or so have not yet begun testing. Prunus is the only genus in which we have a backlog so a special initiative is underway to move Prunus through quarantine. Accordingly more than 2,000 tests were performed this past year on about 200 accessions with plans to repeat this level of activity again next year. A Post Doc was hired to develop improved virus detection techniques, especially for the plum pox virus. Tests were completed on 45 accessions and they were released from quarantine. Germplasm of 75 accessions was sent to some 25 stone fruit specialists in April. We anticipate that another 50 accessions will be eligible for release this summer.

Tests for viruses that produce a symptom only in the fruit in field virus indicator trees require three to four years to complete. A new protocol has been approved by APHIS that will allow early release and distribution of stone fruit germplasm if preliminary laboratory tests for viruses are negative. The multi-year field tests will continue after initial distribution has been made. H. Waterworth/R. Jones

Other Quarantined Crops - Current inventory is about 340 accessions and includes nearly 100 items of grasses and currants, along with smaller numbers of maples, raspberries, mulberries, Citrus, lilacs, Euonymus, horse chestnuts, and Cassava. this includes about 110 new accessions of grasses, currants, mangos and raspberries. One or more virus tests were conducted on 90% of the inventory during the past year or about 450 tests completed or underway. About 1,220 plants of coffee, 300 of mangos, representing 45 accessions, and 30 accessions of grasses, bamboo, corn, and ornamentals were released from quarantine and shipped. We anticipate that another 100 accessions, primarily grasses, will become eligible for distribution by late summer. H. Waterworth/P. Boyd

QUARANTINE (GLENN DALE/Bldg 580)

Suzanne Hurtt

Pome Fruits Quarantine - Twenty-two apple and eleven pears/quince accessions were added to the quarantine program during 1990. The germplasm came primarily from Brazil, Italy, Bulgaria, and China. Twenty-three apples and eight quince were unconditionally released and 19 pears and four apples were provisionally released from quarantine during late 1989 and 1990. The number of pome fruit trees maintained in the program now exceeds 500. the majority of the plants are infected and must undergo therapeutic treatments and retesting to be eligible for release. We are working with the CAC to eliminate those pome which are infected and of little importance to the user community. A small scale heat therapy program that utilized the existing indexing staff and resources was initiated in 1990. Germplasm of seven apples and four pears were heat treated. An additional 10 pears and 10 apples were entered into the therapy program in January, 1991. The success of these

treatments will take several years to evaluate. Dr. Ed Podleckis joined the group on a post doctoral appointment to study methods of freeing germplasm of viroid infections. His emphasis will be on potatoes and pears.

Potato/Sweet Potato Quarantine - Four vegetatively propagated potatoes, 68 true potato seed lots, and 49 sweet potatoes were received as new introductions in 1990. Three of the seed lots were found to be infected, the other seed lots were released from quarantine and distributed in the spring of 1991. Forty-two vegetatively propagated potatoes were released in 1990. Provisional release for 76 sweet potatoes was obtained in March 1991. Reliable detection of the white fly-borne component of sweet potatoes continues to be a problem. This has resulted in our inability to obtain the unconditional release of numerous sweet potatoes. We are currently holding approximately 60 sweet potatoes and 110 potatoes that are virus-infected. With the respective CAC's we are evaluating the list to identify those that should enter the heat therapy program as it commences. The technician responsible for conducting the potato/sweet potato quarantine program resigned in January, 1991. Procedures to replace this key person are in progress.

Sugarcane Quarantine - New accessions in 1990 included 106 clones in the interstate exchange program and 146 clones in the international importation program. At the same time 342 clones were shipped internationally to foreign recipients and 144 were sent to U.S. recipients. Our current inventory is approximately 500 clones. A new technician joined the sugarcane project in late 1989. He received training in Introductory Microbiology at the University of Maryland during the fall of 1990. He has also made good progress in computerizing the sugarcane files.

VIRUS DETECTION RESEARCH
Ahmed Hadidi

We have determined that the closely related apple scar skin and dapple apple viroids are seed-borne. This is the first report of graft-transmissible pathogens definitively identified in seeds from infected pome fruit trees. The implication is that foreign pome fruit seed may need to be tested for viroids.

The application of the polymerase chain reaction (PCR) technology for plant pathogen detection has been pioneered in our laboratory by demonstrating the detection of pome fruit viroids in total nucleic acids from infected tissue by in <u>in vitro</u> cDNA amplifications. This method is more sensitive than existing detection methods and provides information about pathogen detection without requiring large samples, construction of a probe, and/or molecular hybridization. In view of its high sensitivity, the PCR technology has the potential to detect other viroids, viruses and satellite RNAs. The PCR technology could also be useful in many

other plant pathological studies including the study of pathogen host interactions.

The degree of structural variation between a Chinese isolate of apple scar skin viroid and the prototype isolate from Japan was compared. The Chinese isolate consists of a circular RNA of 329 nucleotides and differs from the 330 nucleotide long viroid from Japan in four sites.

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Activities Report to the W-6 and S-9 Technical Committee

Submitted by Francis Zee

National Clonal Germplasm Repository for Tropical and Subtropical Fruits and Nuts at Hilo, Hawaii

1991

It has been a busy year for the NCGR-Hilo since the last time we met. I went on two collection trips in Southeast Asia to collect germplasm of lychee, rambutan, durian and mango. In August 1990, I joined Drs. Robert Knignt Jr. and Ray Schnell Jr. from NCGR-Miami on a trip to Sabah and Sarawak on the island of Borneo and to the Malaysian Agricultural Research and Development Institute (MARDI) in Malaysia to collect Mangifera, Artocarpus, Durio, Averrhoa, Garcinia and Nephelium species. We returned with a total of 85 different accessions of seeds, scionwood or young plants. The Artocarpus, Durio, Averrhoa and Nephelium species from this collection are doing well at the Hilo repository and will be field planted in September after the one year post-entry quarantine. In May 1991, I attended the International Symposium for Research in Tropical Fruits at Pattaya, Thailand, and took the opportunity to travel to Chanthaburi (the durian and rambutan production area in central Thailand), Surat Thani (Southern Thailand), Ubon Ratchathani and Khon Kaen in the Northeast to look for wild species of Nephelium. This visit resulted in 20 accessions of Durio, Nephelium and Carica and identified potential sites for future collections of land races of Nephelium lappaceum and Nephelium hyperleucum. Nephelium hyperleucum is a native species with small fruits resembling the lychee, but with a seed resembling the rambutan. Fruits ripens in early March to April, a potential germplasm for early season production for rambutan. Only a few individual tree of this species remained in central Thailand due to extensive and intensive cultivation of two commercial cultivars of rambutan and three cultivars of durian. On my way back to Hawaii, I also visited Tainan, Chia-Yi and Fen-Shang experiment station in Taiwan and collected 14 accessions of lychee and carambola. I was impressed with the tropical fruit research done in both countries; their intensive cultural methods and their success in tissue culture of lychee, carambola, jack fruit, bamboo, papaya and mangosteen is important information that will facilitate our objectives of the long-term preservation and storage of these germplasm at the Hilo repository.

On the home front, Ms. Claire Arakawa, a tissue culture specialist with 11 years of experience and Mr. Gregory Santos, a pesticide specialist joined our team on May 20, 1991. While I was away, some progress were made by Ms. Arakawa on the tissue culture of Canarium. Mr. Santos has

also contributed his knowledge to our pesticide safety program.

Between June 1990 and 1991, we successfully introduced 127 accessions of plant materials and distributed 63 domestic and foreign orders totaling 237 accessions.

We are working closely with Drs. Eric Roos and Sharon Sowa at the NSSL on storage of recalcitrant seeds of Litchi chinensis and Dimocarpus longan. An article, "Anesthetic Storage of recalcitrant Seed : Nitrous Oxide Prolongs Longevity of Lychee and Longan" by S. Sowa, E.E. Roos and F. Zee will be published in HortScience.

We successfully stored pineapple tissue plantlets in a low salt medium for over 12 months at ambient temperature without the need of transferring into new culture medium. A manuscript "Low Maintenance In Vitro Germplasm Storage of Pineapple (Ananas spp.)" by F. Zee and M. Munekata has been submitted to HortScience for review.

We are continuing our test on seed viability of papaya seed storage, and in cooperation with Drs. Robert Paul and Richard Manshardt on the evaluation of our pineapple collection using horticultural and iso-enzyme assays.

National Program Staff Report
June 18, 1991
Henry L. Shands

FY 1992 Budget. The FY 1992 budget contains no budget askings for plant germplasm programs. Furthermore, there turned out to be no need for construction fund increases for NSSL since the construction bids were considerably below estimates. The groundbreaking for the addition was June 7, 1991 with its completion scheduled for February 1992. The remodelling of the present NSSL will be completed about six months later.

Germplasm Funding:

Activity	FY 1989	FY 1990	FY 1991
Acquisition	$ 3,762,000	$ 3,861,000	$ 4,205,200
Preservation	10,175,000	11,369,200	12,703,700
SUB-TOTALS:[1/]	13,937,000	15,230,200	16,908,900
Evaluation	8,537,000	6,980,000	6,992,600
Enhancement	6,029,000	5,849,100	5,602,700
TOTALS:	$28,503,000	$28,059,300	$29,504,200

[1/] Funding level most consistent with activities relating to National Genetic Resources Program legislation in 1990 Farm Bill.

FY 1991 Budget. The FY 1991 budget increase for plant germplasm program was $2.2 millions. Of this total, $1.1 million was withheld from release or recalled from programs after release to permit the germplasm program's GRIN database management unit to purchase a new computer. Two programs, one in Mayaguez for sorghum and one for maize genetic stocks at Urbana were postponed until FY 1992 to soften the impact of the recalls on other programs.

Substantial increases were put with programs at Davis, Hilo, and Riverside to bring them up to adequate operational strength. Funds allocated to support the important Rhizobium collection at Beltsville gave formal recognition to the importance of microorganisms to the plant germplasm program. In addition to the Maize Genetic Stock Center at Urbana, funds to partially support the Tomato Genetic Stock Center at Davis, the barley genetic stocks at Fort Collins, and the Gerry Marx pea collection at Geneva started to recognize the present and future importance of these genetic stock collections.

National Genetic Resources Program. The 1990 Farm Bill included an important section authorizing the establishment of a National Genetic Resources Program (NGRP). The program authorized should include plants (including silvicultural species), animals, microbials, insects, and aquatic species of importance to food and agriculture. The program is to be established under the leadership of the Agricultural Research Service and modelled after the National Plant Germplasm System for the other groups of organisms. The Department has authorized ARS to reorganize the

National Program Staff to add one new Associate Deputy Administrator for Genetic Resources as Director of the NGRP along with new ADAs for Natural Resources/Systems and Agriproducts and Human Nutrition Sciences. An Acting Director of the NGRP will be appointed to develop the program until the Office of Personnel Management completes its review of staffing grade levels and the positions are competitively advertised.

Expert Committees have been assembled to provide the information to develop the report required by the legislation within the one-year time of enactment. The committee Chairs are Steve Eberhart (plant germplasm), Gerry Still (plant genome), Neal Jorgensen (animal germplasm and genome), Jack Seqwright (insect germplasm), and Amy Rossman (microbial germplasm). Stan Krugman is providing the forest genetic resources assessment. All project leaders of NPGS projects have been asked to submit information to Dr. Eberhart. A full report is due to the Secretary and to the Congress by November 1991 which includes the proposed components of the program and ten-year budget requirement.

An Advisory Council for the National Genetic Resources Program is established to provide guidance to the Secretary of Agriculture regarding the breadth of genetic resources covered under the program. The Department intends to simultaneously phase out the National Plant Genetic Resources Board (NPGRB) while replacing it by the new Advisory Council.

National Academy of Science/Board on Agriculture Report on Managing Global Genetic Resources. The report dealing with the National Plant Germplasm System was released in September of 1990. A number of the recommendations are meshed with the ARS actions to implement the NGRP discussed above. The forestry report is near to release and the others are due to be released during CY 1991.

FAO Comission on Plant Genetic Resources and Keystone Dialogue on Plant Genetic Resources. The Fourth Session of the FAO Commission on PGR was held in Rome in April 1991. The U.S. joined the Commission in September of 1990 and was followed by Canada and Japan. None of the three have signed adherence to the International Undertaking of the FAO. The Soviet Union signed adherence to the IU and requested membership on the CPGR which will likely be granted but requires special approval since the USSR is not a member of FAO. The Report of the Session of the CPGR is now available. Discussion of mandatory contributions to the International Fund brought strong protests during the meeting from most developed countries which have sought to keep a zero-based budget for programs of FAO. (Special program funds are often accorded for activities over and above the regular program budget.) Of interest to all should be proposed Code of Conduct for Germplasm Collecting and Transfer. The proposed international genebank in Spitsbergen offered by Norway provides for long term storage at -3.5°C which may offer low cost storage for countries unable to afford a long-term storage site, with

slightly inadequate storage temperatures (recommended -18 to -20°C).

Following the CPGR meeting two work sessions of the Keystone Dialogue on PGR were held in Rome in preparation for the Third (and final) Plenary Session held in Oslo. The Plenary dealt with the proposed (optimum?) structure of an international governing council, executive body, and scientific and technical advisory committee to manage a global genetic resources fund. The report of the Plenary indicates the level of consensus possible on intellectual property rights as well as financial needs for a fund. The report's timing was critical to put PGR in competition for possible funding as part of the biodiversity effort in the United Nation's Conference on Environment and Development (UNCED) to be held in Rio de Janeiro, Brazil in June, 1992. In addition, the Keystone Center and the Dag Hammarskjold Foundation (Uppsala, Sweden) will jointly publish a small book summarizing the Keystone Dialogue Series on PGR held from 1988 until now.

Both reports should interest those following the very important issues of ownership, regulation of, and access to PGR. The messages contained within these reports should alert all to the important task we have to protect what we already have since it will likely be more difficult to obtain access in the future. Contrary to the expressions "free access to" or "unrestricted access to" PGR, other phrases such as "national sovereignty" and "mutually beneficial basis" are now in vogue by developing countries. Cooperative efforts such as those initiated with the PRC and joint collecting with Brazil are likely to set the model for future. The Code of Conduct for Germplasm Collection and Transfer should be carefully scrutinized and comments are being taken until July 1991 by the Secretariat of the CPGR.

Foundation on Economic Trends (FOET) Lawsuit on Germplasm. The District (of Washington, DC) Appeals Court heard the oral arguments by each side in January 1991 on the suit by Jeremy Rifkin charging the USDA with mismanagement of plant germplasm under NEPA statutes. The three judge panel's report should be available shortly based upon the usual time for the Court to render its opinion.

Cooperative Research with the SADCC Genebank. The Nordic country consortium which sponsored the establishment of the ten-country regional genebank in Zimbabwe is interested in establishing cooperative projects on plant genetic resources of interest to the region. Those include corn, cotton, cowpea, sorghum, millets, peanut and minor crops. The African countries are looking for opportunities to train persons for genetic resources management and utilization positions. Opportunities for U.S. scientists to develop a working relationship with the Africans, impart knowledge and teach skills for them to carry back home are very great indeed.

New Publications. The USDA publication, "Seeds for Our Future",

at 100,000 copies suggests that the Department has felt the important need for the NPGS publication. Thanks go to all the project leaders who provided guidance and content during the process. The National Geographic April 1991 article, "World's Food Supply at Risk", involved the assistance of many NPGS persons over the several years in its making. Thanks to Kay Asay and Calvin Sperling and the many others who made it happen. "Advances in New Crops" from Timber Press contains the papers of the First New Crops Symposium held in October 1988. The Second Symposium will be held October 6-9, 1991 in Indianapolis, Indiana.

Personnel. Welcome to Peter Bretting, the new leader and regional coordinator at Ames. Thanks to Dick Wilson who has done an outstanding job filling in behind Ray Clark.

June 13, 1991

SUBJECT: NSSL 1990 Progress Report

TO: Regional Technical Committees on Plant Germplasm

FROM: National Seed Storage Laboratory
Steve A. Eberhart, Director
Eric E. Roos, Research Leader
Loren E. Wiesner, Curator

The NSSL cold vaults were filled in November, and curators of working collections were notified to send seeds of 1990 regenerations for crops that store well at 5° C to two Regional Plant Introduction Stations for temporary storage. Wheat and barley will be sent to the Regional Plant Introduction Station at Ames. Corn, bean, pea, cotton, sorghum and tomato will be sent to the Small Grain Center at Aberdeen, Idaho.

Funding for construction of the NSSL expansion was increased to $11.25 million ($2.75 million in FY 89, $5.5 million in FY 90, and $3.0 million in FY 91). Merrick and Company had completed the design in August. Five bids were received in February, and the construction contract was awarded to M. A. Mortenson Company, Colorado Springs for $8.28 million. This bid should allow purchase of several items that were not included in the original specifications because of expected cost constraints, including mobile shelving, telephones and liquid nitrogen tanks. The Ground Breaking ceremony was held June 7 with remarks from Dr. R. D. Plowman, ARS Administrator; Dr. A. C. Yates, CSU President; Mrs. S. Kirkpatrick, Mayor of Fort Collins; Mr. B. Walker, Merrick and Company President; and letters from Senator Wirth, Senator Brown and Congressman Allard were read by their staff assistants. Mortenson and Company plan to have the building enclosed by October and completed in late summer 1992.

Complete renovation of the roof system of the current NSSL building including modifications to change the slope and improve drainage, was completed. The security system has been installed and is in operation. Minor modifications of three research laboratories increased space and improved working conditions. The new casework installed in those labs will be used in the NSSL expansion project.

Dr. Loren Wiesner received the Crop Science Society of America (CSSA) Seed Science Award at the 1990 annual meetings in San Antonio. CSSA established a new C-8 Plant Genetic Resources Division to coordinate and expand activities in this area. Dr. Steve Eberhart is serving as Past President of CSSA, and Dr. Loren Wiesner continues to serve as editor of the Journal of Seed Technology. Dr. Henry Shands and Loren Wiesner were co-editors of the ASA/CSSA special publications, "Use of Plant Introductions in Developing New Cultivars" Volumes I and II, resulting from symposia at the 1989 and 1990 CSSA annual meetings.

Seed Viability and Storage Research Unit

The physical inventory and bar coding of samples has continued and PI number assignment and classification for lettuce and onion was completed. To evaluate seed quality 31,006 tests were conducted. There were 12,294 initial germination tests; 15,786 germination retests; and 2,926 sample that could only be tested for

moisture and checked for seed number. During the year 10,146 new samples were received: 285 were received from the Plant Variety Protection Office; 1,285 from Plant Quarantine; 4,898 which were regenerated by Regional Plant Introduction Stations (RPIS); and the remaining 4,283 accessions were new items received for storage from plant breeders, RPIS, conservation groups, and other individuals and organizations. This group of samples includes 452 accessions received for storage for Crop Science Registration. A total 7,027 accessions were distributed to 72 Scientists in 10 different countries. There were 1,587 sorghum accessions packaged and sent to St. Croix for planting under quarantine. In addition, 50 corn accessions were also sent to St. Croix for increase under quarantine.

Fewer tests will be conducted in the next two years due to the restriction we have placed on receiving samples of barley, wheat, corn, bean, cotton, pea, sorghum and tomato. With the reduction in seed intake, NSSL has accelerated the physical inventory,the assignment of PI numbers to unique NSSL accessions, the classification of samples and the distribution of portions of samples to working collection sites of those accessions previously held only at NSSL.

To accomplish these tasks, we have organized teams consisting of members of the Seed Quality Evaluation group and the Data Management and Support Services group. Two inventory teams are in operation and are verifying accuracy of GRIN records with NSSL records, are verifying sample location and size and are applying bar code labels to all samples in vaults 205 and 212. Plans are to start a third inventory team in the near future.

Based on the classification of samples, we have one team working to remove duplicate material and to split samples of accessions held only by NSSL for distribution to working collections. As more unique accessions become PI'ed we will be setting up another team to remove or distribute samples. Through this process we will reduce the amount of germplasm that will have to be transferred to the new vaults.

The remainder of the Seed Quality Evaluation staff have been involved in the preparing of samples for cryopreservation which now is our major method of seed storage. Similarly, the remaining staff of the Data Management group is involved in the check-in of
samples, adding of passport information to GRIN, and data input to GRIN.

The viability testing procedures have been modified to reduce the time required to obtain test results by using tetrazolium staining of dormant seeds. This procedure has increased our output, but will require that changes be made for reporting the results on GRIN.

Applied research is being conducted on the vigor evaluation of corn seedlings, cryopreservation of alfalfa, moisture testing of sorghum and an electrophoresis laboratory is being set up for identifying duplicate accessions present in our collection.

With the expanding work load at NSSL, two positions for technicians in the seed quality laboratory have been added. In the data management section two computer assistant positions are expected to be upgraded to computer programmer positions.

Plant Germplasm Preservation Research Unit

Eric E. Roos (Plant Physiologist)

The objective of my research are: a) To develop methods for detecting seed deterioration at the earliest point in time in order to predict longevity, determine proper retest intervals, and develop a better understanding of the seed deterioration process/mechanism and b) To develop methods to rescue deteriorated germplasm.

A computer program was developed to enable the use of the Richards function to analyze single seed conductivity data. This test measures electrolytes leached from the seed upon soaking and has been used as a seed vigor test. Data can be formed into frequency distributions which describe graphically the variability within a seed population. Using the cumulative frequency distribution of conductivity data, the Richards function provides an effective estimation of slopes of hypothetical lines tangent to the inflection points of the various sigmoidal curves generated from different seed lots. The maximum slope or "internal slope" can be used as a seed viability index.

An index of viability (internal slope), based on electrolyte leakage from individual seeds, was developed. Nearly a 4-fold difference in internal slope was found for 2 soybean (Glycine max L.) seed lots. The greater the internal slope, the less the variation among individual seed conductivities and the higher the seed quality.

Tests were conducted to measure conductivity (EC) of individual seed leachates of two lots of corn (Zea mays L. cv. B73xLH51). One lot was produced in Nebraska under dry land (DL) conditions, and the other lot was produced in Illinois under irrigation (IR). Field run seed germinated 96 and 88% for DL and IR, respectively. Hand sorting increased germination to 99 and 98%, respectively. After 2 to 4 h of soaking, vigor differences were detected in the two lots. These differences were confirmed using root length data and artificial aging treatments. Respiration measurements were done on three lots of hybrid corn seed at 2 h intervals from 0 to 48 h of imbibition. Warm germinations for lots 1, 2, and 3 were 80, 98 and 92%; with cold germinations of 43, 68 and 71%, respectively. At each time period eight seeds were sampled for fresh wt, dry wt, root length, and polarographic respiratory activity. Root emergence occurred at approximately 30, 26 and 30 h, respectively in lots 1, 2, and 3; although time, per se, was not a good indicator of when emergence occurred. Average seed moisture contents (dw basis) were not a good predictor of emergence.

Methods to increase the germination percentage of seed lots with less than 50% germination have focused on techniques which eliminate stress during germination, supply nutrients that may be deficient in low vigor seeds, or provide conditions which enable the aged seeds to repair structural damage to cells. While slow pre-hydration of seeds to reduce imbibitional damage increased germination percentages slightly, surface sterilization to remove pathogenic fungi on low vigor seeds had no beneficial effects.

We have made significant progress on our conductivity research. Although we do not yet have a truly non-destructive test, we appear to be able to obtain reliable data in as little as four hours after soaking begins. Preliminary results show that, at least for corn, this soaking period has no effect on seed viability or vigor. Repeated soakings (up to 5 cycles), however, will reduce vigor. The work on respiration shows that much longer soaking periods may be necessary in order to determine viability differences, and it is not readily apparent that we can detect differences in vigor.

Our preliminary work using seed X-ray analysis has been disappointing. We can not consistently identify dead seeds (corn again) using either barium chloride or sodium iodide as a contrasting agent.

Sharon Sowa (Research Chemist, RJR grant)

The goal of my research remains the early detection of seed deterioration based on the measurement of biochemical events that occur during seed germination and storage. The main objective is to investigate biochemical parameters that are essential to plant germplasm viability. The ultimate goal of this research is to measure plant germplasm viability on a noninvasive basis.

Two basic approaches have been taken to solve this problem: the study of respiration and the use of spectroscopy. These approaches are not mutually exclusive; in fact they overlap nicely to provide complementary information.

The development of respiratory capacity is a key germination event that has been a continued focus of these investigations. Studies of dioxygen utilization have been conducted on several levels, from whole seed to purified enzyme. Effector molecules have also been used to examine the correlation between respiration and germination/viability.

A specific focus has been the respiratory enzyme cytochrome c oxidase. This hemoprotein reduces dioxygen to water, with partially reduced O_2 species (superoxide, peroxide, etc.) as reaction intermediates. An important (and as yet unanswered) question is "does cytochrome oxidase in deteriorated seed have a greater tendency to release these harmful reaction intermediates, thereby increasing the potential for oxidative damage?". Infrared spectroscopy has proved to be a very informative technique to measure structure/function relationships in this key bioenergetic enzyme.

Infrared (IR) spectroscopy also provides a broader approach to measuring the biochemical characteristics of plant germplasm. Vibrational frequencies of molecular dipoles are collected simultaneously and accurately over the IR frequency range using Fourier-transform instrumentation (FTIR). FTIR can measure functional group (e.g. protein, lipid, carbohydrate) structure, as well as changes in these with temperature, hydration, viability, or germination.

Several sampling techniques are available to accommodate different types of biological materials for FTIR analysis. Conventional transmission techniques, in which the IR radiation passes through the sample, are augmented by ATR (attenuated total reflection) sample holders for multiple reflections through highly-absorbing aqueous solutions, by DRIFT (diffuse reflectance) sampling which measures radiation reflected off a powdered or solid surface, and by PAS, or photoacoustic detection, which can be used for solid-state analysis.

Although we have successfully measured biochemical parameters in different types of clonal germplasm (suspension cultured cells, pollen, and potato tissue), the emphasis of future FTIR study will be placed on PAS measurements of intact seeds.

NMR (nuclear magnetic resonance) spectroscopy is another sophisticated analytical technique that is gaining in vivo biochemical application, including noninvasive measurement of metabolism, intracellular pH, and changes in water environment during seed hydration. We are investigating the use of NMR to examine seed viability and vigor.

In addition, as a part of an IBPGR-funded study, we analyze the chemical composition of seed conductivity leachates in association with seed respiration measurement as a viability indicator.

We were successful in using a new method to more highly purify bean seedling cytochrome oxidase, and determined biochemical characteristics of this new preparation, including effector molecule studies of enzyme activity. However, the labor intensive nature of these experiments has required temporary postponement of further studies.

Experiments measuring seed respiration, viability, and vigor were conducted on several lots of corn seed. Relationships between seed moisture and respiration appear correlated to viability. We also measured the respiratory activity of germinating lettuce seeds that had been stored for 10 years at +5C, -18C, and liquid nitrogen temperatures in a collaborative experiment with Phil Stanwood.

This year, Francis Zee supplied new samples of lychee and longan seed to continue our studies of anesthetic storage of recalcitrant seed. We tried lower oxygen concentration in combination with nitrous oxide, and found species-sensitivity to decreased oxygen in the storage atmosphere. We also finished the storage experiments with the 1989 harvest of passionfruit and macadamia. Complete data analysis is pending,

however, we again saw dormancy in the passionfruit seeds. Accidental freezing of our samples showed that passionfruit seed can tolerate low temperature, but macadamia cannot.

Analysis of seed conductivity leachates revealed that metal ion content, especially Ca, P, Mg, and K, and protein content increase with conductivity. Changes in the uv-visible spectrum also occur, with significant absorbance maxima at 265, 280, and 315 nm. We did not observe any correlation between conductivity and pH.

FTIR studies focused on clonal germplasm materials. We measured suspension culture cell viability quantitatively using ATR sampling in a collaborative experiment with Leigh Towill. As a part of the cell experiment, we also measured viability of suspensions taken to subzero temperatures using both FTIR and tetrazolium staining. The two methods gave similar assessments of cell viability. The FTIR viability measurement was rapid and completely noninvasive.

We also used FTIR to directly measure membrane phase transitions in intact pollen grains of 4 species in collaboration with Kris Connor. We used transmission spectroscopy with sample temperature controlled between -10 and +35C. Our results showed that membrane phase is not the only factor contributing to imbibitional damage in pollen species. Changes in protein structure with temperature and hydration were also analyzed.

We also directly and noninvasively measured the biochemical changes during germination of pine and spruce pollen using ATR sampling. FTIR data showed changes in lipid, protein and carbohydrate content and structure. Fatty acid utilization and increased CO_2 production during germination were clearly demonstrated by the spectra. Complete data analysis is pending.

Studies to correlate "northern vigor" of potatoes to biochemical characteristics using DRIFT to study lyophilized tissue were conducted in collaboration with Cecil Stushnoff. Data analysis is pending.

The PAS accessory for our FTIR spectrometer arrived and is now operational. We began collecting preliminary data on whole seeds; differences between species were immediately evident. Preliminary spectra also indicated that CO_2 production during germination and changes in H_2O content will be easy to measure by this method. Instrument and sampling parameters remain to be optimized for these studies. Seed size is a limiting factor in these experiments, but we can measure whole corn and bean seeds without difficulty. A literature review provided the basis for a grant proposal to CSRS (Biochemical Events During Seed Germination Measured by Infrared Photoacoustics) which will be resubmitted this year but will also include preliminary data.

NMR studies conducted in collaboration with the CSU chemistry department showed definite changes in phosphate metabolites during seed germination. Inorganic phosphate, phosphomonoesters, and phosphodiesters were used to characterize the stage of germination in Phaseolus. Analyses of different types of extracts from cotyledons, radicals, and excised embryos showed that ^{31}P NMR is a useful technique to monitor bean seed viability.

Our studies have shown that the development of respiratory capacity is an important event in seed germination and can be a determinant of seed vigor. The key enzyme of the mitochondrial respiratory chain is cytochrome c oxidase which catalytically reduces dioxygen to water.

Reversible inhibition of respiration (and other metabolism) by the gaseous anesthetic nitrous oxide in combination with oxygen has provided a new approach to prolonging storage longevity of recalcitrant seeds.

Modern spectroscopic techniques such as FTIR and NMR can be used to provide biochemical information about seed viability and vigor. FTIR has proven to be an especially fruitful approach to the study of plant

germplasm viability. Various sampling accessories can accommodate intact biological materials. Direct measurements can be made. For example, membrane phase is determined by the frequency of the lipid vibrations; protein structure is determined by the frequency of the amide group vibrations. The measurements are also quantitative.

The combination of FTIR and photoacoustic detection might provide the ability to analyze properties of intact seeds, and therefore allow us to determine the biochemical requirements for viability while measuring them on a noninvasive basis.

Phillip C. Stanwood (Research Agronomist)

The conservation of plant germplasm requires an understanding of physiological deterioration, methods to measure viability, and techniques to counter deterioration. Application of this information results in improved maintenance of genetic materials by: 1) reducing the frequency at which a sample has to be tested and/or regenerated; 2) reducing maintenance costs both for equipment operation and support personnel; 3) providing greater physical protection of the specimen; and 4) providing a method of preservation for materials that are not or cannot now be routinely stored.

My current research is directed at: 1) development and understanding of cryopreservation of seeds and pollen using liquid nitrogen as a storage medium; and 2) the use of computer digital analysis to measure vigor of seed germplasm and to develop the concept of an "electronic seed (plant) herbarium".

Cryopreservation of seed germplasm using liquid nitrogen offers the opportunity to enhance the longevity and quality of stored seed materials. This technique can also improve the reliability of the storage system and reduce overall expenditures, depending on the application and seed material. Cryopreservation also offers the opportunity to preserve those materials that cannot now be routinely preserved, namely recalcitrant (desiccation-sensitive) seeds and pollen.

Computer digital analysis of biological materials is an emerging field that has significant potential for the characterization and evaluation of plant genetic resources. One project objective is to characterize seed deterioration with computer digital analysis of seedling growth and relate that to seed longevity and physiological process leading to deterioration. A second objective is to develop a digital image system to collect and evaluate morphological characteristics of seed germplasm diversity within a species.

The following projects were initiated or continued in 1990:

A. A monochrome computer digital image system was assembled and appropriate general purpose image analysis software tested for adaptability to our seed and seedling materials. Root growth rate and x-ray (Dr. Roos) image analysis studies were initiated.

B. Cooperative research on desiccation sensitivity of wild rice was continued with Dr. Bradford, Univ. of Calif., Davis.

C. A cooperative project on tropical recalcitrant seeds with Dr. Hor, University of Malaysia was continued.

D. A cooperative project on sugar beet pollen cryopreservation was continued with Dr. Hecker, USDA-ARS, Fort Collins.

E. A cooperative project was continued with Dr. Martin, Pioneer Hi-Bred International, investigating genetic response to short and long-term storage at varying temperatures including liquid nitrogen.

F. A project was initiated with Dr. Forsline, USDA-ARS, Geneva N.Y. investigating the feasibility of storing grape seeds in liquid nitrogen.

G. A project with the National Park Service and Soil Conservation Service was initiated, investigating the cryopreservation of endangered flowering dogwood species.

H. Engineering and safety standards for operating a cryopreservation facility were developed with Merrick, Inc., Denver, Colorado, in association with the completion of engineering plans for the NSSL expansion.

Lettuce and celery seeds held for over 11 years in liquid nitrogen have maintained their germination and vigor. Samples held at 5 C over the same period exhibit signs of deterioration and loss of germination. These results are consistent with similar evaluations of onion seeds (conducted in 1989).

Corn seed germplasm exhibits some variation to liquid nitrogen exposure damage. It has not been determined if this variation is genetically related or a function of environmental conditions during seed maturation. Approximately 80% of the selections were not damaged by the short-term exposure. Long-term (3 years) exposure to liquid nitrogen did not increase the damage or generate new damage.

Wild rice seeds were dried to moisture contents less that 10% with a survival rate of over 60%. Seeds dried to this level and exposed to liquid nitrogen were not significantly damaged by the exposure.

Computer digital analysis of lettuce root growth rates suggested that perimeter > length > area > average width/rectangularity/optical reflectance in sensitivity and usefulness of measurement. Results also suggested that these rate measurements can provide a very sensitive test for relative vigor (deterioration) of a sample. The use of a monochrome system has been useful in starting up the imaging research. However, being restricted to gray level evaluation is limiting proper image object identification. The research will have to move into "true color" digital analysis.

Sugar beet pollen, after 5 years preservation in liquid nitrogen, exhibited signs of deterioration in germination but not in fertility (seed setting capability). More in-depth research is needed to properly evaluate the significance of these findings.

Long-term results of seed germplasm continues to support the hypothesis cryopreservation will significantly improve the maintenance of valuable plant materials. Research results suggest that seeds high in oil content may exhibit short-term liquid nitrogen exposure damage, however the damage is at the cultivar as opposed to species level. These results emphasize the importance of genetic variation as a factor that must be addressed in preservation studies.

Development of procedures, guidelines and standards for a "Cryopreservation System" is necessary to successfully implement research findings. Biological, mechanical, cost and safety issues all have to be considered. This is particularly timely in that the U.S. National Plant Germplasm System and recently the Canadian Plant Germplasm System have adopted policies to implement and increasingly rely on cryopreservation as a system of choice. Discussions and evaluations are also ongoing with CYMMIT in Mexico and the NBPGR, India to implement cryopreservation of their materials on a routine basis.

Leigh E. Towill (Plant Physiologist)

My research program is concerned with studies necessary for the development of base collection preservation of species normally maintained as clones. Clonal species encompass woody and herbaceous lines with differing levels of cold hardiness and acclimation potential (i.e. tropical to temperate habitats). Storage at cryogenic temperatures is still the desirable condition. Generalized and useful preservation schemes are desired because

of the diversity of clonal collections. Storage of buds or shoot tips maintains clonal identity, although pollen and seed storage can preserve the genetic diversity of the species. The availability of each propagule has certain advantages and an integrated system using all propagules is desirable for long term, base collection storage. My program has emphasized pollen and bud/shoot tip preservation.

The following were addressed in CY 1990:

A. Continuation of studies on vitrification for shoot tip cryopreservation.

B. Developed plans for pilot project for shoot tip cryopreservation. Proposed species: potato, mint, strawberry.

C. Continuation of studies to determine whether true-to-type characteristics are maintained in regenerants from treated shoot tips (mint/potato).

D. Continuation of apple cryopreservation project: a pilot project to determine aspects of collecting, treating and handling of materials for long term preservation.

E. Pollen preservation in conjunction with Kris Connor, research associate, NSSL.

Vitrification methods developed for mint species and literature methods were applied to a number of lines. Useful percentages of survival were found in many lines, although some showed no survival. Permeation is probably essential for obtaining survival, but extended exposures are toxic, more so than with 'two-step cooling'. Glass fracturing in usual storage vessels has been a problem and must be overcome for practical use.

New materials for the apple bud cryopreservation project were placed into storage. Materials stored for ca. 1 month and 1 year were evaluated by grafting (Geneva, NY), and browning and leakage (Fort Collins). Lines differ in their sensitivity to the protocol being used but lines considered cold hardy did form shoots (in variable percentages) upon grafting.

Field- (potato) and greenhouse-observations (mint) were continued for selected, treated lines. No abnormal phenotypes were observed for traits associated with flowering, leaf and vine characteristics or tuberization.

Preliminary tests with the cryopreservation of diversity by vitrification have been encouraging, although not without caveats. Three examples: In vitro culture retrieval systems need to be improved; health of the stock plant from which the buds/shoot tips are derived is crucial; improved vitrification solutions are needed and stability from fracturing and nucleation over time must be evaluated.

Results from the apple cryopreservation project demonstrate that materials can be retrieved after longer-term storage (1 yr in 1990), but that differences among clones (tender vs hardy) do affect survival percentages. Methods, thus, need to be improved to obtain higher percentages of survival. Browning and electrolyte leakage are still being used for evaluation but still are not manipulated in such a way as to have any predictive value.

Analyses of regenerants will not be continued. Lack of abnormal regenerants corroborates microscopy data that suggest most lines probably regenerate from true axillary meristems. This, however, is probably very line and species-specific and will require more extensive observations if great concern about variation is expressed. My opinion is that if microscopy can demonstrate that the preponderance of regenerants form from axillary or terminal buds, then cryopreservation followed by culture of the buds will produce no greater percentage of abnormal regenerants than would conventional propagation.

Kristina F. Connor (Plant Physiologist, ARS post-doctorate - Research Associate)

My research objective is to develop methodology for the long-term preservation of pollen. A coordinated effort is necessary to formulate cryopreservation techniques for both desiccation-tolerant and desiccation-sensitive pollens. By using pollen there exists great potential for genetic preservation utilizing minimal space, especially for species possessing recalcitrant seed or maintained as clones.

A cryopreservation protocol for desiccation-tolerant pollens was developed. This involved aspects of shipping, extracting, drying, handling, and in vitro testing of pollen. Cooperative programs with repositories at Athens, GA and Brownwood, TX (pecan), Riverside, CA (citrus, date), Corvallis, OR (filbert, pear), Geneva, NY (apple), and Davis, CA (walnut, grape) were established. We are continuing work on a protocol for desiccation-sensitive species, and are continuing biochemical studies of desiccation-tolerant pollens.

Pollen or flowers were again received from the above locations, and the methods for in vitro germination testing developed in 1989 were applied. Considerable time was saved in the critical drying period since methodology had already been developed. In vitro germination, time, and rehydration procedures were some of the elements that we had already refined. Samples of these pollens were dried and then stored under low temperature conditions. Tests were made after 1-2 hrs on samples stored in liquid nitrogen (LN) to determine effects (if any) on viability. Initial tests indicated that viability is maintained at LN temperatures; after one year of storage in LN, apple and pecan pollens showed no reduction in viability. In all cases, rehydration of pollen was necessary for accurate viability estimates. We found that for apple pollen, it was necessary to first chop the anthers and then rehydrate for 4 hours to attain germination near the control levels. We hypothesize that pollen grains trapped within a dried, hardened anther do not hydrate to the extent that free pollen grains do. This year, due to improved handling techniques, we succeeded in achieving germination of some citrus pollens after storage in LN and at -20C. Stored citrus pollen was tested for fertility in the field; preliminary results indicate successful fruit set and seed development.

Fourier Transform infrared (FTIR) spectrophotometer studies on mass-collected pine, spruce, pecan, and cattail pollen measured changes in vibrational frequency occurring in membrane hydrocarbons with changes in temperature as membranes shift from the liquid crystalline to the gel phase. Other FTIR experiments indicate changing biochemical properties as pollen deteriorates and as pollen germinates. The presence of a large amount of dissolved CO_2 and depletion of fatty acids are the strongest indicators of germination, while protein structure and phosphate absorbencies are poor indicators.

Preliminary findings with the DSC indicate an absence of glass formations at temperatures ranging from 10°C to -70°C in pine pollen sampled at varying moisture contents. At moisture contents of +30%, it was possible to detect thermal transitions as water crystallized in the pollen grains.

Moisture isotherms were developed for pine, spruce, pecan, and maize. Water was rapidly lost or gained during the first 30 minutes of exposure to saturated salt solutions of $MgCl_2$, $Mg(NO_3)_2$, NH_4NO_3, KCl, and $CuSO_4 \cdot 5H_2O$. Equilibrium moisture contents (EMCs) were also determined for cattail, date, and filbert pollens placed over these salts. Experiments were conducted both at room temperature (23°C) and under refrigeration (-2°C). Preliminary drying experiments of corn pollen over $Mg(NO_3)_2$ have resulted in successful storage of this pollen in LN_2. Further studies are pending.

All repositories contacted were very cooperative. The successful LN storage of pollens was achieved (confirmed by in vitro tests). LN-stored citrus pollen successfully produced fruit and seed in field tests. The moisture isotherms developed using desiccation-tolerant pollens enabled us to control and regulate water content of a desiccation-sensitive species (maize) and to achieve successful LN_2 storage. The FTIR studies found significant changes as pollen deteriorates, provided accurate measurement of membrane lipid transition

changes from the gel to the liquid crystalline state, and measured biochemical changes occurring as pollen germinates.

Christina W. Vertucci (Plant Physiologist)

The goal of this project is to understand the physiology of dried organisms at ambient and subzero temperatures. From these studies we will gain insights into the mechanisms by which seeds deteriorate in storage and the role of water in controlling the extent and kinetics of the deteriorative reactions.

Deterioration is defined as the loss of viability as a result of exposure to a known stress (such as high or low temperatures, desiccation, or denaturing agents) or the progressive loss of viability during storage in an environment where the organism is protected from known stresses. Our work focusses on the interaction of water and the expression of freezing, desiccation, heat, aging and oxidative stresses. We have defined several levels of water binding based on measurements of the physical properties of water using differential scanning calorimetry. These levels can now be correlated, at the subcellular level, with macromolecule structure and organelle function and, at the tissue level, with physiological activity. Specific experiments have:

A. Characterized physiological activity with hydration levels for seeds of various compositions and related this to the properties of water at different relative humidities.

B. Studied the sensitivity of seeds to denaturing organic solvents as a function of hydration level.

C. Studied changes in the levels of unfreezable water and desiccation tolerance during acclimation of vegetative apple buds.

D. Compared the physical properties of water in orthodox and recalcitrant seeds.

E. Related the state of water in recalcitrant seeds to desiccation tolerance, developmental status, and sensitivity to freezing stress.

F. Monitored the changes in oxygen consumption of seeds treated with various mitochondrial and peroxidative inhibitors and promoters and hydrated to different levels.

G. Compared the sensitivity of the plasmalemma and mitochondria to different methods of deterioration.

H. Detected changes in the physical properties of lipids with water content.

I. Correlated the physical properties of lipids with seed longevity.

J. Assayed changes in the physical and chemical properties of lipids with different methods of seed aging.

K. Compared the sensitivity to aging under different conditions with the fatty acid composition of the lipids.

We have identified at least 6 types of water in orthodox seeds. Based on the presence of each type of water, we can predict survival of tissues to heat, freezing, solvent, and aging stresses. Several of these hydration levels are apparent in recalcitrant seeds, yet, the water at certain levels appears to have somewhat different properties than the water in orthodox seeds at corresponding hydration levels. The nature of these differences is under investigation. Injury by desiccation and freezing in recalcitrant seeds correspond to the absence/presence of certain types of water.

Oxidative uptake in seeds varies with hydration level. The use of inhibitors and promoters has suggested some of the origins of the oxidative activity. Inhibitors of mitochondrial electron transport reduce oxidative activity at high moisture levels. Inhibitors of peroxidative reactions reduce oxidative activity at low moisture levels. Peroxidative agents enhance oxidative activity at all moisture levels.

The physical properties of lipids in vivo correlate with the longevity of seeds. These physical properties change as seeds deteriorate under dry conditions but not under humid conditions. Changes in the physical properties of lipids in dry-aged seeds suggest chemical changes, and yet these have not been detected. We have found, however, that seeds with a higher level of unsaturated fatty acids are more sensitive to deterioration under ultra-dry conditions.

For soybean and broccoli seeds aged under humid conditions (@100% RH), mitochondrial activity is diminished, but there is no significant change in the rate of electrolyte leakage from aged and unaged seeds. The opposite is true for seeds stored under dry conditions.

We continue to see relationships between the status of water and the physiological status of the seed. This has been very useful in determining methods by which desiccation sensitive seeds can be preserved. This approach has also given us additional insights into the nature of deteriorative reactions in orthodox seeds.

There is a recurring theme in our studies of deterioration of seeds under wet and dry conditions which suggests that the mechanisms of deterioration under these two conditions vary. For example, changes in lipids are observed when seeds age under dry conditions; these changes are not observed during deterioration in humid conditions. Mitochondria are not active under dry conditions, but they are under wet. The plasmalemma appears to be the site of damage during dry aging, while the mitochondria appears to be damaged during wet aging. Seeds with high amounts of poly-unsaturated fatty acids are more sensitive to ultra dry conditions than seeds with lower amounts of unsaturated fatty acids (also, results by M. Browers show that the plasmalemma lipids have a greater level of unsaturated fatty acids than mitochondrial lipids.

Marcia A. Browers (Plant Physiologist, RJR grant)

The goal of this project is to elucidate the link between seed aging and lipid peroxidation. Lipid peroxidation may make a major contribution to deterioration of seeds stored under dry cold conditions. Products of lipid peroxidation can cause membrane damage and result in altering membrane properties such as fluidity and permeability. Both of these properties have been documented during seed deterioration, however, direct evidence for lipid peroxidation in deteriorative processes remains meager. Lack of direct evidence is problematic: one can not define the role of lipid peroxidation in seed aging, or even determine to what extent peroxidation has occurred.

Recent efforts have developed gas chromatography as a means to directly quantify lipid peroxidation products. This has allowed a number of investigations, not previously possible, to commence. The resulting approach has been one allowing investigation of basic questions of the role of lipid peroxidation.

A. Which lipid components yield detectable peroxidation products and how does this affect properties of these products? The effects of peroxidation on purified phospholipid standards are being evaluated to determine the origin of peroxidation products quantified by gas chromatography as well as determine the characteristic peroxidation products for each lipid. Differential scanning calorimetry is being used to define physical changes in the peroxidized lipids.

B. What is the result of peroxidation of seed samples and what effect does that have on lipid properties? Soybeans are being used as a model system since their lipid properties have been previously well-defined. As in the study of purified standards, the gas chromatograph is being

used to evaluate the components changed by peroxidation and correlated with physical changes measured by differential scanning calorimetry.

C. How do physical properties of phospholipids change as acyl chain saturation and degree of hydration are varied? Differential scanning calorimetry is used to show how alterations in lipid composition could affect thermal lipid properties and interactions with water.

D. How does peroxidation affect biological properties of the seed such as viability and deterioration in storage? This question is being approached in collaboration with Dr. C. Vertucci as part of the longer-term study undertaken to link lipid composition of seeds with seed aging (see report by C. Vertucci). Soybeans as a model system are being used to evaluate the propagation of peroxidative reactions during storage, and the resulting decrease in viability.

The effects of lipid peroxidation as measured in the varieties of experiments outlined above appear to be consistent, whether shown in purified phospholipids or soybean extracts. As indicated by gas chromatography, peroxidation results in changes in the polyunsaturated fatty acid constituents of lipids. These changes include desaturation, decrease in fatty acid chain length, and possible increases in polarity. Studies of physical properties measured by differential scanning calorimetry of pure phospholipid standards show that decreases in saturation raise melting temperatures, transition enthalpy, and alter interaction with water. Taken together, these findings show that peroxidation results in many changes in lipid properties. Data from propagation of peroxidation reactions are not complete enough to allow conclusions to be drawn.

Lipid peroxidation may explain some phenomena observed during cold dry storage of seeds. The sum of results to date suggest that peroxidation alters fatty acid components, and consequently, reduces fluidity. Since lipid fluidity is well correlated with deterioration during seed aging, this data can further support the hypothesis of peroxidation as a cause of seed aging. Thus model studies of lipid peroxidation reproduce features of seed deterioration during cold dry storage. The challenge that remains is to more directly tie lipid peroxidation to seed aging.

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Report for 1991 Meetings of the W-6, S-9,
and NC-7 Technical Committees

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High Erucic Acid Oils...Crambe and Industrial Rapeseed.

In 1989, the High Erucic Acid Development Effort (HEADE) management committee and Iowa State University (ISU) crushed excess and aging crambe seed in a full-press mill in Montana. Oil and meal were successfully marketed. This activity spurred a three-way partnership between North Dakota farmers, National Sun Industries (NSI) and HEADE, which resulted in successful production, harvest and processing of ca. 2000 acres of crambe in the summer of 1990. Dr. John Gardner, ND State University did a superb job of spearheading and coordinating this very successful project. NSI's Enderlin, ND, mill processed the harvested seed to 500 t of oil, 850 t of meal and 150 t of hulls (fuel). Farmers received 9.5 cents/lb for the seed, and the oil and meal were marketed for 27 cents/lb and $80/t, respectively. The meal has been fed without problems to beef cattle by Foxley Cattle Co. (Bartlett, NE). Armed with this success, NSI requested 10,000 acres of crambe in 1991, but sufficient seed was available to plant only ca. 4500 acres. HEADE is working to ensure that planting seed will be available for 10-20,000 acres in 1992. The commercial fields of crambe showed the same marked resistance to flea beetles that plots had shown in earlier research. Flea beetles do great damage to canola and industrial rapeseed according to the ND studies.

Spearheaded by Dr. Gardner (NDSU) and Dr. Ken Larson, (ISU), HEADE is pursuing the very difficult task of herbicide clearance for crambe. As crambe production increases, this need becomes more critical.

Dr. Koert Lessman (New Mexico State University), preeminent crambe researcher, will retire in November, 1991, and HEADE is working to preserve his crambe germplasm, and to to ensure that crambe breeding efforts continue.

HEADE sponsored research on chemical intermediates, paints and coatings, and lubricants continues in efforts to expand the market potential of high erucic acid oils.

Calgene and the University of Idaho continue their excellent programs in rapeseed development. Calgene's industrial rapeseed production in the Midsouth (KY, TN, MO, AR) ranges from 10-20,000 acres annually, with oil extraction in facilities in Nashville, TN. Much of Idaho's rapeseed production is shipped to Japan for processing, although a Great Falls, MT, mill crushes rapeseed and markets the oil and meal domestically.

Dr. Carol Klopfenstein (Kansas State University) has completed a second rapeseed meal beef feeding study, which replicated and confirmed an earlier study by her that showed equal or superior performance of animals fed full-press industrial rapeseed meal in diets supplemented with protein from rapeseed compared with those containing soybean meal. Animals in her initial study statistically graded higher when fed diets supplemented only with protein from rapeseed.

Lesquerella Developments.

Oil produced in earlier pilot plant processing runs has been degummed and bleached. A study of saponification of this oil to produce free fatty acids has been completed, and efforts to isolate the hydroxy acid fraction are about to begin. Arrangements have been made also to conduct a pilot-scale "split" of the oil via commercial steam/pressure splitting techniques. The hydroxy acid fraction is needed for product development studies.

Two pilot plant produced defatted meals have been chosen for feeding studies to determine the nutritional quality of lesquerella meals in animal diets. One meal is a typical full-press meal containing 8-10% residual oil; the second is a typical extrusion processed/solvent extracted meal containing ca. 1% residual oil. Dr. Carol Klopfenstein (KSU) has agreed to conduct these studies, which will characterize both rat and chick performance on diets containing these meals. Histopathological analyses will be conducted on organs from the animals. These are considered necessary studies preparatory to beef cattle feeding trials, which are being planned for the near future as meal is available from small scale semicommercial production of *Lesquerella fendleri* seed.

Male sterile lesquerella plants have been identified and appropriate crosses made to determine inheritance and usefulness in future 1st generation hybrid seed production. Extensive cooperative work was started with industry to supply sufficient seed for pilot plant extraction and oil evaluation. Irrigation studies on lesquerella showed that yields were greater with high than low frequencies when total applied water was low, but results were reversed with high total amount of water applied. New plantings were made in the fall of 1990 to apply crop water stress indexing to yield and irrigation scheduling.

Vernonia

A working germplasm collection of 38 accessions of all available *Vernonia galamensis* subspecies and varieties have been assembled. Seeds from bulk collections and single plant selections planted by direct seeding in April had very poor stands for most accessions except *V. galamensis* spp. *galamensis* var. *petitiana*. Periodic seed harvests were made throughout the growing season for germplasm and agronomic improvement studies.

Meadowfoam

Derivatives produced from meadowfoam fatty acids have been produced using a novel process. These materials will have applications in lubricants and cosmetics. Breeding and agronomic work is proceeding at Oregon State University.

Jojoba

3000 kg of solvent extracted jojoba meal was fermented under farm conditions to biodegrade jojoba toxins. 1820 kg of pressed jojoba seed was detoxified by the enzyme method under farm conditions. Cattle feeding trials were started. Pound quantities of water soluble jojoba proteins were isolated and sent to a cosmetic manufacturer for evaluation in shampoo.

Cuphea

Mutation breeding is progressing at Oregon State University and germplasm evaluation is ongoing at the Plant Introduction Center at Ames, IA and at NCAUR.

Natural Products for Control of Plant and Microbial Pests

Three new isoflavones were isolated from alfalfa and were characterized by spectroscopy and x-ray crystallography. Gram quantities of the phytoalexins medicarpin and maackiain were isolated and sent out for bioassay. A facile synthetic route to 5,7-dihydroxychromone, a flavonoid decomposition product that inhibits plant growth, was found and the product was entered into the bioassay screens. Piceatannol, a phytoalexin produced by sugar cane was assayed to determine its toxicity towards germ tube growth of *Colletotrichum falcatum*, the fungus that causes sugarcane red rot disease. Levels of piceatannol from extracts of infected sugarcane suggest that piceatannol may act as a defense mechanism against *C. falcatum*. Extracts of dyers woad (*Isatis tinctoria*) were both insecticidal and herbicidal and the active compounds are being isolated and identified. Detoxification of xanthotoxin, a plant-produced furanocoumarin, by certain strains of the plant pathogenic fungus *Fusarium* produced a new compound, 5-(2-carboxyethyl)-6-hydroxy-7-methoxybenzofuran. This is the first report of fungal detoxification of xanthotoxin and represents a major finding in plant-fungal interactions. These studies of natural products provide information on chemical structures that may be used in the design of new environmentally safe herbicides, fungicides, and plant growth regulators.

Four phytoalexins were purified in significant quantities from plant sources and were made available for biological testing. These include: medicarpin from alfalfa (*Medicago sativa* L.), maackiain from the Japanese pagoda tree (*Sophora japonica* L.), pisatin from garden peas (*Pisum sativum* L.) and capsidiol from green peppers (*Capsicum annuum* L.). Medicarpin and maackiain are constitutive in their respective plants so elicitation was not necessary. Pisatin and capsidiol were elicited in good yield. Means to elicit and purify the isomeric glyceollins I, II and III from soybeans (*Glycine max* L.) were developed. Final separation of the isomers was achieved on silica and has been scaled up to process about 100 mg at a time. These compounds will soon be available for bioassay. Insecticidal screening on the first four compounds has indicated toxicity against fall army worms and European corn borers but the dosages are quite high (greater than 400 ppm). Fungal screening of these compounds has not yet been concluded.

Fumonisins

Substantial progress has been made in several areas of research on the fumonisins, a newly recognized group of fungal toxins produced by Fusarium species on corn. Fumonisins regularly are found at low levels in corn. Higher levels present in the 1989 crop have been associated with specific diseases in horses and swine. Several analytical methods for these toxins have been developed and are being validated for accuracy. Methods for the production and purification of these compounds in quantities required for toxicology studies have been developed and multi-gram quantities have been provided to cooperators for a variety of studies. It appears that fumonisin levels of 10 parts per million or greater are related to the problems seen in animals while "normal"

corn usually contains fumonisin levels of less than 6 ppm. These findings, however, must be regarded as preliminary until further confirmation is obtained. Additional studies have revealed the structure of a new fumonisin and the presence of additional related compounds. A number of related fungal strains are under examination for their ability to produce these toxins. Major goals of this research are to identify harmful naturally-occurring chemicals in crop plants and to provide analytical methods and chemical support to monitor and preserve quality and safety of the food supply. Additional plant-fungal interaction studies are in progress.

Biologically Active Natural Products for Insect Control

Research has continued on the male-produced aggregation pheromones of nitidulid beetles. Two species, *Carpophilus hemipterus* and *C. freemani*, have been investigated in depth to identify male-specific compounds produced in minor amounts; for field use, minor pheromone components are sometimes of critical importance for optimal activity of the pheromone. A total of 16 compounds have been identified for *C. hemipterus* and 8 for *C. freemani*; identifications were confirmed by synthesis. All of the compounds were hydrocarbon tetraenes and trienes. Rearing methods have been developed for 4 additional nitidulid species in preparation for expanded pheromone research: C. mutilatus, *Urophorus humeralis*, *Haptoncus luteolus*, and *Stelidota geminata*. One component, a novel hydrocarbon triene, has been identified for *C. mutilatus*; it has been synthesized and found to be active in preliminary field tests in California. Pheromone research has also commenced for one weevil species, Anthonomus eugenii, the pepper weevil; a laboratory culture for the species has been established. Feeding deterrent activity and toxicity of a series of loline alkaloids has been studied and N-acetylloline was found to be nearly as effective against greenbugs, *Schizaphis graminum*, as nicotine sulfate.

Constituents in Tall Fescue Affecting Livestock Health and Forage Utilization

Further investigation of the minor alkaloids of endophyte-infected tall fescue using high-speed countercurrent chromatography indicate the presence of lysergic acid carbinolamide. Reports of another grass species infected with an unidentified *Acremonium* species led to isolation of lysergic acid amide (LSAA) and ergonovine as the predominant alkaloids; no lolines or ergopeptines were observed. This grass has pronounced sedative properties when consumed by mammals which can be attributed to the relatively large concentration of (LSAA) (more than 10 ppm). Although LSAA is present at roughly one tenth this level in fescue, it could account for some of the lethargy and reduction of feed intake of cattle. Twenty derivatives of loline were prepared and tested for their effects on several insects and on germination and growth of alfalfa and ryegrass. N-formylloline is as effective as nicotine sulfate against certain sucking insects but the natural loline derivatives have little effect on seeds or seedlings. Pure samples of the natural lolines are being investigated in at least five separate studies being conducted at the Univ. of KY, Univ. of TN, and elsewhere. Extraction of 36,000 lbs of fescue seed is to be conducted at the Vienna Correctional Center during the next 2 years, and this material will be available for large-scale feeding trials and/or preparation of kilogram quantities of loline alkaloids.

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1990 S-9 TECHNICAL COMMITTEE REPORT

Agency: Soil Conservation Service

Submitted by: H. W. Everett

Address: 501 W. Felix, Fort Worth, Texas 76115

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Accession user: Jamie L. Whitten Plant Materials Center, Coffeeville, Mississippi

Address: Route 3, Box 215-A, Coffeeville, Mississippi 38922

Nature of Research: Development of new conservation plants for MLRA 133 and 134 with emphasis on cropland erosion control (winter cover crops).

Progress to date: A collection of 110 accessions of Bromus uniloides was planted at Coffeeville in September 1989 for evaluation as cover crops. Accessions PI-250648 and PI-442079 proved to be superior overall when rated for cold hardiness, vigor, foliage production, early maturity, and quantity of seed produced. These accessions plus two others are now in initial seed increase.

Publications: 1

Cultivar release: 0

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Accession user: Brooksville Plant Materials Center

Address: 14119 Broad Street
Brooksville, Florida 34601

Nature of Research: Development of new conservation plants for MRLA 138, 151-155, and 270-273 with emphasis on water quality maintenance, cover crop erosion control.

Progress to date: Three additional perennial peanut (Arachis glabrata) species are proving to be very effective as a cover crop in citrus groves because of their low maintenance and water requirement. Perennial peanuts can be used as a biological supplier of nitrogen. These low growing perennial peanuts can also be used as roadside stabilization and beautification on sandy non-fertile sites. These species are being used in the effluent sprayfields in Ocala and Okeechobee because of the density of

rhizomes. They use and help filter some of the nutrients before they reach the aquifer.

The Inter-Center seed production study of the three Florida native switchgrasses (Panicum virgatum) show seed production potential as being equal to, or greater than, 'Alamo'. Data on prior clipping studies showed forage to be greater than 'Alamo'.

PI-415141 Spartina patens continues to be outstanding in southern coastal areas and is proving exceptional in effluent sprayfields. PI-421238 Spartina patens was released in May 1990 as 'Flageo', for dune stabilization and critical area planting.

PI-421841 Beach sunflower (Helianthus debilis) will be released in mid 1991 for use on dune stabilization and beautification.

Crotalaria lanceolata evaluations have been reduced to 6 accessions for advanced testing as a cover crop erosion control.

Publication: 1

Cultivar release: 1 'Flageo' marshhay cordgrass

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Accession user: USDA-SCS Hawaii Plant Materials Center

Address: P.O. Box 236, Hoolehua, Hawaii 96729

Nature of research: Development and testing of new and improved conservation plants for Hawaii and the Pacific Basin (includes Guam, the Northern Marianas Islands, the Federated States of Micronesia, the Republic of Palau, the Republic of the Marshall Islands and American Samoa).

Progress to date: PI-224980 glycine (G. wightii) is a legume and continues to perform well in Hawaii's low rainfall zones for forage and erosion control. It is currently being tested at the Molokai PMC under replicated irrigated and non-irrigated clipping trials with three other commercially available cultivars. PI-224980 is scheduled for release in 1991.

PI-213903 and PI-271633 vetivergrass (V. zizanioides) is a long lived, deeply rooted

perennial bunch grass. Originally from India, it has recently been selected for advanced testing for contour hedgerow applications for the natural formation of terraces using vegetation.

PI-440790 phaseolus (P. acutifolius), PI-195245 phaseolus (P. lunatus), PI-385126 lupinus (L. hispanicus), PI-201389 phaseolus (P. coccineus), PI-293015 lesquerella (L. fendleri), PI-432526 proboscidea (P. parviflora), PI-251800 jojoba (S. chinensis), PI-422199 Cucurbita (C. foetidissima), PI-478649 Parthenium (P. argentatum, PI-464692 Medicago (M. marina), PI-249937 Medicago (M. arborea), PI-269867 Aristida (A. adscensionis), PI-422242 Guizotia (G. abyssinica), PI-208985 Ehrharta (E. calycina), PI-364326 Aristida (A. congesta), PI-Sporobulus (S. fimbriatus), PI-201475 Cucurbita (C. pepo), PI-312852 Vernonia (V. galamensis), PI-306132 Cucumis (C. melo), PI-212896 Cucumis (C. sativus), PI-441933 Zea (Z. luxurians), PI-478411 Chenopodium (C. quinoa), and PI-435608 Helianthus (H. annuus) are all part of a cooperative project between the USDA-ARS Western Regional Plant Introduction Station and the USDA-SCS Hawaii Plant Materials Center for seed increase of selected germplasm. Many accessions presently maintained at the WRPIS are photoperiod sensitive and a reliable short-day seed increase site was vital to the successful maintenance of this valuable germplasm. The joint project should commence sometime in the summer of 1991.

9037942, 9037940, and 9037941 broadleaf carpetgrass, (Axonopus compressus) a low growing, shade tolerant perennial grass has recently been increased for advanced testing. Current field plantings include those on several large macadamia nut orchards throughout Hawaii.

Publications: Joy, R. J., and P.P. Rotar, 1991. 'Tropic Shore' Seashore Paspalum: Paspalum vaginatum Sw. Hawaii Institute of Tropical Agriculture and Human Resources, University of Hawaii. Research Extension Service 122.

Cultivar release: 0

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Accession user: Americus Plant Materials Center

Address: Route 6, Box 417
Morris Drive
Americus, Georgia 31709

Nature of research: Development of new conservation plants for Georgia, Alabama, South Carolina, and North Carolina with emphasis on cropland erosion control.

Progress to date: The Americus PMC is increasing 4 accessions of Vetiveria zizanoides, PI-196257, PI-271633, PI-537061 and PI-302300. This grass has received much interest for use in erosion control on cropland. The Americus PMC is also conducting an adaptation study involving PI's 271633, 302300, 196257 and 213903 from India and 9054943 from Sunshine, LA.

PI-383803, Vicia villosa, hairy vetch was established in a field planting in the fall of 1988 in Georgia to compare this accession with two commercial vetch varieties for abundance of winter cover. Selected for nitrogen production and ground cover, this accession may be released if results remain promising. This accession is also being increased at Americus PMC. 1991 is the third year that PI-383803 has been tested cooperatively with the University of Georgia at Plains, Georgia.

PI-490363, PI-490364, PI-310131 and PI-202044, Paspalum nicorae, brunswickgrass, continue to be evaluated for grassed waterway stabilization and for forage purposes. They establish more quickly than bahiagrass from seed but seed production techniques are yet to be fully worked out.

PI-199258 and PI-289311, Medicago orbicularis, are being evaluated in field plantings for winter cover when notill seedings of rowcrops will be used in the spring. Also, PI-199258 and PI-289311 are being evaluated cooperatively at the Plains, Georgia test.

In 1987, 'Amquail' thunberg lespedeza was released for use in establishing quail food patches in heavily populated deer country. Amquail displays a resistance to deer browse, the deer may actually avoid it, whereas the deer heavily browse bicolor lespedeza. Amquail provides excellent food and cover for bobwhite quail.

The following accessions are being evaluated for use in improving water quality on:

Constructed wetlands: Phragmites australis, common read, PI-434204 and 434213; Spartina pectinata, prairie cordgrass, PI-421603; Panicum hemitomon, maidencane, PI-434171; Eleocharis dulcis, PI-276260, 276261, 276263, 276264, 276273, and 276274.

Animal waste disposal: Tripsacum dactyloides, eastern gamagrass, PI-421612, 434493; Panicum virgatum, switchgrass, PI-422006; Paspalum nicorae, brunswickgrass, PI-310131; Arundo donax, PI-421727, 'Alamo' Panicum virgatum, PI-422006, and 'Quail Haven' Glycine soja, PI-163453 are being established in Alabama and Georgia to determine their range of adaptation and performance for wildlife.

Publications: 1

Cultivar releases: 1 'Flageo' marshhay cordgrass

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Accession user: East Texas Plant Materials Center

Address: P. O. Box 13000 SFA Station
Nacogdoches, TX 75962

Nature of research: Adaptational information on plant materials for eastern Texas and western Louisiana.

Progress to date: 3 Pennisetum spp: 9042665 (P. orientale), 'Cowboy' laurisagrass; PI-220606 (P. flaccidum, 'Carostan' flaccidgrass; and PI-315868 (P. flaccidum), flaccidgrass are being comparatively evaluated for adaptability and forage potential in eastern Texas. After 3 years of documenting their performance, it appears that 'Cowboy' is better adapted to eastern Texas than 'Carostan' or PI-315868.

9054943 Vetiveria zizaniodes, vetivergrass does not have the cold tolerance to withstand the winters in eastern Texas. During 1989-90, approximately 95-98% was winter killed. Plants that survived the 1989-90 winter received more winter damage during 1990-91.

PI 299993 Hemarthria altissima, 'Redalta' limpograss has gained interest in eastern Texas for use in forage systems. Plans are being made to put it into field plantings in eastern Texas and western Louisiana. Because there are no commercial sources available, the plot at the PMC is being increased. If it proves successful in field planting, 'Redalta' will be included in the states standards and specifications. Hopes are to locate someone to commercially produce it.

Publications: 0

Cultivar Releases: 0

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Accession User: James E. "Bud" Smith Plant Materials Center

Address: Route 1, Box 155
Knox City, TX 79529-9752

Progress To Date: No accessions of foreign origin were selected for advanced evaluation in 1990.

SOUTHERN REGIONAL PLANT INTRODUCTION STATION
Report to S-9 Technical Committee
July 24-25, 1991

This report covers the primary activities of this plant introduction station for the period of July 1, 1990 through June 30, 1991.

Plant Introduction

Germplasm of 1,225 new Plant Introductions (PI's) were added to the S-9 Project plant germplasm collections. The major crop groups received were sorghums, sweet potatoes, peanuts, and squash. The total collection is now 63,416 and is composed of 261 genera and 1,359 species from 160 countries.

Seed Distribution

A total of 26,033 seed samples or tissue cultures were shipped in all categories of distribution. In direct response to 703 requests, 11,979 were shipped within the S-9 Region; 6,526 to the other three regions (NC-7, NE-9, and W-6); 2,631 to 62 foreign countries; 1,060 forage legume cultivars for field trials in the southern states; and 348 sweet potato cultivars to national and international requests.

Shipments in other categories of distribution were 643 PI's sent to the National Seed Storage Laboratory (NSSL) for long-term storage, and 3,194 distributed for seed increase.

Seed Increase

A total of 3,194 are included in the 1991 increase plantings. The major crop groups involved are sorghum, cowpeas, peanuts, grasses, clovers, sesame, and peppers. The P. I. Station is increasing 754 new and old PI's and cooperators in Alabama, Arizona, California, Florida, Puerto Rico, and St. Croix, VI are increasing 2,440.

Research and Screening

Greenhouse screening of Vigna seedlings for virus infection worked well for most PI's but not all. Field testing of watermelon accessions for resistance to watermelon mosaic virus 2 yielded five citron types with good resistance, but the greenhouse screening methods were not rigorous enough to screen for resistance.

Tissue culture techniques have been successful in maintaining sweet potato nodes in vitro for 2+ years in a state of "no growth". After transfer to

hormone-free media, axillary bud development resumes and normal plantlets are obtained after three months. Also, construction of a genomic library for sweet potato has been completed.

Last year 300 accessions of cultivated peanuts were evaluated for tomato spotted wilt virus resistance at the Decatur County experiment station. Material screened included U.S. cultivars, foreign cultivars, landraces and some wild species. Approximately 10% of all entries had two or less plants infected by harvest. Eleven entries had no infected plants 100 days after seeding.

A Post-Doc scientist has begun work on the development of procedures for maintaining wild peanut accessions in vitro. Four explant sources have been evaluated for use in regeneration of Arachis species in vitro: leaves, nodes, shoot tips, and meristems. Using these explant sources, shoots have been generated from more than 12 Arachis species. Bacterial contamination has been a problem with the nodes, shoot tips, and meristems but not the leaf explants. However, using leaf explants, shoots were regenerated from only 5 of 16 Arachis species tested within 12 weeks of culture. Experiments have been performed to develop an improved system to regenerate shoots from leaf explants to Arachis species. The factors gelling agent, light intensity, phyohormones, explant age, and genotype have been observed to significantly affect the rate of shoot regeneration from leaf explants of Arachis species. By changing the gelling agent alone a 3X increase in the number of shoots per explant was observed for Arachis villosulicarpa.

APPENDIX I

Southern Regional Plant Introduction Station Budget

Sources of Funds		FY-91	FY-92
Regional Research Funds (Pooled)		$ 207,835	$ 224,325*
RRF (Committee of Nine Allocations)		0	0
	TOTAL	$ 207,835	$ 224,325

Expenditures			
Personal Services - Salaries		$ 121,304	$ 101,076
Personal Services - Benefits		44,067	36,387
Travel		500	500
Supplies & Operations		39,964	75,964*
Equipment		2,000	2,000
	TOTAL	$ 207,835	$ 215,927

* FY 92 salary increase for 16 additional working hours, benefits, and medical insurance increases are $871, $331, and $387, respectively (Total = $1,589).

** Proposed $50,000 HVAC remodeling of S-9 laboratory building ($36,000 from SAES directors and $14,000 from the S-9 operating budget).

Sources of Funds			
ARS Base (Recurring Funds)		$1,492,284	$1,497,385

Expenditures			
Personal Services		$ 589,009[1/]	$ 830,005[3/]
Post Doc Positions		83,000	0
Travel		28,000	31,000
Construction & Repairs		250,286[2/]	96,000[4/]
Supplies & Materials		62,989	76,427
Support Equipment		58,586	12,328
Operations		171,211	120,814
Cooperative Agreements		249,203	330,811
	TOTAL	$1,492,284	$1,497,385

1/ Two "Post-Doc" positions established with Soft Funds.

2/ Construction of a second Seed Storage Building. Also includes installation of moveable shelving in storage room.

3/ Includes continuation of "Post-Doc's" with base funding.

4/ Includes fencing and irrigation of new plot land on UGA farm.

1991

S-9 TECHNICAL COMMITTEE REPORT

Agency: U.S. Department of Agriculture, Subtropical Horticulture Research Station

Submitted by: R. J. Schnell

Address: 13601 Old Cutler Road, Miami, Florida 33158

Accession Users: R. J. Schnell and R. J. Knight

Nature of Research: Introduction, preservation and evaluation of tropical and subtropical plants.

Progress to Date:

This station maintains as live plants 8000 accessions of tropical perennial economic plants. It is the National Clonal Germplasm Repository for avocado, mango, coffee, banana and plantain, sugarcane, Tripsacum, Annona, and palms. The Miami station serves as an intermediate quarantine facility for Theobroma cacao, which after clearing this facility is established permanently at Mayaguez.

Between 1 June 1990 and 31 May 1991, 243 new introductions were received in Miami (Table 1). During this reporting period 39 germplasm orders left the station (Table II). Most of the distributions were to people involved in research, education, public service, or private industry in the United States.

Germplasm Evaluation and Enhancement:

Germplasm Collection: In August 1990 a U.S.D.A. expedition to the island of Borneo was successful in collecting 15 species of Mangifera other than indica. In addition, many other tropical fruit species were collected (Table 3). These plants are now being established at the NCGR-Miami Florida and Hilo Hawaii.

Mangifera: The population structure of the newly collected domesticated, semidomesticated, and wild Mangifera species are being investigated. The use of RFLP and RAPD molecular markers as well as isozymes has allowed estimation of genetic relationships to be made.

Theobroma: A U.S. AID sponsored project to screen populations of cacao for resistance to witches' broom (Crinipellis perniciosa) is continuing. We have been successful at establishing a method for inoculation and screening under controlled conditions which allows selection of resistant and tolerant seedlings. We have found an association with the fast allele of Malate Dehydrogenase (EC 1.1.1.3.7) locus 1 and resistant seedlings. This fast allele is at a very low frequency in the general population but has been present in every resistant seedling.

Field Evaluations:

Mangifera: Collection of data on fruit weight, size, color, seed weight, sugars, and acids was completed for the mango germplasm collection. This information will be gathered for five years and published to help mango breeders utilize the collection.

Passion Fruit: The second set of selected seedlings are established at Byron Ga. Several seedlings from last years test look promising for release as commercial cultivars.

Publications:

Schnell, R. J., and Chifumi Nagai. 1991. Variation for agronomic characters among maternal half-sib families of Saccharum officinarum and elite Hawaiian commercial clones. Tropical Agriculture. Accepted Feb. 1991.

Schnell, R. J., and R. J. Knight Jr. 1991. Frequency of Zygotic Seedlings from Five Polyembryonic Mango Rootstocks. HortScience. Accepted June 1991.

C.M. Ronning, D.M. Harkins, R.J. Schnell, and L. H. Purdy. 1991. Estimation of Genetic Relationships in Theobroma cacao. (abs) 88th Annual Meeting of the ASHS, Penn. State Univ. 19-24 July 1991.

Table I

NEW INTRODUCTIONS

1 JUNE 1990 THROUGH 31 MAY 1991

TAXONOMIC NAME	QUANTITY
Averrhoa	1
Citrus	10
Mangifera	5
Musa	38
Passiflora	8
Saccharum	130
Theobroma	17
Miscellaneous Ornamentals	34
Total:	243

Table II

CATEGORY DISTRIBUTION OF ORDERS FOR CR-MIA

06/01/90 to 05/31/91

CATEGORIES	ORDER TYPE	ORDERS FREQ.	ORDERS PERCENT	ACCESSIONS FREQ.	ACCESSIONS PERCENT
ARS - USDA ARS	Distribution	5	12.821	18	12.081
FCOM - Foreign, commercial companies	Distribution	2	5.128	4	2.685
FED - Other U.S. federal agencies	Distribution	1	2.564	1	0.671
FIND - Foreign individual	Distribution	3	7.692	12	8.054
FPRU - Foreign public org. (non gov.)	Distribution	2	5.128	11	7.383
FPUB - Foreign public organization (gov.)	Distribution	5	12.821	31	20.805
INT - International Agr. Res. Centers	Distribution	2	5.128	29	19.463
STA - USA state institution	Distribution	10	25.641	31	20.805
UCOM - USA Commercial companies	Distribution	1	2.564	2	1.342
UIND - USA individual	Distribution	5	12.821	8	5.369
UPRU - USA public organization	Distribution	3	7.692	2	1.342
	Totals =	39	100.000	149	100.000

Table 3. Fruit & Vegetable Crop Species and Relatives Collected in Malaysia by R. J. Knight, R. J. Schnell and F. Zee [USDA-ARS], August 1990

Family	Species	Name	Number of collections
Anacardiaceae	*Mangifera applanata*		2
	M. caesia	Binjai	2
	M. casturi	Kasturi	1
	M. decandra		1
	M. foetida	Mangga pau	2
	M. griffithii	Raba	5
	M. indica	Mango	2
	M. laurina	Mangga air	7
	M. macrocarpa		1
	M. odorata	Kwini	3
	M. pajang	Pajang	1
	M. pentandra	Pau damar	1
	M. quadrifida	Rancha-rancha, kumbang	2
	Mangifera spp.		2
	M. swintonioides	Mangga utan	1
	M. torquenda	Bunitan, faliman	3
Bombacaceae	*Durio grandiflora*		1
	D. oxleyanus	Durian sukang	1
	Durio sp.		1
	Durio zibethinus	Durian	3
Burseraceae	*Canarium* aff. *decumanum*		1
Euphorbiaceae	*Baccaurea angulata*	Tempoi bilimbi	1
	Baccaurea sp.	Tempoi	1
	Sauropus androgonus	Greenfinger, sayor manis	1
Guttiferae	*Garcinia hombroniana*	Bruas	2
	G. mangostana	Mangosteen, manggis	1
	G. parviflora	Kandis	2
Lauraceae	*Litsea garciae*	Medang	2
Meliaceae	*Lansium domesticum*	Langsat, langsat-duku	2
Moraceae	*Artocarpus communis*	Breadnut, kemansi	1
	A. integer	Champedak	1
	A. odoratissimum	Terap	4
Myrtaceae	*Psidium guajava*	Guava	1
	Syzygium aqueum	Wax jambu	1
Oxalidaceae	*Averrhoa carambola*	Carambola, bilimbi	4
Rubiaceae	*Coffea canephora*	'Surathani' robusta coffee	1
Rutaceae	*Citrus reticulata*	Wild mandarin	1
	Pleiospermum latiolatum	Orangeaster	1
Sapindaceae	*Dimocarpus longan* var. *malesianus*	Mata kuching	1
	Nephelium cuspidatum var. *cuspidatum*	Giant rambutan	1
	N. lappaceum	Rambutan	6
	N. lappaceum var. *pallens*	Wild rambutan	3
	N. mutabile	Pulasan	2

1991

S-9 TECHNICAL COMMITTEE REPORT

Agency: USDA, ARS
Tropical Agriculture Research Station
Submitted by: Francisco Vázquez, Agronomist
P.O. Box 70
Mayaguez, Puerto Rico 00681

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Accession User: A. Sotomayor-Ríos
Address: Tropical Agriculture Research Station, P.O. Box 70, Mayaguez, Puerto Rico
Nature of Research: Response of five dwarf selections and common Merkergrass (Pennisetum purpureum) to three cutting intervals and two locations.

Progress to Date: The response of five dwarf Merkergrass selections and common Merkergrass (Pennisetum purpureum) to cutting intervals of 45, 65 and 85 days was examined in an Oxisol (Isabela) and an Ultisol (Mayaguez) in Puerto Rico. All grasses showed higher dry matter yield (DMY) and plant height when grown in the Ultisol, while crude protein content (CPC), crude protein yield, and in vitro dry matter digestibility (IVDMD) values were higher in the Oxisol. In general, as length of the cutting interval (CI) increased, yield of forage increased, although CPC and IVDMD decreased. At both locations at the three CI, the DMY of common Merkergrass was greater than that of the dwarf selections except N43, which had superior yield. Across locations, dwarf selection N43's mean DMY was 5.5, 9.6 and 11.7 t/ha at the 45-day (7 harvests), 65-day (5 harvests) and 85-day (4 harvests) intervals, respectively. These represent 19, 15 and 0.7 percent more yield than that of common Merkergrass. The most appropriate cutting interval to utilize the grasses appears to be 65 days. The dwarf selections have a prolific tillering habit and high leaf/stem ratio. Their excellent forage production and outstanding forage quality attest to their potential as valuable grasses for the tropics.

Publications: Torres-Cardona, S., Quiles-Belén, A., and Sotomayor-Ríos, A. 1991. Response of five dwarf Merkergrass selections and Merkergrass, Pennisetum purpureum, to cutting intervals and locations. Proc., Caribbean Food Crops Society (CFCS).

Accession User: A. Sotomayor-Ríos
Address: Tropical Agriculture Reseach Station, P.O. Box 70, Mayaguez, Puerto Rico
Nature of Research: Response of three Pennisetum interspecific hybrids and local cultivar Millo Blanco (Sorghum bicolor) to three cutting intervals and two locations.
Progress to Date: Interspecific hybrids with excellent forage potential have been developed utilizing male-fertile cultivars of Merkergrass (Pennisetum purpureum) crossed onto Pearl Millet (Pennisetum glaucum) cytoplasmic male-sterile lines. These hybrids are capable of producing yields comparable to the best tropical forages. The response of three Merkergrass intespecific hybrids and local cultivar Millo Blanco (Sorghum bicolor) to cutting intervals of 45, 65, and 85 days was evaluated in an Oxisol (Isabela) and an Ultisol (Mayaguez) in Puerto Rico. Differences among the four genotypes were significant for most of the traits studied. In general, as the cutting interval (CI) increased, dry matter yield increased with a decrease in crude protein content (CPC) and in vitro dry matter digestibility (IVDMD). Yields ranged from 5-12 t/ha of dry forage, with 9% CPC and 45% IVDMD at the 65-day CI. Based on the regression curve, it appears that the optimum time for harvesting these grasses is between 45 and 65 days. The results of their preliminary evaluation are very encouraging.

Publications: None.

Accession User: A. Sotomayor-Ríos
Address: Tropical Agriculture Research Station, P.O. Box 70, Mayaguez, Puerto Rico
Nature of Research: Evaluation of the yield potential of six Stylosanthes guianensis introductions.
Progress to Date: This study was conducted to evaluate the yield potential of six Stylosanthes guianensis introductions planted monthly from February to July, 1989, in short- and long-day periods and harvested 60 and 120 days after an initial 180-day cutting. Across planting dates, CIAT 184 had the highest mean dry forage yield (DFY) and crude protein content (CPC) (7,160 kg/ha and 9.7%, respectively) at the 180-day cutting. The highest DFY and CPC were those of the February planting. Across planting dates at the 60-day cutting, CIAT 1283 had the highest DFY (2,194 kg/ha), while the CPC of the six Stylos remained relatively constant (12.2-13.0%). Across planting dates at the 120-day cutting, CIAT 184 had the highest DFY (5,064 kg/ha), with a mean CPC of 11.7%. A positive linear relationship was observed

between days to flower and DFY. Significant differences were obtained among Stylos in terms of IVDMD (60-day harvest) for all planting dates except June and July. Across planting dates, all other Stylos were significantly superior to CIAT 15 and CIAT 136. Based on this preliminary study, the optimal time for planting Stylo in Puerto Rico appears to be February-March.

Publication: Sotomayor-Ríos, A., Arias-Pedraza, A., and Torres-Cardona, S. 1990. Forage Potential of Stylosanthes guianensis in Puerto Rico. Proc., Caribbean Food Crops Society (CFCS).

Accession User: A. Sotomayor-Ríos
Tropical Agriculture Research Station, P.O. Box 70, Mayaguez, Puerto Rico
Nature of Research: Increase and evaluation of sorghum collection.
Progress to Date: Part of the world sorghum collection (900 accessions) was planted; individual plants were selfed and classified. The selfed seed was returned to the Coordinator of the South Atlantic Area Regional Plant Introduction Station.

Publications: None.

Accession User: A. Sotomayor-Ríos
Address: Tropical Agriculture Research Station, P.O. Box 70, Mayaguez, Puerto Rico
Nature of Research: Increase and evaluation of corn collection.
Progress to Date: Four hundred and fifty-eight accessions were planted (2 reps), increased and classified. The seed was returned to the Corn Curator of the Midwest Regional Plant Introduction Station.

Publication: None

Accession User: A. Sotomayor-Ríos
Address: Tropical Agriculture Research Station, P.O. Box 70, Mayaguez, Puerto Rico
Nature of Research: Evaluation of barley germplasm.
Progress to Date: Ten thousand accessions were planted, rust inoculated, and classified in terms of their reaction to race QCC of Pucinnia graminis f. sp. tritici. From the nursery stock at Isabela, 124 genotypes with putative resistance to rust were identified. Several thousand susceptible genotypes were observed.

Publications: None.

Accession User: E. Rivera and R. Goenaga
Address: Tropical Agriculture Research Station, P.O. Box 70, Mayaguez, Puerto Rico
Nature of Research: Improving tanier (Xanthosoma spp.) production through breeding and management.
Progress to Date: A trial consisting of a selection of the most promising hybrids and the original parents was planted for further evaluation. Work with colchicine-treated tanier seeds has continued; seeds of different tanier hybrids were treated with colchicine at higher exposure times and concentrations for chromosome duplication studies. Tanier plants that were successfully treated with colchicine will be propagated by tissue culture to increase their number, which will permit further evaluation. The tanier collection, consisting of 75 lines, will be transferred to tissue culture and submitted to isozyme analysis.

Publications: None.

Accession User: D. Ritchey
Address: Tropical Agriculture Research Station, P.O. Box 70, Mayaguez, Puerto Rico
Nature of Research: Evaluating soil acidity tolerance in sweet potato genotypes and testing them for suitability for mountainous areas of the tropics.
Progress to Date: SPV55, a promising sweet potato genotype selected at TARS, was evaluated at Corozal in a replicated soil acidity tolerance trial. It outyielded the seven other entries at all pH levels (3.4-4.3 calcium chloride pH) and produced 24,000 kg/ha commercial sweet potatoes at the highest pH level.

Publications: None.

Accession Users: F. Vázquez and P. Hepperly
Address: Tropical Agriculture Research Station, P.O. Box 70, Mayaguez, Puerto Rico
Nature of Research: Evaluation of tropical plant germplasm
Progress to Date: Germplasm evaluation of yam, papaya, cassava, and soybean has focused on evaluating varietal potential, disease and pest resistance, and germplasm enhancement.

Winged yam (Dioscorea alata) and potato yam (D. esculenta) - Tuber yields (kg/ha) of winged yam varieties varied from 2,215 in Leon Globe to 32,855 in Binugas. Three varieties had poor yields (2,215 to 6,602), and these showed a dry, powdery storage

decay caused by yam spiral nematode (Scutellonema bradys). This condition was also associated with severe, early anthracnose (Colletotrichum gloeosporioides). The relationships between yam yield components were evaluated. Tuber size correlated significantly with yield ($r = 0.67^*$, $P = 0.05$); however, no significant correlation was found between yield and tuber number/plant. Different clones of the Florido yam varied in their tuber form, size, number/plant, foliage form, and anthracnose susceptibility. Small, multiple-tubered clones with narrow, small leaves were less susceptible to anthracnose than other clones. Potato yam yield varied from 17,385 to 36,060 kg/ha in Kombi and Doli, respectively. Poorer yields in Kombi and Beti were associated with their susceptibility to root-knot nematode (Meloidegyne incognita) and poor tuber-piece emergence. African yams D. rotundata and D. cayenensis yielded from 16,249 to 36,115 kg/ha.

Papaya - Introduced and native varieties were evaluated for papaya ringspot virus (PRV) reactions. Useful levels of virus tolerance were identified in Danilo (Guatemala), Washington (India), Tainung 5 (Taiwan), and Paco, Tommy, Tony, and Teddy (Puerto Rico). Washington produced compact plants with small fruits. Few virus blemishes were found on up to 20 fruits produced with a brix of 12. Danilo was a very robust, large-fruited variety, producing up to 10 fruits under severe early PRV infection. The Puerto Rican varieties showed combined tolerance to virus and bunchy top mycoplasm. A Solo selection from Barbados, Rafael Sel., had superior reaction to PRV and bunchy top compared to other Solos tested to date. Work continues on recombining and selecting papaya varieties to develop better tolerance to major diseases in Puerto Rico.

Cassava (Manihot esculenta) - The effect of fungicide treatment on post-harvest losses was determined in 49 introduced and local cassava cultivars planted in an Oxisol at Isabela, Puerto Rico, and stored for up to 16 days. The extent of root deterioration was measured visually four and 16 days after harvest using the CIAT Index. Hydrogen cyanide (HCN) content was measured at harvest, and dry matter content and culinary quality at harvest and on the two post-harvest dates. Treatments consisted of 4,000 ppm of the fungicide thiabendazole applied to 50% of the roots harvested from each cultivar. At 16 days after harvest, when treated with the fungicide, ten

cultivars, including Brava and PI 12903, had maintained less than 5% root deterioration; and PI 12903 had retained its superior culinary quality. Brava and PI 9608 were the only cultivars with higher than 115 ppm HCN. Some of the introduced varieties showed better storage and culinary qualities than tested cultivars used commercially in Puerto Rico. Fungicide treatment was highly effective in delaying post-harvest deterioration, especially when combined with resistant cultivars.

Soybean (Glycine max) - Three soybean cultivars and 12 breeding lines were planted in a subhumid Oxisol at Isabela and in a semiarid Vertisol at Lajas during winter-spring (January planting) and summer-fall (July and August planting), 1990. Overall highest yields were obtained from the January planting at Lajas, with 2,625 kg/ha for F82-7614. At Isabela, yields were highest in the July planting, reaching 1,925 kg/ha for Cristilina, which, along with UFV-1, showed the highest consistent yields for both sites. F82-7614 had the highest specific adaptation for Lajas and Cristilina for Isabela.

Publications: Cárdenas-Guillen, F.M., Hepperly, P.R. and Vázquez, F. 1991. Effect of fungicide treatment on post-harvest losses of cassava (Manihot esculenta Crantz) cultivars in Puerto Rico. Proc., Caribbean Food Crops Society (CFCS).

Accession User: F. Vázquez
Address: Tropical Agriculture Research Station, P.O. Box 70, Mayaguez, Puerto Rico
Nature of Research: Maintenance, increase, and distribution of germplasm collections
Progress to Date:

Germplasm Collections:

Fruit trees, vines, and shrubs - Over 550 accessions of 416 species, representing nearly 190 genera of tropical and subtropical fruits and nuts, ornamental and medicinal trees and shrubs, and legumes and grasses, are maintained on the TARS grounds.

Yam (Dioscorea spp.) - Eleven selections of Dioscorea alata, five selections of D. esculenta, three selections of D. rotundata and three of D. cayanensis were grown for evaluation in replicated plots. Requests for yam plant material were processed during the months of February and March, 1991.

Cacao (Theobroma cacao) - In cooperation with the American Cocoa Research Institute (ACRI), TARS maintains a disease-free field collection of selected cacao clones, which serves as a permanent source of budwood for worldwide distribution. The collection consists of more than 380 clones, with three mature plants representing each clone. The cacao collection provides plant material for continuous breeding research, serving also as a source of moderate or large-scale distribution to scientists, cacao breeders, and institutions in the U.S. and throughout the world. New clones are added to the collection once they are grafted and achieve the proper size for transplanting.

Cassava (Manihot esculenta) - A collection of 50 cultivars of cassava is under field evaluation at the Isabela farm. Vegetative material is available for distribution.

Germplasm Distribution:

TARS is directed to fulfill local, national and foreign needs for plant germplasm. Requests have been handled from Puerto Rico, the Virgin Islands, the continental United States and foreign countries for vegetable seeds, tubers, yams, cuttings, seedlings, fruits, nuts, etc. A summary of these distributions during fiscal year 1991 follows:

USA (including PR and VI)	-Entries
Institutions	95
USDA	65
Individuals	35
	195
Foreign countries	
Institutions	102
Individuals	7
	109

Publications: None.
Cultivar Releases: None.