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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

Louisiana State University
Baton Rouge, Louisiana

June 22-23, 1978

FILE COPY

Respectfully submitted,

Clarence E. Watson Jr., Secretary

AGENDA

S-9 Regional Technical Committee Meeting

Louisiana State University

Baton Rouge, Louisiana

June 22 and 23, 1978

1. Call to Order. 8:00 AM June 22
2. Introduction of Attendees
3. Official Welcome from LSU - Dr. Doyle Chambers
4. Approval of Minutes, 1977 Meeting
5. Approval of Agenda, 1978 Meeting
6. Appointment of Committees
   a. Nominations
   b. Time and Place of Next Meeting
   c. Resolutions
7. Report on Germplasm Resources Information Project (GRIP) - Jay April
8. Report from Data Systems Applications Division - Charles Gerhardt
9. State Progress Reports and Research Plans
10. Remarks from Administrative Advisor - Dr. C. R. Jackson
11. Tours to Burden Research Center, Arranged by Dr. R. J. Stadtherr (Afternoon June 22, 1978)
12. Report from National Program Staff and Review of Recent Plant Explorations - Dr. Quentin Jones
13. Report from Germplasm Resources Laboratory - Dr. A. J. Oakes
14. Report from National Seed Storage Laboratory - Dr. E. E. Roos
15. Report of the Northern Regional Research Center - Dr. L. H. Princen
16. Report from the Southern Regional Plant Introduction Station - Dr. W. R. Langford

17. Review of Plant Exploration Proposals - Dr. W. R. Langford

18. Germplasm Collections and Programs at
    a. Mayaguez Institute of Tropical Agriculture - Dr. F. W. Martin
    b. Subtropical Horticulture Research Station - Dr. R. J. Knight
    c. Soil Conservation Service - Dr. A. G. Davis

19. Committee Reports
    a. Nominations
    b. Time and Place of Next Meeting
    c. Resolutions

20. Unfinished or New Business

21. Adjournment

1. CALL TO ORDER

The meeting of the S-9 Technical Committee was called to order by Chairman, Gordon M. Prine (FL), at 8:00 AM June 22, 1978 in Food Science 215, Louisiana State University, Baton Rouge, Louisiana.

2. INTRODUCTION OF ATTENDEES

Name	Address	Phone
*Clarence E. Watson, Jr.	Dept. of Agronomy Box 5248 Mississippi State, MS 39762	(601) 325-4181
Doyle Chambers	Louisiana Agric. Exp. Stn. Louisiana State Univ. Baton Rouge, LA 70808	(504) 388-4181
*Carl S. Hoveland	Agronomy & Soils Dept. Auburn University Auburn, AL 36830	(205) 826-4100
*Robert J. Knight, Jr.	USDA/SEA/FR 13601 Old Cutler Road Miami, FL 33158	(305) 235-2533 238-9321
*Philip J. Ito	Horticulture Dept. 461 W. Lanikaula St. Hilo, Hawaii 96720	(808) 935-2885
*Franklin W. Martin	Mayaguez Institute of Tropical Agriculture Mayaguez, Puerto Rico 00708	(809) 832-2435
*L. H. Princen	Northern Reg. Res. Center USDA Peoria, IL	(309) 685-4011 Ext. 232 or 270
*Eli L. Whiteley	Texas Agric. Exp. Stn. Dept. of Soil and Crop Sciences College Station, TX 77843	(713) 845-5322
*J. L. Bowers	Dept. of Horticulture & Forestry Univ. of Arkansas Fayetteville, AR 72701	(501) 575-2605

Name	Address	Phone
*A. J. Lewis	Dept. of Horticulture VPI & SU Blacksburg, VA 24061	(703) 951-5019
*David W. Bradshaw	Dept. of Horticulture Clemson University Clemson, SC 29631	(803) 656-3404
*Grover Sowell, Jr.	Reg Plant Introduction Stn. Experiment, GA 30212	(404) 228-7282
*Eric E. Roos	USDA-SEA National Seed Storage Lab. Colorado State University Fort Collins, CO 80523	(303) 484-0402
*A. J. Oakes	USDA-SEA Germplasm Resources Lab. Beltsville, MD 20705	(301) 344-3639
*L. N. Skold	Dept. of Plant and Soil Science University of Tennessee Knoxville, TN 37901	(605) 974-7391
*Quentin Jones	SEA, FR National Program Staff Beltsville, MD 20705	(301) 344-3930
C. Gerhardt	USDA-SEA-CDSD NAL Bldg., Room 408 Beltsville, MD 20705	(301) 344-2840
B. Leese	USDA-AMS-PVPO NAL Bldg., Room 200 Beltsville, MD 20705	
Jay April	IS/GR Program University of Colorado Boulder, CO 80309	(303) 492-5056
Bob Harville	Agronomy Dept. Louisiana State University Baton Rouge, LA 70803	(504) 388-3381
C. L. Mondart, Jr.	Agronomy Dept. Louisiana State University Baton Rouge, LA 70803	(504) 388-3381
*W. R. Langford	Reg. Plant Introduction Stn. Experiment, GA 30212	(404) 228-7255

Name	Address	Phone
*Oscar D. Ramirez	Dept. of Horticulture College of Agriculture Agricultural Experiment Stn. Rio Piedras, Puerto Rico 00928	(809) 767-9705
*Curtis R. Jackson	Georgia Experiment Stn. Experiment, GA 30212	(404) 228-7263
*R. J. Stadtherr	Horticulture Dept. 235 Agron.-Hort. Bldg. Louisiana State University Baton Rouge, LA 70803	(504) 388-2729

*Members of the S-9 Technical Committee.

3. OFFICIAL WELCOME FROM LSU

The S-9 Technical Committee members and visitors were welcomed to Louisiana State University by Dr. Doyle Chambers, Director of the Louisiana Agricultural Experiment Station. Dr. Chambers gave a brief history of the Louisiana Experiment Station.

4. APPROVAL OF MINUTES

Dr. Eli Whiteley moved approval of the minutes of the 1977 meeting. The motion was seconded and approved.

5. APPROVAL OF AGENDA

The tenative agenda was slightly modified and the agenda as presented in these minutes was approved.

6. APPOINTMENT OF COMMITTEES

Chairman Prine appointed the following Committees:

A. Nominations: C. S. Hoveland, Chm.
E. L. Whiteley
A. J. Lewis

B. Time and Place of Next Meeting: J. L. Bowers, Chm.
L. N. Skold
R. J. Stadtherr

C. Resolutions: O. D. Ramirez, Chm.
D. W. Bradshaw
R. J. Knight

7. REPORT ON GERMPLASM RESOURCES INFORMATION PROJECT

Jay April discussed the history of the GRIP program. He noted that international interest in the program was developing.

8. REPORT FROM DATA SYSTEMS APPLICATIONS DIVISION

Charles Gerhardt discussed the progress made during the first nine months of the GRIP project. The scope of the project will include registry, inventory control, information exchange, and management information. A five-year project plan has been developed and is progressing well.

9. STATE PROGRESS REPORTS AND RESEARCH PLANS

The following state representatives presented their annual reports. Copies of the reports are contained in Appendix A.

Representative	State
C. S. Hoveland	Alabama
J. L. Bowers	Arkansas
G. M. Prine	Florida
G. Sowell, Jr.	Georgia
P. J. Ito	Hawaii
R. J. Stadtherr	Louisiana
C. E. Watson, Jr.	Mississippi
O. D. Ramirez	Puerto Rico
D. W. Bradshaw	South Carolina
L. N. Skold	Tennessee
E. L. Whiteley	Texas
A. J. Lewis III	Virginia

10. REMARKS FROM ADMINISTRATIVE ADVISOR

Dr. C. R. Jackson, S-9 Administrative Advisor, announced that Dr. D. E. Zimmer is the new area director of SEA-FR for

the Georgia-South Carolina area, associated with S-9 as Co-Administrative Advisor. The operation of the S-9 regional project was discussed. Dr. Jackson expressed the wish that all state representatives would keep their directors informed of S-9 activities so that they will be aware of the value of the project to each state. Dr. Jackson recognized Dr. E. L. Whiteley for his years of service to the S-9 Technical Committee.

11. TOURS ON JUNE 22.

The attendees were taken on a tour of the Rural Life Museum at the Burden Research Center in the afternoon. Following this, Dr. R. J. Stadtherr took half of the group on a tour of the ornamental research plots at the Burden Research Center. The remainder of the group toured the agronomic crops research at the Perkins Road Research Center, accompanied by Dr. C. L. Mondart, Jr. and Dr. B. G. Harville.

12. REPORT FROM NATIONAL PROGRAM STAFF AND REVIEW OF RECENT PLANT EXPLORATIONS

Dr. Quentin Jones presented the report of the National Program Staff. He noted that NPGS has received $1.6 million in new money for FY 78. One million of this is for clonal repositories and $300,000 for the Information System.

The reorganication of 1972 is nearly completed and the reorganization of 1978 is well under way.

The National Plant Genetic Resources Board was reestablished on February 23, 1978. They have met with Assistant Secretary Cutler and are preparing a report to present to Secretary Bergland, explaining the concerns of the board.

The NPGS is in the process of formalizing curatorships for designated curators of plant germplasm. Dr. Jones has been charged with this responsibility.

The current status of efforts to implement Executive Order 11987 on introduction of exotic organisms was discussed.

The small grains exploration trip to Central and South America which was planned for this year has been cancelled, but is planned for next year. In lieu of this cancellation three explorations have been approved for this year. These are: (1) collection of Phaseolus in Mexico and Central America, (2) collection of wild potatoes in the southwestern United States, and (3) collection of native sunflowers in the southwestern United States.

A detailed copy of Dr. Jones report is available in Appendix A.

13. REPORT FROM GERMPLASM RESOURCES LABORATORY

Dr. A. J. Oakes reported on the activities of the Germplasm Resources Laboratory. He noted that the Laboratory was available to help plant scientists with their explorations, germplasm requests, imports and exports, and other germplasm related needs. His report is contained in Appendix A.

14. REPORT FROM NATIONAL SEED STORAGE LABORATORY

Dr. E. E. Roos presented the report of the National Seed Storage Laboratory. He discussed the research aspects of the Laboratory and presented a slide show on research concerning genetic changes in aged seed. His report is presented in Appendix A.

Dr. W. R. Langford presented the proposals to the committee for discussion. The committee was in accord with the decision made last year by the S-9 Executive Commitee, that the proposal to collect Chenopodium did not fit into the goals of the National Plant Germplasm System. It was also the general feeling of the committee that the proposal to collect Vigna sesquipedalis needed to be trimmed down and the objectives more clearly stated.

Following the discussion, Dr. J. L. Bowers presented the recommendation of the plant exploration committee that the S-9 Technical Committee approve the following proposals, listed in order of their priority:

1. Exploration for Festuca, Dactylis, Trifolium, and Lotus Species in Yugoslavia - R. L. Haaland.
2. Exploration of Mexico for Cucurbitaceae - G. Sowell, Jr.

The motion was seconded by Dr. C. R. Jackson and approved. Copes of these proposals are contained in Appendix B.

Dr. E. L. Whiteley moved that the committee encourage Dr. Burson to revise his proposal to collect Paspalum to include additional genera. Futher, that he alter the proposed budget to show funding for himself as the only U.S. scientist participating, but to include per diem and expenses for scientists in the respective countries who can aid him with the collection. The motion was seconded and approved.

15. REPORT OF THE NORTHERN REGIONAL RESEARCH CENTER

Dr. L. H. Princen reported on the activities at the Northern Regional Research Center. His report is presented in Appendix A.

16. REPORT FROM THE SOUTHERN REGIONAL PLANT INTRODUCTION STATION

Dr. W. R. Langford presented the report of the Regional Station. Several new catalogues are being prepared. These will be in a new format which will be distributed to libraries and can be referenced more easily than the old format. Dr. G. Sowell, Jr. discussed pathology research at the station. The report appears in Appendix A.

Dr. Langford presented the budget of Regional Station for 1979. Dr. E. L. Whiteley moved approval of the budget. The motion was seconded and carried.

17. REVIEW OF PLANT EXPLORATION PROPOSALS

Five plant exploration proposals were received for consideration by the committee. These consisted of four new proposals and one resubmittal. The five proposals were:

1. Exploration for Festuca, Dactylis, Trifolium, and Lotus species in Yugoslavia - R. L. Haaland.
2. Exploration of Mexico for Cucurbitaceae - G. Sowell, Jr.
3. Exploration of Foreign Paspalum species - B. L. Burson.
4. Collection of Vigna sesquipedalis - K. L. Chin.
5. Exploration for Chenopodium germplasm in South America - H. D. Wilson.

18. GERMPLASM COLLECTIONS AND PROGRAMS AT

A. Mayaguez Institute of Tropical Agriculture.

Dr. F. W. Martin presented a report of activities at the Mayaguez Institute. His report is included in Appendix A.

B. Subtropical Horticulture Research Station.

Dr. R. J. Knight discussed the program at the Subtropical Horticulture Unit in Miami. His report is contained in Appendix A.

C. Soil Conservation Service

Dr. A. G. David discussed SCS activities during the past year. Dr. Davis' report is contained in Appendix A.

19. COMMITTEE REPORTS

A. Nominations: Dr. C. S. Hoveland, Chairman, moved the nominations of Dr. C. E. Watson, Jr. as Chairman and Dr. D. W. Bradshaw as Secretary. The motion was seconded and approved.

B. Time and Place of Next Meeting: Dr. J. L. Bowers, Chairman, moved the acceptance of the National Seed Storage Laboratory at Fort Collins, Colorado as the site of the next meeting, with meeting dates just prior to the American Society of Agronomy meetings at Fort Collins. It was further moved that the Chairman and Secretary determine the exact dates and explore the possibility of a joint meeting with

other regional committees. The motion was seconded and approved.

C. Resolutions.

Dr. O. D. Ramirez, Chairman, moved the acceptance of the following resolutions:

Resolution A.

Be it resolved that the S-9 Technical Committee express its deep regret at the passing of Charles McKnight in May 1978. His services at the Southern Regional Plant Introduction Station at Experiment, Georgia, where he served since it was organized in 1950, will be greatly missed.

Resolution B.

Be it resolved that the S-9 Technical Committee express its hope for a speedy recovery of the wife of Dr. William T. Fike, and we regret that her illness prevented his attendance at this meeting.

Resolution C.

Be it resolved that the S-9 Technical Committee express its appreciation for the faithful services that Dr. Eli L. Whiteley has rendered to the Technical Committee. We wish him many years of health and continued productive activities.

Resolution D.

Be it resolved that the S-9 Technical Committee express its appreciation to Dr. Richard Stadtherr for making arranagements for the meeting at

Louisiana State University and for the excellent tour to the Burden Research Plantation and to the Rural Life Museum.

The motion was seconded and approved.

20. UNFINISHED OR NEW BUSINESS

There was no unfinished or new business.

21. ADJOURNMENT

Chairman Prine adjourned the meeting of the S-9 Technical Committee at 11:00 AM June 23, 1978.

APPENDIX A

STATE AND FEDERAL AGENCY REPORTS

Progress reports presented at
the meeting are attached
in the following order

ALABAMA
ARKANSAS
FLORIDA
GEORGIA
HAWAII
LOUISIANA
MISSISSIPPI
NORTH CAROLINA*
OKLAHOMA*
PUERTO RICO
SOUTH CAROLINA
TENNESSEE
TEXAS
VIRGINIA

NATIONAL PROGRAM STAFF

GERMPLASM RESOURCES LABORATORY

NATIONAL SEED STORAGE LABORATORY

NORTHERN REGIONAL RESEARCH CENTER

SOUTHERN REGIONAL PLANT INTRODUCTION STATION

MAYAGUEZ INSTITUTE OF TROPICAL AGRICULTURE

SUBTROPICAL HORTICULTURE RESEARCH STATION

SOIL CONSERVATION SERVICE**

* Not presented at meeting but submitted for minutes of meeting

** No written report provided for minutes of meeting

ALA-1

ALABAMA S-9 PLANT INTRODUCTION ACTIVITIES

August 1977-June 1978

Carl S. Hoveland, Agronomy & Soils Dept.
Auburn University, Auburn, Alabama 36830

A total of 317 recorded introductions were received from the Plant Introduction Station by Alabama cooperators this past year. They included 7 watermelon, 5 tomato, 22 Amaranthus, 7 sorghum, 13 grasses, 241 clover, 3 vetch, and 19 trefoil.

HORTICULTURAL CROPS

Tomato (W. H. Greenleaf, Auburn)

During the fall and winter, 1977-78, I made several new wide crosses to broaden the genetic base of my tomato breeding program thereby increasing the potential payoff of this research. I have observed the plant introductions (PI's) in question in the field over the past several years, mainly at the Wiregrass Substation at Headland, in southern Alabama. This location is favorable for heat stressing tomatoes for the selection of heat tolerant germplasm.

The PI's which I used in my new crosses are: PI 272735 (Lycopersicon esculentum, San Salvador) for heat tolerance and superior flavor for developing a patio type tomato.

PI 204998 (L. esculentum x L. pimpinellifdium) derivative from the University of West VA AES showed high heat tolerance during the exceptionally hot, dry summer of 1978 and it also possesses leaf disease resistances to early blight and to late blight.

PI 134417 (L. hirsutum f. glabratum) is resistant to early blight, and to the following insects: tomato fruit worm, spider mites and leaf miners. This species also possesses a desirable, delicate fragrance of the foliage. We are researching the chemical nature of the fragrant constituent, with the cooperation of Dr. Kenneth S. Rymal, food scientist and flavor chemist, and we hope to breed a whole new class of fragrant, insect and disease resistant tomatoes from this source.

We are also researching both the chemical and biological nature of the insect resistance through the cooperation of Dr. K. S. Rymal with a staff entomologist, Dr. Costas Kouskolekas and his graduate student. Hopefully, the fragrant factor in L. hirsutum f. glabratum will be the same as that conferring the insect resistances. This eventuality should greatly facilitate the breeding effort and assure its success.

We are also using PI 128248 and PI 128254 (both from Bolivia) in a study of the causes of heat sterility in tomatoes in cooperation with Dr. Curt Peterson of the Botany Department.

Cowpea, watermelon, and cantaloupe

No reports were received on these crops where a large number of plant introductions are being used in breeding programs.

Tall fescue (R. L. Haaland, Auburn)

Tall fescue clones selected from PI No.'s 231560, 231562, and 251823 are being used in genetic diversity studies on root size, nematode tolerance, and mineral composition.

Trefoils (R. L. Haaland and C. S. Hoveland, Auburn)

Lotus sp. from several European countries including Italy, Spain, France, and Yugoslavia are being evaluated for forage potential and general agronomic worth. Initial observations in 1977-78 indicate that *L. caucasicus* and *L. arvensis* are not well adapted to Alabama. Several *L. corniculatus* PI's look very promising.

In a northern Alabama yield trial, San Gabriel trefoil from Brazil (probably the same as PI 296318) has averaged over 4 tons of dry forage per acre annually during a 3-year period. Stands and production continue to be excellent and similar to the best alfalfa cultivars during the fourth year. Three Auburn selections from plant introductions are currently in trefoil variety yield trials at 4 locations in Alabama. Two of these trefoil selections are also in tall fescue mixture trials at 8 locations in the State.

Seed is being increased of several promising trefoil introductions and selections of them. Trefoil seed collected in recent foreign explorations by Dr. Langford have been increased at our Plant Breeding Unit in 1977 and 1978 for the Southern Regional Plant Introduction Station.

Cool Season Annual Legumes (C. S. Hoveland and R. L. Haaland, Auburn)

Several berseem (*Trifolium alexandrinum*) clover accessions survived the very cold winter of 1976-77 in a central Alabama nursery so were planted in yield trials in September 1977. Most berseem entries were inferior to arrowleaf clover. PI 292967 made considerable autumn and winter growth in the Gulf Coast area and may have some potential.

Seed was increased this spring from selections of *T. purpureum* *T. mutabile*, *T. nigrescens*, and *T. hirtum* for grazing trials. All of these selections have performed well in small plot yield trials.

REQUESTS FOR ADDITIONAL GERMPLASM

Species	Characteristic needed	Location
Festuca arundinacea	Nematode resistance or tolerance	Mediterranean area
Dactylis glomerata	Tolerance to nematodes and foliar diseases	Mediterranean area
Lotus corniculatus	Tolerance to *Rhizoctonia* disease	Mediterranean area

ALA-3

PUBLICATIONS CONCERNING PLANT INTRODUCTIONS

1. Hoveland, C. S., R. L. Haaland, J. T. Eason, M. E. Ruf, and H. E. Burgess. 1978. Birdsfoot trefoil - legume of the future in north Alabama? Auburn Univ. Agric. Exp. Sta. Highlights of Agric. Res. Vol. 25, No. 2.

S-9 TECHNICAL COMMITTEE REPORT

Arkansas Agricultural Experiment Station
Fayetteville, AR 72701

Period of July 1, 1977, to July 1, 1978

Rape and Chick Peas: We have concluded our testing program on rape. This work was conducted on the Southeast Branch Experiment Station at Rowher and on the Vegetable Substation, Alma, Arkansas. Seed yields on the best producing plant accession (P.I. 305278) was around 1000 pounds per acre. We plan to continue our testing of the better adapted chick pea accessions. A fall trial planting will be carried out on the Main Station at Fayetteville and on the Vegetable Substation at Alma. The extremely cool wet spring season in 1978 prevented us from getting our spring trial planted. Spring trials in the past at Fayetteville have been relatively successful and yields of dried shell peas of around 800-1000 pounds per acre were obtained.

Southern Peas: The F_2 plants of crosses made between the blight resistant plant accessions and the blight susceptible station lines have been made in the field. The field screening for bacterial blight resistance is a very important phase of our work on this crop and we plan to utilize the susceptible Bush Purple Hull as one check and the highly resistant AR77-197 as our resistant check.

Spinach: These spinach accessions: P.I. 217425 (Korea); P.I. 175726 (Turkey); P.I. 165560 (India), and P.I. 179560 (Belgium) were seeded in our fall nursery 1977 planting. The very late infection of white rust prevented us from getting a reading on white rust resistance in these accessions. These will be increased in our greenhouse and again tested in the fall of 1978. The white rust resistance possessed in our advanced station breeding lines was derived from material obtained from the U.S.D.A. and their original source came out of P.I. 165560.

Okra: Dr. Joe McFerran and Dr. M. J. Goode with the Arkansas Agricultural Experiment Station released a new okra cultivar, Lee, in January, 1978. The parentage of this cultivar involved Gulfcoast, Emerald, Clemson Spineless and a selection out of P.I. 248999 made by W.R. Cowley. Lee develops a plant which attains a height of 5 to 6 feet by the end of the growing season, but it may grow taller when irrigated regularly and heavily fertilized. The plant is usually free of lateral branches which aids in the hand harvest. The leaves are lobed slightly at beginning of growing season, but lobing becomes more pronounced as the season progresses. Pods are formed at

a very distinct angle from the stalk and the five carpellate pods are very straight, possessing a very bright green uniform color. The pods are free of objectionable spines but are slightly harder to snap off than Clemson Spineless pods.

One article was prepared and published in the Arkansas Farm Research V. IIVI No. 5:14 on Plant Introduction and Development of New Crops in the South.(Arkansas Participation.)

Germ Plasm Needs: We are very muchly interested in the program on the screening of *Cucumis sativus* accessions of rhizoctonia fruit rot resistance being carried out at the North Central Plant Introduction Station at Ames, Iowa. We would like to be on record of supporting any proposed plant explorations initiated in other regions on the search of new germ plasm in this species.

June 1978

1978 Florida Report to S-9 Regional Technical Committee
Prepared by G. M. Prine

Scientists from many disciplines in Florida continue to receive and evaluate plant introductions obtained from or through the Southern Regional Plant Introduction Station. Test plantings of various introductions are widely scattered throughout the state. In this report the investigator and where he is located in the state will be given along with information about promising introductions.

Dr. A. A. Cook, Plant Pathology Department, Gainesville, reports resistance to both pathotypes of *Xanthomonas vesicatoria* that infect pepper in Florida has been found in PI 260435 (*Capsicum chacoense*). Despite lack of good compatibility, they have been able to transfer these resistances to plant types with fruit and foliage characteristics of *C. annuum*. Another introduction, PI 194879 (*C. chinense*), also is resistant to at least one pathotype of the same bacterium and has been crossed successfully with *C. annuum* but further progress remains in question at this time.

Dr. J. M. Crall, watermelon breeder, Agricultural Research Center, Leesburg, is still working with a tolerance to watermelon mosaic virus derived from PI 255137. Several lines are being carried in his breeding stocks, but none are close to varietal release and the degree of tolerance retained has not been determined. The value of this introdution as a source of WMV resistance is still being investigated.

Dr. J. A. Mortensen, grape breeder, Agricultural Research Station, Leesburg, reports that the following PI numbers of *Vitis* species have been useful in breeding of scion types:

PI 360749 'Muska' (crack-resistant)
PI 360750 'Pirobella' (early ripening, crack resistant)
PI 354108 'PQ 7' (very early ripening)
PI 341823 'Anab-E-Shahi' from India
PI 341924 'Bharat Early; from India
PIM 18902 Large black grape productive in Cuba and South Florida.

The following PI numbers of *Vitis* have promise in breeding of rootstock types:

PI 279898 'Malegue 44-53'

Other PI numbers are likely to be useful, such as Argentina numbers PI 391446, 391448, and 391449 in breeding for seedlessness and earliness of ripening. As yet they have not come into bloom.

Dr. D. W. Gorbet, sorghum and peanut breeder, Agricultural Research Center, Marianna, gives this report on peanuts (*Arachis hypogaea*) and sorghum (*Sorghum bicolor*):

a. Peanuts: Thirty-eight plant introductions were grown in in 1977 to generate a fresh supply of seed. They had previously been grown in 1971. One to six plants were saved from each entry. These seed will be stored in a freezer for long-term preservation.

Six new PIs (415876 through 415881) from South Africa are being grown in the field this year (1978) for the first time. They will be evaluated and compared to eight PIs from our 1976 PI nursery to determine future utilization.

Selections are being continued in segregating populations from crosses previously reported. Some of this material went into yield trials for the first time in 1977 and 1978. Additional crosses were made in 1978 with PI 383423, 383424, segregates of 262090, C410 (A. species), A. chacoese, and A. cardenasii,---with emphasis on Cercospora resistance and the genetics of a mutant from a PI 262090 cross.

b. Sorghum: No new sorghum germplasm was obtained in 1977. The same introductions indicated in the 1977 report PI 217721, 229838, 229841, 217708, Dobbs, AF 28, Mn 960. and a number of lines from Purdue and Texas) are still being utilized as parents and/or evaluated for yield, disease resistance, midge resistance, and chemical quality (starch type and amino acid content).

Dr. K. H. Quesenberry, forage breeder, Agronomy Department, Gainesville, had the following to report:

A. Limpograss (Hemarthria altissima)

1. Three plant introductions, PI 299993, 299994, and 299995 were officially released in 1978 jointly by IFAS and the USDA, SCS. The cultivar names for these introductions are Redalta, Greenalta, and Bigalta respectively. An IFAS bulletin is in press describing research results with these grasses.

2. About 25 introductions are in second year study under grazing and clipping. The limpograsses continue to show superior early spring growth. The five week cutting interval used in this study has caused loss of stand in some introductions, but others have near 100% stand. Most entries persisted better under grazing and clipping and did not show significant winter damage. High yielding introductions in 1977 were 364888, 364887, 349749, 364891 and 365509. Introductions high in IVOMD were 349753, 299995, 364888, 365509 and 347238.

3. Second year data on forage quality (IVOMD, crude protein, and minerals) of limpograss is similar to 1976 results and suggests that PI 299995 could be used as a conserved forage in the field or late fall and winter grazing.

4. A new experiment was planted in May 1978 to directly compare grazing and clipping in 30 introductions. This test includes 15 new introductions received in 1977 from the collection trip to South Africa by Drs. Oakes and Bashaw and other introductions which have not been previously tested.

5. An experiment to evaluate the effect of rest interval between grazing on yield and persistence of limpograss was also planted in June 1978. This experiment consists of eight selected introductions.

6. A long-term holding nursery of all available Hemarthria germplasm is being established for maintenance of material which may be used in making crosses.

B. Paspalum spp.

Most introductions of P. guenoarum failed to survive the winter of 1977-78. Some lines of P. pilicatulum and P. notatum are still being evaluated.

Dr. O. C. Ruelke, Forage and Pasture Specialist, Agronomy Department, Gainesville has the following to report:

1. From 53 accessions of 'Limpograss', Hemarthria altissima (Poir) Stapf et. C. E. Hubb. which were evaluated in replicated greenhouse and field trials, six accessions show great promise and will be grown in replicated blocks for further evaluation under various fertility and harvest management treatments.

2. New bermudagrass hybrids developed from hybridization of plant introductions from Africa, Italy, Germany and other areas of the world crossed with improved hybrids (now commercially available) appear to be superior to commercial cultivars and are being evaluated further under various fertility and harvest management treatments.

Dr. Leonard S. Dunavin, Agricultural Research Center, Jay, makes these comments:

1. F_2 seed have been obtained from plants from a cross between Trifolium incarnatum, PI 378130, and a white flowered strain of T. incarnatum.

2. Observations of Hemarthria altissima, PI 364888, have indicated good cold hardiness and vigorous spreading growth. This grass has been placed into a replicated trial this spring.

3. In a replicated trial established in 1977 but not yet clipped for yield, three introductions of H. altissima had visual ratings as follows: PI 349752 > PI 364891 > PI 365509, and all looked better than Big Alta limpograss (PI 299995).

Dr. G. M. Prine, Plant Introduction and New Crops Specialist, Agronomy Department, Gainesville, announces the joint release with SCS of 'Florigraze' perennial peanut (Arachis glabrata Bentham) which is probably a seedling from PI 118457. Public distribution of Florigraze will be made in February and March, 1979. Another perennial peanut PI 262817 (Arbrook) gave superior early season growth during the severe drought of 1977.

Dr. Prine is making pigeonpea (Cajanus cajan) selections from segregating populations received from ICRISAT in India. Selection criteria include high seed yield, early maturity, short plants, large seed and large numbers of seed per pod. He is also looking at accessions of the cool season grain legumes: Chickpea (Cicer arietinum), lentils (Lens esculenta), peas (Pisum sativum), and faba beans (Vicia faba.) Superior accessions have been found in all crops for December plantings at Gainesville. Plant selections of Vicia faba have been made that show some resistance to a devastating but yet unidentified disease that attacks this crop.

Over 100 red clover (Trifolium pratense) and 400 sub clover (T. subterraneum) accessions were evaluated in rod rows during the 1977-78 winter. Seed of best accessions were collected for further evaluation. A number of commercial sub clover cultivars and a serradella cultivar from Australia were evaluated in replicated trials. Final results have not been tabulated. Sub clover looks promising as a reseeding winter annual forage legume in North Florida.

Dr. R. J. Allen, Jr. Agronomist, Agricultural Research and Education Center, Belle Glade,, has started grazing studies on Callie bermudagrass and Big Alta limpograss on muck soils. Results are too preliminary for reporting now.

A joint committee of Florida IFAS and SCS personnel has been appointed to pull together information and publish a circular on jointvetch (Aeschynomene americana). This annual summer legume is either indigenous or an early introduction to Florida. Jointvetch grows best on moist fertile soils. Dr. E. M. Hodges, Agricultural Research Center, Ona, is chairman of the Jointvetch Committee.

Dr. Stanley C. Schank, Agronomy Department, Gainesville, is seeking release of his digitgrass cross 46-2 as a named cultivar. The hybrid 46-2 is a cross between Digitaria valida PI 299850 and Digitaria sp. PI 299892, both from South Africa.

Dr. A. E. Kretschmer, Agronomist at Fort Pierce ARC, has many tropical legumes and grasses under observation. He is releasing Desmodium heterocarpon (PI 217910) as a named cultivar to be called 'Florida'. This legume is a long-lived perennial legume under South Florida conditions.

GEORGIA AGRICULTURAL EXPERIMENT STATIONS

REPORT TO S-9 TECHNICAL COMMITTEE

June 22 - 23, 1978

The following comments were received from some of the people who are evaluating and using plant introductions in Georgia.

I. Turner S. Davis, Georgia Station, Experiment, Georgia.

Some of the introductions continue to look good and show promise as ornamentals.

1. P.I. 235128 (Betula platyphylla var. japonica) has grown over 20 ft. in 6 years, the bark is white and appears to be free of pests.

2. (Pistachia chinensis) continues to be one of the more attractive trees in the fall, leaves vary in color from yellow to orange to red. Growth has been good and it is free of pests. An abundance of seed is present on these 9-year-old trees this year. Form is spreading.

3. (Quercus myrsinaefolia) is quiet spreading in form, evergreen and could be used as a screen or specimen tree. Height growth has slowed since reaching about 20 ft. after 8 years.

4. Only one strain of Cryptomeria japonica (NA-13454-C) keeps its green color through the winter.

5. P.I. 319315 (Pinus densiflora), planted 9 years ago, has considerable die-back this year, has put on very little height growth the past 2 years, and continues to spread more. Performance not too good. About 12 ft. tall.

6. (Pinus thunbergii) P.I. 342930 & P.I. 317258 grows very irregular, spreading, fast growth at early age but tends to have die-back after several years.

7. (Quercus chenii) P.I. 102653 has tremendous spread. Over 25 ft. height in 9 years. Looks healthy but must use in large areas.

8. (Metasequoia glyptostroboides) is a nice specimen tree. Over 20 feet in 9 years outplanted. Deciduous. Some people may confuse this with Taxodium distichum but Metasequoia has opposite leaves and Taxodium alternate leaves.

9. Most of the Cunninghamia lanceolata trees (P.I. 324969) are damaged by cold weather in middle Georgia each year, and sprout back in spring.

10. Acer ginnala var. Semenovii is only 6 ft. tall after 9 years and has performed poorly.

We received seed from 42 species of trees from the National Arboretum in May, 1978. A few of each have been planted in the greenhouse for future trials.

II. Dr. C. W. Kuhn, Dept. of Plant Pathology and Plant Genetics, University of Georgia, Athens, Georgia.

Peanut PI's 261945 and 261946 showed a high level of tolerance (no reduction in yield) to Peanut Mottle Virus. (Kuhn, C. W., O. R. Paquio, and D. B. Adams. 1978. Tolerance in peanuts to peanut mottle virus. Plant Disease Reptr. 62:365-368.)

III. Dr. Aubrey C. Mixon, SEA-FR, Coastal Plain Experiment Station, Tifton, Georgia.

In our effort to breed peanuts with resistance to toxin-producing strains of A. flavus, we have utilized peanut introductions very extensively. For our 1978 nursery we are increasing 38 lines selected from 19 peanut introductions that have various levels of resistance to seed colonization by A. flavus in the laboratory. We are also increasing 46 lines selected from crosses that have a peanut introduction as at least one of their parents. Twenty two of these lines have sufficient resistance for including in performance tests to evaluate their yield and market quality. Each year additional introductions are evaluated and new crosses or backcrosses are made as a continuing effort to breed peanuts resistant to aflatoxin strains of the Aspergillus fungus.

IV. Dr. R. O. Hammons, SEA-FR, Coastal Plain Experiment Station, Tifton, Georgia.

1. Agronomic evaluation of Arachis hypogaea L. introductions.

Adaptation, stability, performance and economic value were measured for 29 introduced peanuts with U. S. commercial cultivars as standards. Included were 4 Valencia cultivars recently released in the Manfredi, Argentina, breeding program. None of the 29 entries appeared superior to the standards. A reselection from PI 268689 was continued in the Spanish group of the national peanut variety tests. Two white-testa genotypes, 'Spanwhite' a fixed breeding line from the cross 'Argentine' (PI 121070) X Arachis monticola Krap et Rig. (PI 405933), and PI 288160 from India, exhibit considerable promise for economic use in food supplementation.

Sixty-four P.I.'s were grown in one-replicate observation nurseries and seed returned to the Plant Introduction Station.

2. Using Arachis introductions in breeding.

A new breeding and genetic effort created 275 F_1 hybrid plants in 36 cross combinations. Grown in a spaced field nursery these plants produced 183,721 F_2 seeds -- a record average 668 seed/F_1 plant. Single-plant productions records were: number of pods, 1,053; yield of pods, 1,310 g (cal. 8,864 kg/h); number of seed, 1,430; and weight of seed, 923 g/plant. These crosses combine parents with very high yield potential, performance, stability, growth configuration, shelling grade and organoleptic quality traits desirable in peanut agricultural production and finished food manufacturing. Plant introductions among the parental genotypes included:

(a) A. hypogaea: (1) leafspot resistant PI 109839 (7 combinations); (2) rust and leaf spot resistant 'Tarapoto' PI 341879 (10 combinations); high-yielding cultivar 'Makulu Red' PI 371965 (17 combinations); and high-yielding Rhodesian line from GKP Col. 486 PI 274191 (9 combinations).

(b) A. batizogaea PI 405082 (5 crosses).

Extensive F_2 populations (up to 2,000 plants per cross combination) are in culture in 1977/78 at Tifton and in an international breeding program, and numerous selections will be made for new breeding exploitation.

3. Rust resistant germplasm.

The world-wide threat of peanut rust, incited by Puccinia arachidis Speg., continues. Three primary sources of germplasm resistant to rust are documented by P.I. accession numbers and published in PANS.

Twenty P.I. accessions, mostly from Peru classified as resistant (scale 0 = highest to 4 = least) in USDA-SEA field nurseries at Tifton, GA and Isabella, Puerto Rico, were grown in a 4-replicate test at Tifton in 1977, but rust was not observed in Georgia. Among 60 peanut entries screened in the USDA-SEA Puerto Rican nursery, 1977-78 ca. 23 P.I.'s exhibited resistance to natural infection during a severe rust outbreak. Many are from the collection by Dr. L. D. Tripp, others were collected, bred, and/or evaluated by J. Romero.

Resistant accessions include: PI 336985, Arachis villosulicarpa
PI 338279-80, Arachis sp. HLK Col. 408/410.

4. Leafspot resistance breeding.

Two-way and four-way cross combinations involving peanuts with resistance to early leafspot and/or leaf rust (PI's 109839 and 259747 or 341879) were grown in F_1 and F_2 nurseries at Tifton and F_2 and F_3 nurseries in Puerto Rico and numerous selections made on agronomic criteria. These will be progeny tested in 1978.

5. Cylindrocladium black rot (CBR) resistance.

More than 1300 peanut P.I. accessions, fixed generation lines, or commercial cultivars have been screened under laboratory procedures for resistance to CBR inoculum in studies cooperative between University of Georgia Coastal Plain Station Plant Pathologist E. K. Sobers and USDA-SEA Geneticist R. O. Hammons. A significant percentage of these exhibit resistance to this serious disease. Individual isolates within lines are resistant when other plants from that culture are susceptible. Seed production from resistant isolates and re-testing with reselection is being practiced to intensify the resistance. Documentation for the P.I. accessions will be made as the study progresses.

6. Arachis species germplasm.

Limited seed was produced for several Arachis species accessions:
P.I. 378181 A. villosulicarpa 4n = 40 (1 embryo).
P.I. 336985 A. villosulicarpa 2n = 20
(Also, a glabrous-podded form)
P.I. 405082 A. batizogaea.
P.I. 405933 A. monticola.

In addition, a single plant of A. lignosa has survived three years at Tifton.

7. Roadside beautification and stabilization.

Studies have begun in a limited way in cooperation with the SCS Plant Materials Center, Americus, GA and the Dept. of Transportation, Atlanta, on the suitability and feasibility of using A. species HLK 408/410 (PI 338279/280) in the highway beautification program.

Publications

1. Worthington, R. E., and R. O. Hammons. Variability in Fatty Acid Composition Among Arachis Genotypes: A Potential Source of Product Improvement. (Lecture). J. Amer. Oil Chemists' Soc. 54(2): 105A-108A. Feb. 1977.

2. Amaya-Farfan, Jaime, Clyde T. Young and Ray O. Hammons. The Tryptophan Content of the U. S. Commercial and Some American Wild Genotypes of the Genus Arachis: A Survey. Oleagineux 32(5): 225-229. Eng. & Span. Resume, p. 229. May 1977.

3. Hammons, R. O. Groundnut Rust in the United States and the Caribbean (Invitational Paper). PANS (Pest Articles and News Summaries) (London) 23(3): 300-304. Sept. 1977.

S-9 Technical Committee Report

Louisiana State University, Baton Rouge, Louisiana

June 22-23, 1978

There are twelve research personnel at the University of Hawaii and one individual with the USDA soil conservation service involved in plant introduction and testing with a number of varying crops in Hawaii. Hundreds of these accessions are in various stages of testing, and few of the more promising ones are included in this report.

A. Forage and Ground Cover

1. Legumes (R. J. Joy and A. S. Whitney)

a. Biserrula pelecinus - PI-186284, 276650 - low-growing, fast spreading, and shows promise as ground cover in sugar cane.

b. Desmodium cinerascens - PI-282691 - tall, erect perennial and promising as brouse plant for domestic animal.

c. Vigna luteola - PI-280131 - trailing legume which appears as a perennial and promising as a ground cover.

d. Trifolium ambiguum - 108699, 206843, 291770 have indicated an excellent potential due to rhizomatous habit which give great drought resistance.

e. Trifolium arvense - 244322 - excellent but late flowering. PI-120076, 120079, 197082, 204518, and 249864 are very susceptible to diseases.

f. Trifolium trichocephalum - 233830 - very vigorous but disease susceptible.

g. Dolichos josei - low, fast spreading, perennial, being tested as ground cover on papayas.

h. Glycine wightii - PI-244980 - resistant to drought, excellent for pasture and erosion control in areas less than 30 inches.

2. Grasses (R. J. Joy and A. S. Whitney)

a. Digitaria valida - PI-299877 - perennial, tested for erosion control and beautification along highways.

b. Panicum maximum - PI-156074 - palatable, good recovery after clipping and preferred by cattle but poor seed production.

c. Panicum maximum var. trichoglume - PI-259549 - uniform, palatable, drought tolerant, perennial with fairly good seed production.

d. Paspalum hieronymii - PI-310108 - low growing, wear resistant, perennial, forms tight mat and promising as ground cover, heavy-used area and waterways.

3. Grains (J. R. Thompson and J. L. Brewbaker)

a. Zea maize - Over 100 PI's tested and used in breeding, representing crop section of tropical and sub-tropical materials. Following are PI's with outstanding characteristics: 'Jola'- late, tall, suitable to cooler conditions. 'Helminthosporium Resistant Composite'- late maturing, good resistance to H. turcicum with large ears. 'Yellow Caribbean Composite'- good ear size, adapted to sub-tropical conditions. 'Tuxpens'- heavy stalks, suitable to sub-tropics and tropical condition. 'Comiteco'- late maturing, large kernal. 'Antigua'- good mosaic resistance, adapted to sub-tropics.

B. Vegetables (J. A. Tanaka and T. Sekioka)

1. Capsicum annuum - 'Jessore' resistant to baterial wilt (Psuedomonus solanacearum), high yielding, hot pepper.

C. Fruits and Nuts (P. J. Ito and R. A. Hamilton)

1. Nuts

a. Canarium ovatum - Pili nut, Sel. # 1 & 2, both have 25% kernal, good yielding but low oil.

2. Fruits

a. Lancium domesticum - Lansone, good quality, good yields from several trees.

b. Nephelium lappaceum - Rambutan, good yield on several trees, quality variable.

c. Nephelium mutabile - Pulasan, fruits from seedlings of varying quality, sel. 4-3 has good quality and good production.

d. Garcinia mangostana - Mangosteen, good quality, few fruits after 14 years.

e. Artocarpus odoratissimus - Marang, high quality, good production from a slected tree.

f. Durio zibethinus - Durian, fair quality from seedling trees, flowers heavy but poor set.

D. Ornamentals (P. E. Parvin)

1. Cut flowers

a. Protea species--continued evaluation of 63 species for cut flower, foliage and landscaping.

E. New Cultivars and Breeding Lines Released

1. Grains (J. L. Brewbaker and J. R. Thompson)

a. Zea maize - 'H-610' & 'H-688', single and double cross respectively, resistant to mosaic, rust and helminthosporium, good yield, adapted to low elevation tropics.

2. Vegetables (J. A. Tanaka, T. Sekioka, & P. J. Ito)

a. Ipomea batatas - 'HAES 71-5', red skin, orange flesh, dry type, high in carotene and good yield.

b. Lycopersicon esculentum - 'HAES 8222 and 8248', large fruited, determinate, resistant to rootknot nematode, T.M.V., fusarium wilt and stemphylium.

c. Solanum tuberosum - 'Pele', high yielding, good quality potato for high elevation tropics with resistance to late blight.

3. Ornamentals (P. E. Parvin)

a. (Leucospermum conocarpodendron X L. cuneiforme) - 'Hawaii Gold', good quality cut flower, chrome yellow, small leaves, long stem, good production.

b. Protea laurifolia - 'Improved Rose Mink', superior form, long stem, excellent yield of high quality flowers.

4. Fruits and Nuts (P. J. Ito, R. A. Hamilton, and H. Y. Nakasone)

a. Macadamia integrifolia - 'Makai, HAES 800' and Mauka, HAES 741', 'Makai' for low elevations and 'Mauka' for higher elevations near 2000 feet. Both high yielding, good quality kernels.

b. Psidium guajava - 'Ka Hua Kula', high yielding, good quality, pink fleshed processing guava.

c. Passiflora edulis var. flavicarpa - 'Noel's Special', dark orange pulp, vigorous, tolerant to Alternaria passiflorae.

d. Persea americanca - 'Hayes', Guatemalan type, high yielding, good quality, dark purple, late season for export.

Thanks to all the researchers listed and their cooperation, this report is submitted by P. J. Ito.

LOUISIANA S-9 REPORT

June 1978

Richard J. Stadtherr
Horticulture Department
Louisiana State University

In 1977, 80 accessions were received including 47 ornamentals, 13 Trifoliums, 9 Paspalums, 6 Lycopersicons, and 5 Vignas.

In 1973 the year for which we are reporting for ornamentals received, we obtained 63 different accessions. Those which showed the greatest potential commercially include: Koelreuteria formosana PI 62345, Ilex verticillata 'Cacapon' PI 377678 and 'Fairfax' PI 377679, Lagerstroemia indica 'Seminole' NA 30166 and Pyracantha 'Mohave' NA 32225-C. Seedling plants of Koelreuteria were somewhat tender and killed to the ground the first winter. The Seminole crapemyrtle has been very popular and the plant would have been larger if frequent cuttings weren't taken for propagation purposes.

LOUISIANA STATE UNIVERSITY

Annual Report-June 22 and 23, 1978 - S-9 Committee

Ornamentals, R. J. Stadtherr

NAME	P.I OR N.A. NOS.	NO. PLANTS REC'D	NO. PLANTS LIVING	HEIGHT & WIDTH AVERAGE INCHES	COMMENTS
Received 2/23/73 (Miami)					
Koelreuteria formosana	PI 62345	(Seeds)	3	40 x 30	Well adapted. Others died in grass fire in 1976.
Received 2/28/73					
Hibiscus syriacus 'Diana'	NA 32224-C	1	1	20 x 12	Very slow grower.
Pyracantha 'Mohave'	NA 32225-C	1	1	72 x 84	Well-adapted.
Received 3/9/73					
Alnus japonica	NA 33517	1	1	120 x 60	Species not well-adapted.
Betula platyphylla	NA 33520	1	0		Died after grass fire 1976.
Hydrangea scandens Subsp. *chinensis*	NA 31487-C	1	0		Dead 5/30/74.
Lomicera xylosteum	NA 33974	1	0		Lost in fire 1976.
Lomicera xylosteum	NA 33990	1	0		Lost in fire 1976.
Pinus brutia	NA 33064	1	0		Dead 7/20/76.
Rhododendron austrium 'Yellow River'	NA 10060-C	1	0		Died when moved.
Rhododendron Chapmanii	NA 33289	1	1	24 x 36	Not well-adapted in lath house.
Rhododendron Kaempferi 'Dorsett'	NA 27348-C	1	1	60 x 18	Well-adapted.
Weinmannia racemosa	NA 30154	1	0		Dead 5/30/74.
Received 4/9/73					
Buxus microphylla 'Intermedia'	PI 326543	1	0		
Clematis sp.	PI 358786	1	0		
Clematis sp.	PI 358787	2	0		
Clematis sp.	PI 358788				
Hypericum sp.	PI 358791	4	0		Lost in fire 1976.

NAME	P.I. OR N.A. NOS.	NO. PLANTS REC'D	NO. PLANTS LIVING	HEIGHT & WIDTH AVERAGE INCHES	COMMENTS
Received 4/9/78 (continued)					
Ilex verticillata 'Cacapon'	PI 377678	3	2	48 x 28	Well-adapted.
Ilex verticillata 'Fairfax'	PI 377679	1	1	30 x 20	Well-adapted.
Ilex verticillata 'Shaver'	PI 377681	1	0		Lost in fire 1976.
Lonicera pileata 'yunnanensis'	PI 367886	2	2		Have propagated. Well-adapted.
Pontentilla argentea	PI 376937	1	0		
Pontentilla erecta	PI 376938	1	0		
Rhododendron sp.	PI 358798	3	0		
Rosa sp.	PI 358800	2	1	58 x 48	Will discard.
Salix fragilis	PI 370126	6	1	700 x 120	Nothing extraordinary. Discard.
Sambucus siberica	PI 376939	2	0		Discarded.
Sedum sp.	PI 376940	1	1		Have in lath house.
Sorbus torminalis	PI 358440	1	0		Lost in fire 1976.
Cornus (hybrid)	PI 367881	4	0		Lost in fire 1976.
Received 5/3/73					
Rhododendron aurigeranum	PI 354292	2	0		
Rhododendron aurigeranum	PI 354293	2	0		
Rhododendron aurigeranum	PI 354294	3	0		
Rhododendron dielsianum	PI 354304	1	0		
Rhododendron dielsianum	PI 354305	1	0		
Rhododendron macgregoriae	PI 354328	1	0		
Rhododendron amcgregoriae	PI 354330	1	0		
Rhododendron macgregoriae	PI 354331	1	1	50 x 50	In lath house well-adapted.
Rhododendron macgregoriae	PI 354378	1	0		
Rhododendron macgregoriae	PI 354381	2	0		
Rhododendron macgregoriae	PI 354329	2	0		
Rhododendron zoelleri	PI 354362	1	0		
Rhododendron zoelleri	PI 354365	1	0		Bloomed 2 years. In flower when frost hit in 1976 and plants died in lath house.
Rhododendron zoelleri	PI 354366	1	0		
Rhododendron sp.	PI 354373	1	0		
Rhododdendron sp.	PI 354376	1	0		

NAME	P.I. OR N.A. NOS.	NO. PLANTS REC'D	NO. PLANTS REC'D	HEIGHT & WIDTH AVERAGE INCHES	COMMENTS
Received 5/3/73 (continued)					
Rhododendron sp.	PI 354380	1	0		
Received 8/21/73 (Experiment) arriced in very poor condition					
Callicarpa japonica	PI 317359	Cuttings	0		Grew well. Discarded 1976. Unattractive.
Cotoneaster microphylla	PI 285343	Cuttings	0		Lost in 1976 grass fire.
Ilex crenata	PI 317235	Cuttings	1	25 x 22	Lost in 1976 grass fire. Just one left. Dwarf.
Ilex montana	PI 316704	Cuttings	2	33 x 30	
Itea japonica	PI 226131	Cuttings	4	40 x 30	Suckers badly.
Lonicera insularis	PI 316409	Cuttings	0		Lost in 1976 grass fire.
Spiraea salicifolia	PI 317288	Cuttings	0		Never rooted.
Spirea fritschiana	PI 317285	Cuttings	0		Never rooted.
Spirea fritschiana	PI 317286	Cuttings	0		Never rooted.
Received 9/20/73					
Lagerstroemia indica 'Seminole'	NA 30166	1	1	66 x 40	Size kept down by taking cuttings-Good demand.
Received 10/1/73 (Chico)					
Dichotomenthos tristaniaecarpa	PI 56117	seed	0		No germination.
Cocculus trilobus	PI 85733	seed	1	vine	In lath house.
Tilia dasystyla	PI 27667	seed	0		Germination but died.
Received 12/12/73 (Miami)					
Dombeya 'Rosemound'	PI 205654	1	0		Carried over in greenhouse. Excellent patio plants for summer.
Dombeya 'Seminole'	M. 21597	1	0		Carried over in greenhouse. Excellent patio plants for summer.

Evaluation of Cowpea and Soybean Varieties and Dolichous Strains for Quality Forage Production Potential, 1977*

Charles R. Montgomery and Marvin Allen

Twelve varieties of cowpeas, two soybean varieties, and two Dolichous strains were planted on Providence silt loam May 26, 1977, in replicated small plots. The experimental area was fertilized uniformly before planting with 20, 60, and 120 pounds per acre of N, P_2O_5, and K_2O, respectively. Inoculated seed were drilled in 36-inch rows at a rate of 10-12 seed per linear foot. Treflan (4 pounds per gallon) was applied prior to planting at the rate of 0.5 pound active material per acre on the broadcast basis.

Results and Discussion

The first of two harvests was made July 8, when the forage was approximately 24 inches high and in the vegetative stage (Table 1). Forage regrowth was harvested August 1. Season-total dry matter (DM) yields for the cowpeas ranged from 2,349 pounds with Miss. Purple to 2,895 pounds per acre with Magnolia Blackeye. Dolichous DM yields were significantly ($P \leq .05$) lower than the cowpea yields. Soybeans exhibited lower yields than both the cowpeas and Dolichous. Forage dry matter percentages, Table 2, were highest for soybean varieties, followed by

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* Taken from: S.E.La. Dairy and Pasture Exp. Sta. Annual Progress Report. 1977. pp. 32-44.

Dolichous strains. The DM percentages of cowpeas were significantly ($P \leq .05$) lowest of all.

Structural carbohydrate percentages, including cell-wall-constituents (CWC), hemicellulose (HC), acid-detergent fiber (ADF), cellulose, acid-insoluble lignin (AIL), and acid-insoluble ash (AIA), are presented in Tables 3, 4, 5, 6, 7 and 8, respectively. No significant differences were noted in season average CWC, ADF, and AIL percentages among cowpea varieties. Season-average CWC and ADF percentages of the soybeans were significantly ($P \leq .05$) higher than those of the Dolichous strains, which were not significantly different from the cowpea varieties. There was no significant difference in season-average HC percentages among or between the Dolichous strains and soybean varieties. Hemicellulose percentages of the cowpeas ranged from 3.6 to 7.0. Season-average cellulose percentages among cowpeas were not significantly different, with the exception of Magnolia Blackeye, which exhibited a significantly ($P \leq .05$) lower cellulose percent. Soybean varieties had significantly ($P \leq .05$) higher cellulose percentages than the Dolichous strains and cowpea varieties.

Season-average CP percentages of the cowpeas ranged from 22.7 with Iron Clay to 25.0 with Calhoun Purple Hull (Table 9). The CP percentages of the cowpeas were not significantly different among varieties, with the exception of Iron Clay which was significantly ($P \leq .05$) lower than all other cowpea varieties. The soybean varieties were significantly ($P \leq .05$) lower in CP than all cowpea varieties.

No significant differences were noted among cowpea varieties in season-average in vitro digestible dry matter (IVDDM), with the exception of Miss. Silver which was significantly ($P \leq .05$) lowest (Table 10). Season-average IVDDM values ranged from 69.7 to 72.0 percent. Soybeans exhibited the lowest IVDDM values, which were significantly ($P \leq .05$) lower than all cowpea varieties.

In summary, DM yields of soybean varieties and Dolichous strains were significantly lower than the yields of the cowpea varieties. Dry matter yields were significantly different among cowpea varieties, however the range was only 549 pounds per acre for the season. Quality measurements, including CWC, ADF, AIL, CP, and IVDDM showed no practical differences among cowpea varieties. Soybean varieties and Dolichous strains were lower in quality, as indicated by higher structural carbohydrate percentages and lower CP and IVDDM values.

Table 1. Field performance of cowpea and soybean varieties and Dolichous strains for forage production, 1977

Entry	Harvest date[1] July 8	Harvest date[1] Aug. 1	Season[1] total	Two-yr. av.
Cowpeas:	- - - - Dry forage yield, lbs/a - - - -			
Miss. Purple	1271[a]	1624[a]	2895[a]	2895
Big Boy	1123[abc]	1632[a]	2755[abc]	3101
Miss. Silver	1054[bc]	1588[ab]	2642[abcd]	2717
Magnolia Blackeye	1122[abc]	1227[d]	2349[d]	2091
Bunch Purple Hull	1192[abc]	1555[ab]	2747[abc]	2241
Iron Clay	1081[bc]	1564[ab]	2645[abcd]	2724
Dixie Lee	1092[abc]	1463[abc]	2555[bcd]	2710
Brown Crowder	1223[ab]	1651[a]	2874[ab]	2899
Blue Goose	1009[c]	1479[abc]	2488[cd]	3001
Black Crowder	1194[abc]	1490[abc]	2684[abc]	2700
Calhoun Purple Hull	1048[bc]	1481[abc]	2529[cd]	2612
La. Green	1201[ab]	1319[cd]	2520[cd]	1891
Bossier (Soybean)	571[e]	1008[e]	1579[f]	
Pelican (Soybean)	804[d]	886[e]	1690[ef]	
Dolichous 164772	560[e]	1399[bcd]	1959[e]	
Dolichous 284802	594[e]	1359[cd]	1953[e]	

[1]Values within each column with different superscripts differ significantly at the P/.05 level of probability.

Table 2. Dry matter content of forage from cowpea and soybean varieties and Dolichous strains, 1977

Entry	Harvest date[1] July 8	Harvest date[1] Aug. 1	Season[1] av.	Two-yr. av.
Cowpeas:	- - - - - - - -	Percent	- - - - - - -	
Miss. Purple	12.9^{abc}	12.7^{bc}	12.8^{abcde}	14.9
Big Boy	13.3^{abc}	12.1^{ab}	12.7^{abcde}	14.0
Miss. Silver	12.5^{ab}	13.0^{bc}	12.7^{abcde}	14.7
Magnolia Blackeye	13.8^{bc}	13.2^{c}	13.5^{e}	14.9
Bunch Purple Hull	14.3^{c}	12.6^{bc}	13.5^{e}	15.2
Iron Clay	12.8^{abc}	11.8^{a}	12.3^{abc}	13.7
Dixie Lee	13.0^{abc}	13.4^{c}	13.2^{cde}	14.4
Brown Crowder	11.9^{a}	12.2^{ab}	12.0^{ab}	14.1
Blue Goose	13.8^{bc}	13.0^{bc}	13.4^{e}	14.7
Black Crowder	12.6^{ab}	12.7^{bc}	12.6^{abcde}	14.0
Calhoun Purple Hull	12.0^{a}	11.4^{a}	11.7^{a}	13.7
La. Green	12.8^{abc}	12.2^{ab}	12.5^{abcd}	14.1
Bossier (Soybean)	25.5^{f}	21.2^{f}	23.4^{g}	
Pelican (Soybean)	23.0^{e}	17.4^{e}	20.2^{g}	
Dolichous 164772	20.1^{d}	16.9^{d}	18.5^{f}	
Dolichous 284802	20.9^{d}	16.1^{de}	18.5^{f}	

[1]Values within each column with different superscripts differ significantly at the $P \angle .05$ level of probability.

Table 3. Forage cell-wall-constituent content of cowpea and soybean varieties and Dolichous strains, 1977

Entry	Harvest date[1] July 8	Harvest date[1] Aug. 1	Season[1] av.	Two-yr. av.
Cowpeas:	- - - - - - - -	Percent	- - - - - - -	
Miss. Purple	33.4[a]	33.4[a]	33.4[a]	33.1
Big Boy	32.7[a]	33.8[a]	33.3[a]	32.5
Miss. Silver	35.2[a]	34.1[a]	34.7[a]	32.7
Magnolia Blackeye	37.1[b]	34.1[a]	35.6[a]	34.1
Bunch Purple Hull	32.5[a]	34.0[a]	33.3[a]	32.8
Iron Clay	33.4[a]	34.6[a]	34.0[a]	34.0
Dixie Lee	33.3[a]	35.4[a]	34.4[a]	34.0
Brown Crowder	36.0[a]	34.2[a]	35.1[a]	33.6
Blue Goose	34.3[a]	34.9[a]	34.6[a]	33.4
Black Crowder	33.9[a]	35.1[a]	34.5[a]	33.2
Calhoun Purple Hull	34.1[a]	36.2[a]	35.2[a]	35.2
La. Green	34.0[a]	35.2[a]	34.6[a]	34.1
Bossier (Soybean)	46.4[c]	43.1[b]	44.8[b]	
Pelican (Soybean)	42.4[c]	45.0[b]	43.7[b]	
Dolichous 164772	37.2[b]	36.5[a]	36.9[a]	
Dolichous 284802	37.9[b]	35.7[a]	36.8[a]	

[1]Values within each column with different superscripts differ significantly at the P/.05 level of probability.

Table 4. Forage hemicellulose content of cowpea and soybean varieties and Dolichous strains, 1977

Entry	Harvest date[1] July 8	Harvest date[1] Aug. 1	Season[1] av.	Two-yr. av.
Cowpeas:	- - - - - - - -	Percent	- - - - - - -	
Miss. Purple	2.5[a]	4.6[a]	3.6[a]	4.5
Big Boy	3.6[ab]	5.1[a]	4.4[a]	4.6
Miss. Silver	3.4[ab]	4.0[a]	3.7[a]	4.7
Magnolia Blackeye	6.9[bcd]	5.3[ab]	6.1[ab]	6.4
Bunch Purple Hull	3.7[a]	5.6[ab]	4.7[a]	5.7
Iron Clay	3.9[ab]	5.6[ab]	4.8[a]	5.5
Dixie Lee	4.1[ab]	6.0[ab]	5.1[a]	5.5
Brown Crowder	4.8[abc]	6.2[ab]	5.5[ab]	5.8
Blue Goose	4.2[ab]	5.4[ab]	4.8[a]	5.3
Black Crowder	3.4[ab]	4.8[a]	4.1[a]	5.1
Calhoun Purple Hull	4.3[ab]	7.3[ab]	5.8[ab]	6.5
La. Green	4.8[abc]	9.2[b]	7.0[b]	6.1
Bossier (Soybean)	6.4[bcd]	8.7[b]	7.6[b]	
Pelican (Soybean)	5.3[ac]	6.8[ab]	6.1[b]	
Dolichous 164772	8.3[cd]	8.4[ab]	8.4[b]	
Dolichous 284802	9.7[d]	7.4[ab]	8.6[b]	

[1]Values within each column with different superscripts differ significantly at the $P \leq .05$ level of probability.

Table 5. Forage acid-detergent fiber content of cowpea and soybean varieties and Dolichous strains, 1977

Entry	Harvest date[1] July 8	Harvest date[1] Aug. 1	Season[1] av.	Two-yr. av.
Cowpeas:	- - - - - - - -	Percent	- - - - - - -	
Miss. Purple	31.0[a]	28.8[a]	29.9[a]	28.8
Big Boy	29.1[a]	28.7[a]	28.9[a]	28.0
Miss. Silver	31.8[a]	30.1[b]	31.0[a]	28.0
Magnolia Blackeye	30.2[a]	28.8[a]	29.5[a]	27.6
Bunch Purple Hull	28.8[a]	28.4[a]	28.6[a]	27.2
Iron Clay	30.0[a]	29.0[a]	29.5[a]	28.3
Dixie Lee	29.3[a]	29.4[a]	29.4[a]	28.5
Brown Crowder	31.2[a]	28.0[a]	29.6[a]	27.8
Blue Goose	30.1[a]	29.5[a]	29.8[a]	28.2
Black Crowder	30.5[a]	30.3[b]	30.4[a]	28.1
Calhoun Purple Hull	29.9[a]	28.9[a]	29.4[a]	28.7
La. Green	29.3[a]	26.0[a]	27.7[a]	28.0
Bossier (Soybean)	40.0[b]	33.9[b]	37.0[b]	
Pelican (Soybean)	37.1[b]	38.2[c]	37.7[b]	
Dolichous 164772	28.9[a]	28.0[a]	28.5[a]	
Dolichous 284802	28.3[a]	28.3[a]	28.3[a]	

[1] Values within each column with different superscripts differ significantly at the $P \leq .05$ level of probability.

Table 6. Forage cellulose content of cowpea and soybean varieties and Dolichous strains, 1977

Entry	Harvest date[1] July 8	Harvest date[1] Aug. 1	Season[1] av.	Two-yr. av.
Cowpeas:	- - - - - - - - -	Percent	- - - - - - - - -	
Miss. Purple	18.0[b]	23.2[ab]	20.6[bc]	20.3
Big Boy	16.6[ab]	22.8[ab]	19.7[abc]	19.8
Miss. Silver	18.3[b]	23.4[ab]	20.9[abc]	19.5
Magnolia Blackeye	19.8[c]	22.9[ab]	21.4[c]	20.2
Bunch Purple Hull	16.1[ab]	22.3[ab]	19.2[abc]	18.1
Iron Clay	17.4[b]	23.5[ab]	20.5[bc]	20.3
Dixie Lee	17.0[b]	23.5[ab]	20.3[abc]	20.2
Brown Crowder	18.2[b]	22.5[ab]	20.4[bc]	19.7
Blue Goose	18.3[b]	23.5[ab]	20.9[bc]	20.3
Black Crowder	18.2[b]	23.1[ab]	20.7[bc]	19.7
Calhoun Purple Hull	18.1[b]	23.9[ab]	21.0[bc]	20.5
La. Green	17.1[b]	20.7[a]	18.9[abc]	19.7
Bossier (Soybean)	22.5[c]	24.7[b]	23.6[d]	
Pelican (Soybean)	21.7[c]	29.7[c]	25.7[d]	
Dolichous 164772	14.9[ab]	22.0[ab]	18.5[abc]	
Dolichous 284802	13.1[a]	21.9[ab]	17.5[a]	

[1]Values within each column with different superscripts differ significantly at the P/.05 level of probability.

Table 7. Forage acid-insoluble lignin content of cowpea and soybean varieties and Dolichous strains, 1977

Entry	Harvest date[1] July 8	Harvest date[1] Aug. 1	Season[1] av.	Two-yr. av.
Cowpeas:	- - - - - - - -	Percent	- - - - - - -	
Miss. Purple	6.00[cd]	5.08[a]	5.54[a]	5.52
Bog Boy	4.83[abc]	5.10[ab]	4.97[a]	5.02
Miss. Silver	6.55[cde]	5.99[abc]	6.27[ab]	5.59
Magnolia Blackeye	5.35[abcd]	4.86[a]	5.11[a]	4.90
Bunch Purple Hull	5.30[abc]	5.81[abc]	5.56[a]	5.28
Iron Clay	5.78[cd]	5.29[abc]	5.54[a]	5.31
Dixie Lee	4.99[abc]	5.09[ab]	5.04[a]	5.18
Brown Crowder	5.51[bcd]	4.74[a]	5.13[a]	4.96
Blue Goose	5.00[abc]	5.51[abc]	5.26[a]	4.97
Black Crowder	5.38[bcd]	6.64[bc]	6.01[ab]	5.55
Calhoun Purple Hull	6.04[cde]	6.25[abc]	6.15[ab]	5.74
La. Green	5.26[abc]	4.54[a]	4.90[a]	5.32
Bossier (Soybean)	7.04[e]	6.78[bc]	6.91[b]	
Pelican (Soybean)	7.79[e]	7.01[c]	7.40[b]	
Dolichous 164772	3.93[ab]	5.00[a]	4.47[a]	
Dolichous 284802	3.68[a]	5.29[abc]	4.49[a]	

[1]Values within each column with different superscripts differ significantly at the P/.05 level of probability.

Table 8. Forage acid-insoluble ash content of cowpea and soybean varieties and Dolichous strains, 1977

Entry	Harvest date[1] July 8	Harvest date[1] Aug. 1	Season[1] av.	Two-yr. av.
Cowpeas:	- - - - - - - - - - Percent - - - - - - -			
Miss. Purple	6.66[a]	0.58[a]	3.62[ab]	2.95
Big Boy	7.65[ab]	0.75[a]	4.20[ab]	3.11
Miss. Silver	7.00[a]	0.96[b]	3.98[ab]	3.06
Magnolia Blackeye	7.51[a]	0.78[a]	4.15[abc]	3.17
Bunch Purple Hull	7.35[a]	0.40[a]	3.88[ab]	3.75
Iron Clay	6.69[a]	0.24[a]	3.47[a]	3.02
Dixie Lee	7.24[a]	0.80[a]	4.02[abc]	3.20
Brown Crowder	7.54[a]	0.75[a]	4.15[abc]	3.23
Blue Goose	6.86[a]	0.56[a]	3.71[ab]	2.95
Black Crowder	6.95[a]	0.53[a]	3.74[ab]	2.92
Calhoun Purple Hull	7.03[a]	0.84[a]	3.94[ab]	3.18
La. Green	6.96[a]	0.80[a]	3.88[ab]	3.15
Bossier (Soybean)	7.70[a]	1.94[c]	4.82[bcd]	
Pelican (Soybean)	7.49[a]	1.45[b]	4.47[bcd]	
Dolichous 164772	9.26[bc]	1.08[b]	5.17[de]	
Dolichous 284802	9.94[c]	1.15[b]	5.55[e]	

[1] Values within each column with different superscripts differ significantly at the P/.05 level of probability.

Table 9. Forage crude protein content of cowpea and soybean varieties and Dolichous strains, 1977

Entry	Harvest date[1] July 8	Harvest date[1] Aug. 1	Season[1] av.	Two-yr. av.
Cowpeas:	- - - - - - - - -	Percent	- - - - - - -	
Miss. Purple	24.5[abc]	22.4[abc]	23.5[ab]	23.4
Big Boy	25.2[ab]	21.6[abcd]	23.4[ab]	23.6
Miss. Silver	25.6[ab]	23.6[ab]	24.6[a]	24.5
Magnolia Blackeye	24.1[bc]	22.3[abc]	23.2[abc]	23.2
Bunch Purple Hull	25.6[ab]	21.9[abcd]	23.8[ab]	23.5
Iron Clay	24.6[abc]	20.8[bcde]	22.7[bc]	23.7
Dixie Lee	25.3[ab]	21.8[abcd]	23.6[ab]	23.2
Brown Crowder	24.5[abc]	22.6[ab]	23.6[ab]	23.5
Blue Goose	25.1[abc]	22.5[ab]	23.8[ab]	23.5
Black Crowder	25.1[abc]	23.0[ab]	24.1[ab]	24.7
Calhoun Purple Hull	26.2[a]	23.8[a]	25.0[a]	24.7
La. Green	25.5[ab]	23.4[a]	24.5[a]	24.6
Bossier (Soybean)	22.1[de]	19.1[e]	20.6[d]	
Pelican (Soybean)	21.7[e]	19.1[e]	20.4[d]	
Dolichous 164772	23.5[cde]	19.8[de]	21.7[cd]	
Dolichous 284802	23.8[bcd]	20.0[cde]	21.9[cd]	

[1]Values within each column with different superscripts differ significantly at the $P \leq .05$ level of probability.

Table 10. Forage in vitro digestion values of cowpea and soybean varieties and Dolichous strains, 1977

Entry	Harvest date[1] July 8	Harvest date[1] Aug. 1	Season[1] av.	Two-yr. av.
Cowpeas:	- - - - - - - - - -		Percent - - - - - - -	
Miss. Purple	70.3^{a}	73.6^{a}	72.0^{a}	70.8
Big Boy	69.3^{ab}	72.3^{a}	70.8^{abc}	70.6
Miss. Silver	68.0^{ab}	71.3^{ab}	69.7^{bcde}	69.8
Magnolia Blackeye	68.9^{ab}	73.5^{a}	71.2^{abc}	71.1
Bunch Purple Hull	69.7^{ab}	72.3^{ab}	71.0^{abc}	70.3
Iron Clay	69.7^{ab}	73.0^{ab}	71.4^{ab}	70.5
Dixie Lee	68.5^{ab}	72.4^{ab}	70.5^{abc}	70.3
Brown Crowder	68.4^{ab}	72.9^{ab}	70.7^{abc}	70.7
Blue Goose	69.6^{ab}	70.4^{ab}	70.0^{abcd}	69.2
Black Crowder	69.8^{ab}	72.0^{ab}	70.9^{abc}	70.2
Calhoun Purple Hull	69.1^{ab}	72.8^{ab}	71.0^{abc}	70.3
La. Green	68.9^{ab}	73.5^{a}	71.2^{abc}	70.3
Bossier (Soybean)	64.6^{e}	69.5^{b}	67.1^{f}	
Pelican (Soybean)	65.0^{de}	70.8^{ab}	67.9^{ef}	
Dolichous 164772	65.6^{cde}	70.6^{ab}	68.1^{def}	
Dolichous 284802	67.5^{bcd}	71.0^{ab}	69.3^{cde}	

[1]Values within each column with different superscripts differ significantly at the P/.05 level of probability.

Mississippi S-9 Progress Report for 1977-78

C. E. Watson, Jr.
Department of Agronomy
Mississippi State University

The following introductions were received from the Plant Introduction Station by Mississippi cooperators during the past year:

Genus	no. of accessions
Cenchuris	30
Citrullus	2
Cucumis	655
Festuca	205
Lolium	236
Luecaena	1
Lycopersicon	7
Spartina	1
Stenotaphrum	20
Trifolium	19
Total accessions	1178

Festuca (Dr. C. E. Watson, Jr.)

158 introductions of Festuca arundinacea Schreb. were planted in the Fall of 1977. These lines are currently being evaluated for their forage potential. Characteristics being evaluated include yield, winter growth, growth habit, leafiness, heat tolerance, cold tolerance, seed yield, and disease resistance.

Lolium (Dr. C. E. Watson, Jr.)

221 introductions of annual species of Lolium were planted in the Fall of 1977 and evaluated for their forage potential. Species examined included: Lolium multiflorum, L. rigidum, L. temulentum, L. canariensa, L. persicum, L. remotum, L. sublatum, and L. strictum. The following introductions exhibited good forage characteristics and are worthy of further examination:

L. multiflorum: 189151, 189389, 189390, 196538, 222526, 235038, 240698, 241586, 241912, 241913, 265337, 265339, 266111, 266112, 272118, 272119, 274638, 283609, 286464, 287847, 295600, 306691, 321395, 339701, 343155, 343156, 371951, 376874, 376875, 376876, 376877.
L. rigidum: 196336, 239779, 239795, 239796, 239798, 250806, 254899, 298416, 311421, 311423, 311424, 314447, 317452.
L. temulentum: 220526, 249725.
L. persicum: 317450.
L. subulatum: 197310.

Lupinus (Dr. V. H. Watson)

75 accessions of blue, white, and yellow lupines from 15 countries were all winterkilled during January and February 1978. Seed were obtained from the Western Plant Introduction Station, Pullman, Washington.

Trifolium (Dr. W. E. Knight)

Eighty-six plant accessions of subterranean clover, *Trifolium subterraneaum* L. were grown in the field in replicated rows in 1977-78. These accessions were rated for vigor, incidence of disease, and spread. Accessions with promise will be increased for evaluation in plots.

One hundred six accessions had insufficient seed to plant in the field. These accessions were grown in the greenhouse for seed increase and were evaluated for vigor, disease and plant type. In 1978-79, these accessions will be evaluated in the field in seeded rows.

Seven accessions evaluated earlier have been increased for evaluation in field plots. These accessions are PI-168638, 184,962, 291917, 311498, 311499, 319145 and 319146. These introductions are well adapted in Mississippi and have outstanding agronomic traits. They have been equal or superior to Australian cultivars during the winters of 1976-77 and 1977-78, the two worst winters on record in Mississippi.

Many of the accessions from Dr. Ian Forbes collection do not appear to have the desired agronomic characteristics sought in Mississippi. They will provide useful genetic diversity for internode length and possibly disease resistance.

Lycopersicon (Dr. E. L. Moore)

Several P. I. numbered lines were received and screened for resistance to buckeye rot caused by *P. parasitica* and soil rot caused by *R. solani*. PI-193407 continues to be the best source of resistance to soil rot infection and PI-205011 the best for buckeye resistance. Soil rot resistance from PI-193407 is inherited as a dominant character at a level of about 30% infection as compared to 75 to 100% for control cultivars in laboratory screening tests. We are using both lines in our breeding program to develop acceptable cultivars with resistance to these two diseases.

North Carolina - New Plant Project

Report of W. T. Fike for S-9 Technical Committee, Baton Rouge, Louisiana, 1978.

Of the 30 campus research personnel who receive P.I. catalogues and information through my office, and others who receive information direct, five cooperators received a total of 240 lines consisting of 23 species of 13 plant genera.

Dr. Jackues Jorgensen	USDA Forest Service	Legumes
Dr. George Kennedy	Entomology	Lycopersicons
Dr. Dave Timothy	Crop Science	Pennisetums
Dr. Craig Pearson	Soil Science	Paspalums
Dr. Warren Henderson	Horticulture Science	Lycopersicons

These are, however, just a very small part of the total number of plant introductions under test in North Carolina as many hundreds of accessions are in various stages of advanced testing.

A. Plant Introduction of Special Interest:

Letter from Dr. Dave Timothy - "I maintain several PI's of *Pennisetum orientale* and *P. flaccidum*, because of their potential as forage species (perennial, high yield, high digestibility, and good protein level), as follows: *P. orientale* - 215,600; 271,593; 271,594; 271,595; 271,596. *P. flaccidum* - 220,606.

PI's 220,606 and 271,596 are especially promising and are now in replicated grazing trials for comparison with switchgrass (*Panicum virgatum*) and a tall fescue-Coastal bermudagrass system.

I continue to have interest in collections of *Pennisetum flaccidum* from Northwest Afghanistan and Kashmir, particularly.

I also maintain about 220 PI clones of *Tripsacum* species because of biosystematic interest. My lists of these, and other PI's of *Tripsacum* seed were submitted to Quentin Jones and/or Bob Langford a few years ago. I do not maintain my current lists with readily accessible PI numbers, so these numbers are not enclosed."

B. Evaluation of Potential New Crops:

Twelve farmers from three blackland counties grew 1200 acres of kenaf under contract in 1977. The variety Cuba 2032 was used in planting this acreage because of an available seed supply. The contracting company provided the seed and harvested the crop. The farmer was responsible for the land, fertilization and planting of the crop. Yields were average or above on 11 farms. The drilled crop, averaging from eight to ten feet in height, was cut with a cutter-crimper and baled. The bales were stacked in 40x100x40 foot stacks from which the kenaf will be decorticated during the

winter of 1978-79. The fiber will be used in the manufacture of fine quality paper. An extremely wet fall and winter hindered harvesting operations but everyone concerned with the project was satisfied with the program. Ten farmers have planted 1000 acres this year. An improved variety, Guatamala 51, makes up a large part of the acreage. Taining No. 1 is also being grown on a limited acreage for comparison. An adequate seed supply of improved varieties will be the mainstay of this venture in future years.

1978 Report to S-9
from the
Oklahoma Agricultural Experiment Station

Peanut Germplasm Resources - D. J. Banks

The wild and cultivated peanut (Arachis) collections made in Brazil, Argentina, Bolivia, and Paraguay during the Gregory-Krapovickas expeditions of 1976-77 under the auspices of the International Board for Plant Genetic Resources (FAO, Rome) are being increased for further distribution. A preliminary increase was made in Oklahoma last summer of the A. hypogaea collections. A winter increase of most of the cultivated types was made in Puerto Rico during the past winter. Further increases of these, as well as the wild collections, are under way now in Oklahoma and Texas.

Dr. Charles Simpson, Texas, returned to Argentina and Brazil during June 1-14, 1978 to acquire the remainder of the wild collections which are being increased in those countries for distribution to the United States. These collections will be further increased in Oklahoma and Texas as soon as they are received. All of these collections are being processed through the established U.S. Plant Introduction procedures. Distribution to ICRISAT, India, will be made as soon as increases are sufficient.

All of the above collections will be evaluated for pest resistance and other desirable characteristics as soon as adequate supplies have been established. Preliminary evaluations on leafspot resistance are being made in Oklahoma.

Peanut and Mungbean P.I. Increase - J. S. Kirby

The Oklahoma Agricultural Experiment Station has cooperated with the Regional P.I. Center and the National Seed Storage Laboratory for the past 2 years in attempting to increase seed of 700 peanut introductions. We attempted the first two seasons at the Perkins location which proved to be a mistake. The 1976 and 1977 seasons were two of the driest years on record and we also had early freezes both years. Seed increases were small and many of the later lines did not produce mature seed. In 1978, we have planted these lines at our Ft. Cobb location which is much less convenient for labor requirements, but which should give us better production. The lines producing no mature seed resulted in plots with no stand this year, so we will have to go back to the P.I. center's reserve seed supply to try again.

In 1978, the Oklahoma AES received seed of 1257 new mungbean introductions to increase and get preliminary evaluation. These lines are planted at our Perkins station and are looking quite good thus far.

Sorghum Germplasm - D. E. Weibel

The sorghum program has F_2 and F_3 segregates from 20 newly converted sorghums which came from introductions. We also have test crosses for early evaluation of 15 more converted lines. We are also using 10-15 Texas lines that have introductions in their lineage, having been derived from crosses of adapted sorghums and converted lines (P.I.'s).

Forest Tree Germplasm - C. G. Tauer

Six seed sources of Virginia pine (*Pinus virginia*) were brought in this spring as 1-0 seedlings. These seedlings were obtained from Dr. Floyd Groggins, Auburn University, and are native to the southeastern U.S. No evaluations are as yet available.

NEW CROPS RESEARCH IN PUERTO RICO

Annual Report July 1977-June 1978

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Río Piedras, Puerto Rico 00928

During the period covered by this report 29 accesions were received. These were grouped as fruits, 9; ornamentals, 9; and forages, 11.

Fruits: Evaluation of avocado (*Persea americana*) continued. Forty-four varieties are being evaluated in two experiments. Work on grapes (*Vitis* sp.) continued. Seven selections and one specie were incorporated to the collection. Two new introductions were received, one from India (Anab-e-shali) and another from St. Thomas, V.I. This year the most promising varieties Ribier and Exotic, were pruned during the second week of November. The purpose of this early prune is to prepare the plants to observe if they can be pruned twice a year to produce two crops.

Ornamentals: Bougainvillea continued to be the most promising introduction received. This year a new cultivar (Sunshine) was received from the Subtropical Horticultural Research Station, Miami, Florida. Twenty three cultivars were planted in the southern coast of Puerto Rico to observe their performance in this dry area. Eight other introductions were received from Miami and are under observation. Three varieties of Impatiens (Aloha, Pelé, Sweet Sue) received last year, all died from root rot.

Coffee: The introduction of coffee "Pacas" demonstrated adaptability when grown at full sunlight and with a probable good yield at 2 years planting. Seventy eight trees are under evaluation and records of individual tree production are kept for further study.

Forage: Sixteen forage grasses are being tested on the northern part of the Island (table 1). Preliminary data (table 2) of 8 harvests show that the genera *Panicum* yielded more dry forage than the genera *Cenchrus*. *Panicum maximum* (291047) was the highest yielder. *Cenchrus ciliaris* (263909) was

the best yielder of the Buffel grasses. It was noticed that during the cool month period, from December to March, Panicum maximum (349676) and Cenchrus ciliaris (263909) produced 32% and 35% more dry forage than Common Guinea grass, respectively.

Preliminary data on a comparison of five Pennisetums is presented on table 3. It indicates that Pennisetum purpureum (285303) is the best yielder (39, 645 lb/A). This production represents 18.5% more forage than the produced by Common Merker.

There are under evaluation 6 cultivars of Stylosanthes guyanensis and 18 varieties of alfalfa (non-hardy). No results as yet (tables 4,5). Ten cultivars of Star grass (Cynodon plectostachyus) P.I. 409742, 409743, 409744, 409745, 409746, 409747, 409748, 409749, 409750, 409751 are being increased for evaluation.

Table 1.- Grasses being tested in the northern part of the Island.

Grass	Introduction Number	Common name
Digitaria decumbens	111110	Pangola Digitgrass
Digitaria decumbens	299752	Transvala Digitgrass
Digitaria milanjiana	299699	-
Digitaria sp.	300935	Slender Digitgrass
Panicum maximum	349676	-
Panicum maximum	-	Common Guinea
Panicum maximum	299553	-
Cynodon plectostachyus	-	Minilla grass
Cynodon plectostachyus	341818	-
Cynodon nlemfuensis var. *nlemfuensis*	-	Stargrass
Cynodon dactylon	255455	-
Cenchrus ciliaris	285303	-
Brachiaria brizantha	-	Signalgrass
Pennisetum purpureum	-	Dwarf Napier
Hemarthria altissima	364861	-
Hemarthria altissima	299995	-

Table 3.- Dry forage yield of five Pennisetums cut at 50 days.

Grass	P.I.No.	Dry forage yield per cut and dates of cutting 1/					Total dry forage
		4-6-77	5-26-77	7-14-77	9-1-77	10-20-77	
Pennisetum purpureum	300086	5,658	7,758	6,366	5,457	7,029	32,268
" "	Common	5,124	8,683	7,321	5,936	6,391	33,455
" "	Hybrid-7350	6,355	8,361	7,174	6,293	7,878	36,061
" "	285303	6,782	10,031	7,738	6,767	8,327	39,645
" "	532	4,602	9,124	5,008	5,946	6,324	31,004
Rainfall (in.)		-	*4.10	5.00	4.56	9.35	

1/ Values are average of four replicates.

* Cover period from 5-15-77 to 5-26-77

Table 4.- Varieties of alfalfa (*Medicago sativa*) being tested.

VARIETY
Venezuela
Peruvian
AZ-Mex
UC-76-E
Moapa
CUF-101
Florida 66
Certified Mesa Sirsa
Hayden PX-1
Thor
UC-Carga
Certified Hayden
WL-311
Liberty (NCW-20)
Sonora 70
Mesa Sirsa Lateral Branch
Tan Verde
UC-Salton

Table 5.- Varieties of *Stylosanthes* being tested.

Variety	P.I.No.
Stylosanthes guyanensis	361877
Stylosanthes guyanensis var. *Endeavor*	-
Stylosanthes guyanensis var. *Schofield* IRFL 1413	-
Stylosanthes guyanensis var. IRFL 1416	-
Stylosanthes gracilis	261266

South Carolina Agricultural Research
Service Report to S-9 Technical Committee
June 22-23, 1978
David W. Bradshaw

Germplasm of three hundred forty-six P.I.'s were distributed to cooperators in S.C. during 1977. In addition twenty-three new accessions of ornamental plants were obtained from the National Arboretum and planted in the arboretum of the Clemson Horticultural Gardens.

Mr. Augustine Day, Research Entomologist, Vegetable Insects Laboratory, Charleston, S.C.

Twelve hundred P.I.'s of Cucumis melo have been screened for resistance to pickleworms. During the fall of 1976 some 30 P.I.'s were selected for further study. During the fall of 1977 some of these selections were retested in field plots and results taken when infestation populations were 36% and above. Following is a table of results. The most effective germplasm found will be published in the June issue of HortScience.

Injury by pickleworms in replicated trials.[1/] Fall 1977 (Field Test)
4 Replicates -

PI	Percent infested means
Hybrid F_1 140471 x (Seminole x 0, 20 - 9)	32.4 a
PI 222717	34.7 ab
PI 179919	37.8 a-c
PI 217974	41.4 a-d
PI 183055	45.4 a-f
PI 179920	46.6 a-f
PI 220515	49.8 b-e
PI 223350	50.3 b-e
PI 179902	50.9 b-e
PI 179677	52.9 c-f
PI 207659	54.1 c-f
PI 182959	55.3 d-f
PI 214318	58.6 ef
PI 220655	62.1 f-g
PI 207659	63.5 g-h
PI 2207822	64.7 h
PI 211944	69.0 h

[1/] Arc sin transformation before analysis of variance (Duncan multiple range test)

Dr. George Fassuliotis, U.S. Vegetable Breeding Laboratory, Charleston, S.C.

Two hundred P.I.'s of Zea mays are currently being tested for resistance to southern root knot nematode, Meloidogyne incognito and to Javanese root knot nematode Meloidogyne javanica. Results have not been determined at this time.

Cucumis metuliferus is being crossed with cantaloup to transfer root knot nematode resistance from the wild species to the cantaloup. Since hybrid embryos abort, embryo culture is being used to try to produce an F_1 interspecific hybrid plant. Enclosed is a recent article relating to Cucumis breeding at the U.S. Vegetable Laboratory in Charleston.

Dr. Pryce Gibson, Agronomy Department, Agricultural Experiment Station, Clemson, S.C.

A number of P.I.'s of Trifolium repens are being screened for resistance to alfalfa mosaic, clover yellow vein, and peanut stunt virus. Trifolium uniflorum is being grown in the greenhouse to obtain seed increase.

Mr. Ben L. Norwood, Norwood Farms, McBee, S.C.

P.I. selections of Cassia, Centrosema and Desmodium are being grown for selection of a potential crop for bobwhite quail forage food. Severe problems of damping off of young Desmodium plants in the greenhouse have been encountered despite pretreatment with various fungicides. Selections are currently being field grown for later evaluation.

Dr. Billy C. Rhodes, College of Agricultural Sciences, Blackville, S.C.

A breeding program involving a number of P.I.'s of Cucurbita has been initiated in an attempt to develop pumpkins resistant to powdery mildew and Diabrotica. This is an attempt to improve both shape of fruit and quality of plants for the Halloween market. Presently, the P.I.'s are being field grown and crosses with pumpkin cultivars will be made.

Dr. LeRon Robbins, Truck Experiment Station, Charleston, S.C.

One hundred P.I.'s of ochre are being screened and crossed for adaptability to machine harvesting. Additional P.I.'s of ochre have been requested.

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Self-fertilization of *Cucumis metuliferus* Naud. and its Cross-compatibility with *C. melo* L.[1]

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Additional index words. African horned cucumber, muskmelon, pollen tubes, callose plugs, hybridization

Abstract. Self- and cross-compatibility relationships between *Cucumis metuliferus* and *C. melo* cv. Gulfstream were studied. In selfed flowers of *C. metuliferus*, the pollen tubes reached the ovules within 24 hours. Fertilization occurred in 91% of the ovules between 24 and 48 hours. 'Gulfstream' pollen on *C. metuliferus* germinated well, but pollen tubes grew slower and most stopped at the level of the uppermost ovules. About 1% of the tubes, however, succeeded in entering and fertilizing the ovules. Seeds recovered from fruit resulting from *C. metuliferus* × *C. melo* did not germinate, probably due to failure to achieve double fertilization or to early embryo abortion. Viable embryos have been successfully cultured when removed from the ovary 15–20 days after pollination but one surviving plant was similar to the maternal parent and was not an interspecific hybrid.

The transfer of genes for pest resistance from wild *Cucumis* species into the cultivated muskmelon (*C. melo*) has been the object of numerous studies (1, 8). Although the genomic constitution of many of the wild species is similar to that of *C. melo* (x=12), fruit set after cross pollination usually does not occur (2, 5). In various cross combinations of wild species with *C. melo*, Kishi and Fukishita (5) found that incompatibility was due to delayed growth and inability of pollen tubes to reach the ovules.

C. metuliferus (African horned cucumber) contains genes for many desirable characters that should be valuable additions to the gene pool of the muskmelon if they could be transferred. It contains genes that confer resistance or tolerance to the southern root-knot nematode, *Meloidogyne incognita* (3), powdery mildew (1), aphids (1), squash mosaic virus (9), and watermelon mosaic virus 1 (9).

At the U.S. Vegetable Laboratory, numerous attempts to cross *C. metuliferus* with *C. melo* have failed. Occasional fruit set and ovary enlargement occurred when *C. metuliferus* was used as the seed parent, but the fruits were small, misshapen,

[1]Received for publication January 14, 1977.
[2]Research Nematologist.

and lacked viable seed (Fassuliotis, unpublished). The reciprocal pollinations did not cause fruit set in any of our attempts. Norton (8), however, reported a successful cross with *C. melo* (PI 140471) as the seed parent. To date we have been unable to duplicate the cross.

The nature of cross incompatibility between *C. metuliferus* and *C. melo* is not known. Identification of the barriers to hybridization of these species may lead to the development of procedures that would overcome the incompatibility.

This paper presents observations on pollen tube growth and fertilization in selfed *C. metuliferus* flowers and in cross pollinations with *C. melo* cv. Gulfstream.

Materials and Methods

C. metuliferus (C 701A) and *C. melo* cv. Gulfstream were grown in the greenhouse and flowers were hand pollinated during Feb. 1976. Greenhouse temperatures ranged from 15.6–26.7°C (60–80°F). Standard pollination procedures for *Cucumis* were used with special precautions to avoid contamination by pollen from foreign sources (11).

The fluorescence microscopic procedure, as described by Kho and Baer (4) and modified by Tomer and Gottreich (10), was used to observe pollen tube growth.

Flowers were collected 0.5, 1, 6, 12, 24, and 48 hr after pollination and immediately fixed in FAA (formalin 4, absolute alcohol 3, acetic acid 1). After 24 hr in fixative, the flowers were washed in water and sectioned free-hand longitudinally and transversally. Each section was softened in 8N NaOH (10) for 1 hr, washed with water and stained with 0.1% analin blue w.s. dissolved in 0.1 N K_3PO_4 (4). The stained tissues were then placed on a slide in glycerine and gently squashed by applying pressure on the cover slip.

Observations were made with a Leitz Ortholux microscope equipped with a 200 W high pressure mercury lamp illuminated at 460 nm by use of transmission filter BG12 and Wratten 1A excitation filters in the oculars. Photomicrographs were taken on Kodak Plus X film with an Orthomat camera fitted with a Wratten 2A filter between the camera and the objective.

Results and Discussion

Pollen of both species germinated within 15 min after application to the stigmas and was not species specific (Table 1). The stigma of *C. metuliferus* was equally receptive to its own and to the *C. melo* pollen (Fig. 1A & B), whereas pollen tubes of both species grew poorly on *C. melo* and failed to penetrate the style (Table 1).

Cucumis melo did not set fruit during this study. *C. metuliferus* was extremely self fertile, however, and 100% of the pollinated flowers set fruit. Pollen tubes grew rapidly, attaining a length of 258 μ within 30 min after pollination and reaching the lower part of the style within 6 hr. By the 12th hr after pollination, they had entered the ovarian cavity and began lateral growth along the carpels (Fig. 1C). Pollen tubes entered the micropyles and expanded in the nucellar beak as they grew toward the embryo sac (Fig. 1F). Expansion of the pollen tube during penetration of the nucellar beak was also described in *C. melo* (7).

Pollen tubes had grown through the entire length of the nucellar beak 24 hr after pollination and fertilization took place within 24–48 hr. This agrees with previous studies on *C. melo* (7) and other *Cucumis* species (5). Cross sections through the ovary showed fertilized ovules and carpels filled with pollen tubes (Fig. 1E). The apical end of the tube contained a highly fluorescent elongated callose plug proximal to the embryo sac (Fig. 1F).

When *C. metuliferus* was treated with *C. melo* pollen, pollen germination was comparable to that of a self, but the pollen tubes grew slower and took 24 hr to reach the ovarian cavity. They were long and filamentous, and did not exhibit any abnormalities that would indicate incompatibility with the style of *C. metuliferus*. However, most of the tubes stopped growing at about the level of the uppermost ovules (Fig. 1D). Observations in longitudinal sections revealed an occasional pollen tube had entered an ovule. A callose plug in proximity to the embryo sac was also present as in selfed ovules. The large number of *C. melo* pollen tubes present at the lower end of the style in *C. metuliferus* within 48 hr after pollination would have been sufficient to fertilize all of the ovules had their growth not been inhibited.

To obtain more concise data on the percentage of *C. metuliferus* ovules that were penetrated by 'Gulfstream' pollen tubes, ovaries taken 48 hr after pollination were macerated in 8N NaOH for 1 hr and washed through a 20/60 combination set of screens. The ovules on the bottom screen were washed into a Syracuse dish with the analin blue solution and then transferred to a microscope slide for examination under ultraviolet light.

Only 1% of the ovules from cross pollinated flowers were penetrated by pollen tubes, compared to 91% in self-pollinated flowers.

Seeds from mature fruit that developed as a result of the cross pollinations were empty; perhaps due to failure to achieve double fertilization or to embryo abortion. However, in two fruit collected 15 and 20 days after pollination a total of 35 globular to heart shaped embryos were excised from ovules and cultured on defined nutrient media to determine whether or not they were true interspecific hybrids. Six developed into plantlets, but only one survived transplanting to soil. The survivor was similar to the maternal parent.

While a hybrid was not obtained, it is significant that

Table 1. Behavior of *C. metuliferus* and *C. melo* pollen tubes on *C. metuliferus* or *C. melo* during a 48 hr period.[z]

Cross	Mean length of pollen tubes (nm)[y]		Location of pollen tubes			
	½ hr	1 hr	6 hr	12 hr	24 hr	48 hr
C. metuliferus × self	258a[x]	648a	lower style	ovarian cavity	micropyle & ovules	ovules
C. metuliferus ♀ × Gulfstream ♂	112b	313b	upper style	lower style	ovarian cavity	ovarian cavity & ovules
C. melo Gulfstream × self	27c	46c	stigma	w	w	w
C. melo ♀ × *C. metuliferus* ♂	17c	102c	stigma	w	w	w

[z]Pollinations were made in the greenhouse during Feb. 1976 when temp ranged from 15.6–26.7°C.

[y]Measurements of 25 pollen tubes from 5 separate fields under the microscope.

[x]Mean separation in columns by Duncan's multiple range test, 5% level.

[w]No pollen tubes were observed.

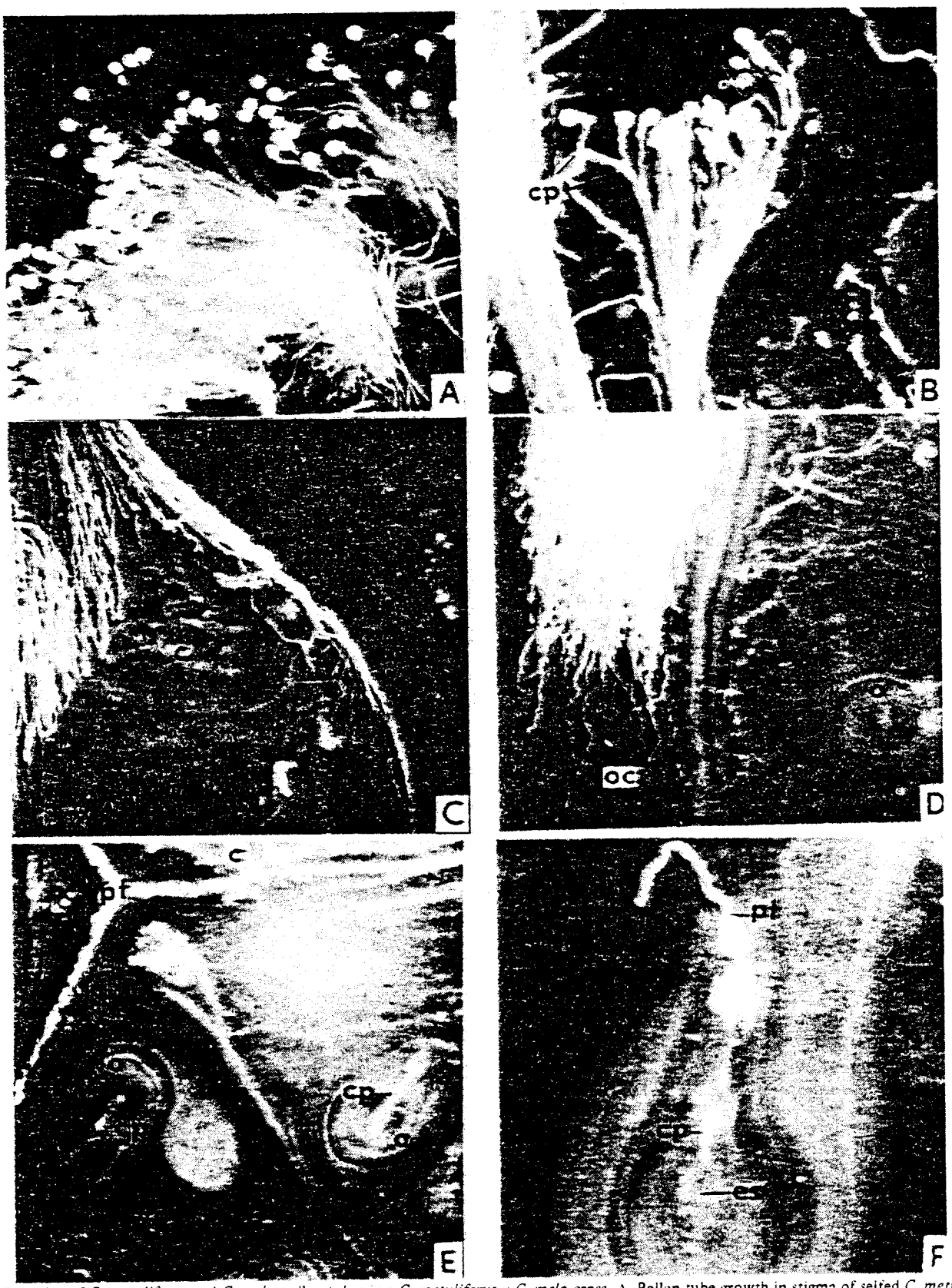

Fig. 1. Behavior of *C. metuliferus* and *C. melo* pollen tubes in a *C. metuliferus* × *C. melo* cross. A. Pollen tube growth in stigma of selfed *C. metuliferus* 6 hr after pollination (×60). B. Growth of *C. melo* pollen tubes on *C. metuliferus* stigma showing callose plug (cp) in the tubes (×60). C. Longitudinal section of selfed *C. metuliferus* 12 hr after pollination showing pollen tubes proceeding to carpel (c) (×60). D. Arrested *C. melo* pollen tube growth in the ovarian cavity (oc) of *C. metuliferus* at level of uppermost ovules 48 hr after pollination (×60). E. Cross section of selfed *C. metuliferus* ovary showing abundance of pollen tubes (pt) between carpels (c) and fertilization of 2 ovules (o) 24 hr after pollination. Note the callose plugs (cp) proximal to embryo sacs (×60). F. Pollen tube behavior after penetration of ovules encountered in either selfed *C. metuliferus* or in *C. metuliferus* × *C. melo* crosses. Pollen tube (pt) expands and contorts in ovule terminating in an apical callose plug (cp) proximal to the embryo sac (es) (×140).

apparently cross fertilization was observed when *C. metuliferus* was treated with *C. melo* pollen. Partial compatibility between the 2 species was indicated by a small percentage of *C. metuliferus* ovules being fertilized by 'Gulfstream' pollen tubes. Incompatibility was expressed, however, by the slower rate of growth of the muskmelon tubes and by an inhibition of growth beyond the uppermost ovules in *C. metuliferus*. Similar results were found by Kishi and Fujishita in a study of cross incompatibility among 9 *Cucumis* species (5).

It was evident that the optimum environmental conditions for *C. metuliferus* and *C. melo* 'Gulfstream' to set fruit differed. Temperature at the time of pollination or during the succeeding 24–48 hr apparently was important. Although no controlled studies were made on the effect of temperature and photoperiodicity on fruit set, our experience in the greenhouse has shown that conditions that existed during the month of Feb. were favorable for *C. metuliferus* fruit set, while March and April conditions were favorable for *C. melo*.

The observation that a few cross-compatible pollen tubes existed in a population of muskmelon pollen suggests that it may be possible to overcome barriers to the interspecific hybridization by altering some of the environmental variables, by modifying pollination techniques (7), or by altering the genetic stocks.

In summary, it has been shown that:

1) pollens are compatible with stigmas in reciprocal crosses;

2) pollen tubes of *C. melo* are compatible with the styles of *C. metuliferus;*

3) pollen tubes of *C. metuliferus* are partly incompatible with the styles of *C. melo:*

4) pollen tubes of *C. melo*, which are usually incompatible with *C. metuliferus* ovaries, are able to penetrate some ovules;

5) viable embryos can be recovered 15 to 20 days after pollination, but not at fruit maturity, suggesting that embryo abortion may be indirect, resulting from endosperm failure; and

6) callose plugs of undetermined significance develop proximal to the embryo sac of *C. metuliferus* following ovule penetration by either self or foreign pollen tubes.

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During the month of May I traveled to Norway with a Rotary International Study Exchange Team. While the trip was not work related, I was afforded an excellent opportunity to visit a number of farms, a wholesale seed dealer, several Agricultural Experiment Stations, and the National Agricultural University at As. Using the import permit issued by the USDA, I was able to collect and ship to Beltsville a number of local varieties and landraces of cabbages, onions, rutabagas, etc. I was also able to have some Trifolium selections mailed for me. These should be forwarded to me from Beltsville after quarantine. Some of the cabbage selections were resistant to clubroot and the onions were resistant to neck rot. If anyone is interested in the collections, call me at Clemson.

Tennessee Report on Plant Introductions to S-9 Technical Committee

July 1977 to June 1978

L. N. Skold

Dactylis glomerata: Dr. B. V. Conger is evaluating 63 introductions and 10 breeding lines received from the NE-9 Regional Plant Introduction Station.

Tripsacum dactyloides: DeKalb Agresearch, Inc., Union City, Tennessee, received 47 introductions from Dr. Langford.

Pennisetum americanum: Northrup, King and Co., Bolivar, Tennessee, received 187 introductions from Dr. Langford.

Brassica oleracea v. botrytis: Dr. Coffey has included an introduction from Israel (via NE-9) in his cauliflower performance trials.

Glycine max and *Zea mays*: Dr. Josephson continues work in transferring the resistance to corn earworm of Zapalote Chico, P.I. 217413, into inbred lines adapted to Tennessee. Dr. F. S. Allen continues screening the world collection of soybeans for germplasm of interest in his newly established soybean breeding program.

ANNUAL REPORT ON NEW CROPS RESEARCH IN TEXAS
Contributing to Southern Regional Project S-9
Prepared by Eli L. Whiteley
June 22 and 23, 1978

The 1977-78 crop year started out dry. Until rains occurred in early June we were about 10 inches below normal rainfall. The winter was dry and relatively warm. The early spring was dry and some crops in the Brazos River Valley had to be irrigated in early May.

Industrial Crops

Buckwheat (*Fagopyrum sagittatum*)

A small planting of buckwheat is being grown at College Station. The planting was made too late in the season to produce good yields due to a very dry early spring.

Nigerseed (*Guizotia abyssinica*)

A small planting of nigerseed was made to test its adaptability to the central Texas area.

Kenaf

Dr. R. A. Creelman grew some kenaf for a paper company for quality research.

Sweet Sorghum

Dr. S. A. Reeves, Jr. reports that sweet sorghum is still a promising plant for sugar production. He is also doing some research on sweet sorghum biomass.

Sweet sorghum yields and brix are satisfactory in the Brazos River Valley. The regional variety test and nursery have been planted and is progressing in a satisfactory manner.

The sugarcane nursery is not growing as well as in past years due to extremely dry weather and cool nights.

Sesame

Research on sesame is continuing to show progress. There were three tests conducted in 1977 - fertilizer, row spacing, and variety tests. The results from the fertilizer test are presented in Tables 1 and 2. Two lines were used in the fertilizer test, however only one line, UCR-4 gaskel RA responded to the fertilizer treatments. The response of UCR-4 gaskel RA to the various fertilizer treatments.

Table 1. Sesame Fertilizer Test - 1977

Treatment $N-P_2O_5-K_2O$	Variety UCR - 3 non-shattering	Yield lbs./acre UCR - 4 gaskel RA shattering	Mean
0 - 0 - 0	1371.5	1532.3	1451.9
40 - 0 - 0	1276.9	1690.5	1483.7
80 - 0 - 0	1301.6	1738.9	1520.3
0 - 40- 0	998.0	1493.0	1245.5
0 - 80- 0	1395.2	1463.2	1429.2
40 - 40- 0	1265.6	2136.0	1700.8
40 - 80- 0	1330.4	2314.1	1822.3
80 - 40- 0	1144.7	1526.2	1335.5
80 - 80- 0	1215.4	1789.2	1502.3
Mean	1255.5	1742.6	1499.1

Table 2. Response of the Line UCR-4-gaskel-RA to Fertilized Treatments in 1977

Fertilizer Treatment	Differences from Check (0-0-0) lbs./a
0-0-0	0
40-0-0	158.2
80-0-0	206.6
0-40-0	-39.3*
0-80-0	-69.1
40-40-0	603.7
40-80-0	781.8
80-40-0	-6.1
80-80-0	256.9

*A minus sign (-) indicates the check plots produced more than the fertilizer treatment.

The results from the row spacing study are presented in Table 3. The 20" row spacing produce more than twice as much as any other row spacing. This is not a normal result and needs further investigation.

Table 3. Sesame Row Spacing Test - Yields in Pounds Per Acre--1977

	Row Spacing				
Variety	20"	26 1/3"	40"-2	40"-1	Mean
UCR-3	2119.6	894.0	833.3	824.2	1167.8
UCR-4 gaskel RA	1942.7	1086.9	921.9	738.8	1172.6
Mean	2031.s	990.5	877.6	781.5	1170.1

The variety test, which consisted of 14 California lines and one variety, was planted late but some of the lines produced good yields. The results from this test are presented in Table 4.

Table 4. Sesame Lines - 1977

Line	Yield in Pounds Per Acre
UCR - 1	837.5
UCR - 2	1012.5
UCR - 3	435.1
UCR - 4	1642.2
UCR - 5	903.4
UCR - 6	846.8
UCR - 7	1612.3
UCR - 8	636.9
UCR - 9	1028.9
UCR - 1 - RA - 10	596.8
UCR - 2 - RA - 11	2270.9
UCR - 3 - RA - 12	2019.8
UCR - 4 - RM - RH	1747.1
UCR - 4 - gaskel - RA	1265.4
Renner - 1	1969.4
Mean	1255.0

Several varieties and plant introduction were obtained from Dr. Bass at the National Seed Storage Laboratory and were grown for evaluation and seed increase. The yields from these one row plots are presented in Table 5. Two varieties, Eva and Margo, produced very high yields.

Table 5. Sesame Varieties and Plant Introductions - 1977

Variety or Plant Introduction	Yield in Pounds per acre
Oro	1852.1
Margo	2629.8
Paloma	1601.0
Baco	1569.5
Gilroy Calinda	1181.2
Saragoza	625.6
Eva	2815.0
P.I. 156994*	683.4
P.I. 158038	40.4
P.I. 207666	863.1
P.I. 214259	880.4
P.I. 265521	243.2
P.I. 158771	278.9
P.I. 170711	417.2
P.I. 194238	386.0
P.I. 200108	654.6
P.I. 265523	192.5
P.I. 153507	129.1
P.I. 154305	325.0
P.I. 249678	179.8
P.I. 258373	266.2
P.I. 265520	103.7

*Yield from 190 seed planted in 40" row 25 feet long, very poor stand in many plots

Peanuts

Dr. O. D. Smith reports that P.I.'s 295233 and 290606 have good levels of resistance to the lesion nematode *Pratylenchus brachyurus*.

Grasses

Dr. William W. T. Woodard filed the following report from Weslaco. He has been screening grasses for possible adaptation in South Texas. The results from these tests are presented in Table 6.

Table 6. Plant Introductions Which Show Promise for South Texas

1 = drought tolerance
2 = recovery after clipping (irrigated conditions)
3 = Recovery after clipping (non-irrigated conditions)
4 = winter growth
5 = spring growth
6 = yield

Botanical Name	P.I. Number	Desirable Characteristics
Cenchrus ciliaris	155084	1,2,3,4,5,6
" "	171944	1
" "	203360	4
" "	206969	2,3,4,5,6
" "	253260	4
" "	253267	1
" "	253271	2,3,4,5,6
" "	271207	1
" "	299504	2
" "	299509	1,2,3,4,5,6
" "	299511	2, 4
" "	299513	2, 4,5,6
" "	299514	2,3,4
" "	299516	2, 4
" "	299517	1,2,3,4,5,6
" "	299521	1
" "	299522	4,5
" "	299523	2
" "	299524	2, 4,5
" "	299525	2, 5
" "	299528	1,2,3,4,5,6
" "	299533	2, 4,5
" "	299535	1,2,3,4,5,6
" "	299540	4
" "	299545	2, 4,5
" "	299546	2, 4,5
" "	307621	2,3,4,5,6
" "	308595	2
" "	314982	2,3,4,5,6
" "	315681	1, 5
" "	319459	1,2,3, 5,6
" "	364428	4
" "	364431	1,2, 4,5,6
" "	364435	4
" "	364436	4
" "	364437	2, 5
" "	364444	3
" "	364445	1,2,3,4,5,6
" "	365677	3
" "	365694	2
" "	365732	2
" "	365733	1, 3
" "	365735	1, 3
" "	365744	2
" "	BN-6401-62	2, 4,5,6

Botanical Name	P.I. Number	Desirable Characteristics
Chloris gayana	151008	1,2,3, 5,6
" "	154878	1
" "	202157	1,2,3 5,6
" "	202363	1
" "	202502	1, 3, 5
" "	203519	3,4,5,6
" "	203851	1, 4,5,6
" "	205250	4,5,6
" "	207542	5
" "	207978	3, 5
" "	208083	1, 5
" "	208926	1, 5
" "	210690	4,5,6
" "	212373	1,2,3, 6
" "	212376	5
" "	246352	1,2,3, 5,6
" "	283226	5
" "	284793	2,3, 5,6
" "	285098	1, 3, 5,6
" "	295635	3
" "	299552	5
" "	306270	3
" "	307624	3
" "	307630	3, 5
" "	308596	1, 3, 5,6
" "	309962	2
" "	316404	5
" "	316632	5
" "	316633	1, 5
" "	317352	2, 4,5,6
" "	365105	5
" "	365979	5
" "	365981	2, 5
" "	379631	3, 5
" "	381336	2, 4,5,6
Panicum coloratum	208943	5
" "	209002	4,5,6
" "	253249	2, 5
" "	263605	2, 4,5,6
" "	263607	5
" "	277963	2
Panicum maximum	153666	2, 6
" "	156075	5,6
" "	156078	2 6
" "	208399	5,6
" "	209004	3, 6
" "	277911	5,6
" "	277921	2, 6

Botanical Name	P.I. Number	Desirable Characteristics
Panicum maximum	277940	5,6
" "	277958	5,6
" "	277968	5,6
" "	286606	2, 6
Paspalum dilatatum	202191	5
" "	217623	5
" "	283014	5
" "	300070	5
" "	300071	5

Mr. W. T. Balzle filled the following report from the SCS Plant Materials center at Knox City, Texas.

(1) Accessions that may be valuable to Texas Agriculture:

Pinus brutia

PI-362153 Afghanistan pine (PMT-4018)
The Afghanistan pine is adapted to hot, arid conditions where rain is only received during the winter. The tree's shape, color and rapid growth rate give it potential for use in landscaping, windbreaks, shelterbelts, and Christmas tree production.

Pennisetum sp.

PI-315868 Buffelgrass (PMT-1711)
This accession of buffelgrass is very rhizomatous and produces ample seed. While not being as leafy as some buffelgrass accessions, forage production is adequate. It has survived one winter at Knox City with temperatures as low as 4°F.

Andropogon caucasicus

PI-78758 Caucasian bluestem (PMT-588)
Caucasian bluestem is a warm season perennial bunchgrass. It is adapted to areas receiving 18 inches or more annual rainfall. It has good forage production and is resistant to leaf rust. It is one of the most cold tolerant introduced bluestems.

Hemarthria altissima

PI-299993, 299994, 299995 Limpograss
These accessions have good potential for use in the southern half of Texas as warm-season pasture grasses. They are good forage producers but are not winter hardy at Knox City.

Eragrostis atherstonei

PI-276033 Atherstone lovegrass
Atherstone lovegrass shows promise in the drier sections of Texas on gravelly or sandy soil types. It appears to have potential for increasing forage production on these sites.

Legumes

Mr. Aaron Baxter of the Texas Power and Light Co. reports that Arrowleaf clover (PI-233816) is doing well in East Texas and that he is trying it in Coastal Bermuda.

Soybeans

Dr. J. P. Craigmiles reports the following P.I.'s being used in the soybean research at Beaumont.

PI 96035, PI 96983, PI 229358, PI 163453 - Resistant to leaf feeding insects and powdery mildew, are currently being used as parents in an effort to improve insect tolerance. (Craigmiles)

PI 205912, PI 279088, PI 219653, PI 204331 - Are currently being used as parents in combination with adapted varieties to improve the seed quality characteristics of soybean varieties for the Texas Gulf Coast. (Ref: Paschar, E. H. and M. A. Ellis. 1978. Variation in seed quality characteristics of tropically grown soybeans. Crop Science. -In press-) (Paschal)

PI 171451 and PI 229358 were crossed with commercial types in an attempt to transfer their resistance to leaf feeding insects. These PI's were first noted for their resistance to Mexican bean beetle (*Epilachua varivestis* Mulsant). Advanced populations are currently being screened for resistance to velvet bean caterpillar (*Anticarsia gemmetalis Hubner*). (Ref: Paschal, E. H. and H. C. Minor. 1978. Velvet bean caterpillar resistance in soybean selections from crosses involving Mexican bean beetle resistant plants. Soybean Genetics Newsletter. -In press-) (Paschal)

"Buffalo," a soybean variety introduced from Rhodesia, was found to have immunity to a wide range of soybean mosaic virus (SMV) isolates. Crosses have been made to initiate inheritance studies as well as to generate segregating populations from which to select improved types. (Ref: Paschal, E. H. and R. M. Goodman. 1978. A new source or resistance to soybean mosaic virus. 1978. Soybean Genetics Newsletter. -In press-). (Paschal)

PI 200492 - A parent of Dowling soybean. PI 200492 is a vigorous plant type with rust resistance. Dowling is a Maturity Group VIII released at Beaumont in 1978, TAES and USDA cooperating.

Plants Released

Dowling soybeans - pedigree includes PI 200492.

Panicum coloratum, PI 166400, "Selection '75" Kleingrass

Since "Selection '75" was released in 1969, over 620,000 acres have been planted in Texas. Of this acreage, over 55,000 acres are cut for hay, 24,000 acres harvested for seed. Cattle graze 590,000 acres; horses 91,000 acres; sheep and goats 170,000 acres. Public acceptance has been very good.

Publications

Gilman, D. F. and O. D. Smith. Internal pericarp color as a subjective maturity index in peanut breeding. Peanut Science.

Gilman, D. F. and O. D. Smith. Maximum percentage of mature fruits and associated characters at two intra-row spacings in peanuts. Crop Science, July issue.

Eastin, E. F., J. W. Sij and J. P. Craigmiles. Tolerance of soybean cultivars to Metribuzin. Crop Science (1978).

Craigmiles, J. P., E. E. Hartwig, and J. W. Sij. Registration of Dowling soybeans. Crop Science (1978).

Dowling Soybeans. J. P. Craigmiles, E. E. Hartwig, and J. W. Sij. TAES Leaflet (1978).

Panicum coloratum ("Selection '75") - The Farmer Stockman Magazine and Southwest Farm Press.

Pinus brutia - "Highlights - Plant Materials Center, Tuscon, Arizona."

1978 S-9 Technical Committee Report

Virginia Agricultural Experiment Station

A.J. Lewis III

Virginia Representative

The following report is a summary of the current activities of Virginia research workers who have requested plant introduction accessions in recent years.

R.L. Boman, Southern Piedmont Research and Continuing Education Center, P.O. Box 148, Blackstone, VA. 23824.

Accessions received: 1976 - 30
1977 - 0
1978 - 0

Objectives: To evaluate promising annual clovers as potential forage crops for Southside Virginia conditions; to compare plant vigor and hardiness, dry matter yield and chemical composition, and optimum harvest date for clovers seeded alone or in combination with annual rye grass.

Status Report: Clover-rye grass combinations were harvested on May 2, May 9, and May 16. 'Crimson' alone was harvested on those same dates. 'Chief Crimson' is at least one week later maturing than either 'Dixie' or 'Talladega' and appears to be more winter hardy. 'Mt. Baker' subterranean clover survived the winter while 'Clare' winter killed. 'Mt. Baker' is very prostrate in growth, but does stand up when grown in rye grass.

The Arrowleaf clovers are later than the Crimson clovers. 'Amclo' looks promising but 'Yuchi' doesn't. 'Meechee' did poorly. The Persian and Ball clovers germinated but sustained severe winter injury.

These same varieties will be seeded again in September.

J.D. Miller, Research Agronomist, USDA, Room 210 Sandy Hall, VPI&SU, Blacksburg, VA. 24061.

Accessions requested: 1976 - 70
1977 - 100
1978 - 27

Objectives: To isolate agronomically desirable clover clones for use in breeding synthetic varieties.

Status Report: In 1976, 70 accessions of white clover were planted. In the fall of 1977, clones from 22 of these were selected for testing in 1978.

The 1977 planting included 47 accessions of red clover and 33 of white clover. Winter survival was poor in most accessions with erosion heavy in both groups.

(Dr. Miller is being transferred to Tifton, Georgia. It now appears these plantings will be abandoned.)

Reprinted from CROP SCIENCE
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REGISTRATION OF VIRGINIA SYNTHETIC NUMBER 10 BIRDSFOOT TREFOIL GERMPLASM[1]

(Reg. No. GP 4)

John D. Miller[2]

'VIRGINIA Synthetic Number 10' germplasm pool of birdsfoot trefoil (*Lotus corniculatus* L.) was constituted when five clones were intercrossed, four of which were selected in Virginia. One clones each was selected for vigor and persistence from 'PI 157531' (Italy), 'PI 188556' (Yugoslavia), and 'PI 230190' (Denmark). One clone was obtained from 'Viking' and one was provided by P. R. Henson, ARS, Beltsville, Maryland. Clones were intercrossed and seed were composited to produce the synthetic.

Virginia Synthetic Number 10 is early and semi-erect, with disease tolerance equal or superior to that of Viking and 'Dawn'. Organisms associated with this disease complex were *Rhizoctonia solani*, *Fusarium* spp., *Leptodiscus terrestris*, and *Mycoleptodiscus* spp. This synthetic has yielded and persisted well under hay and pasture management when grown with several grasses in Virginia, but has not been extensively tested in other states.

The parental clones and seed production nurseries will be maintained by ARS at Blacksburg, Virginia. Up to 10 g of seed will be provided to forage-crop breeders on written request to the author at the Agronomy Department, Virginia Polytechnic Institute and State Univ., Blacksburg, VA 24061.

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[1] Registered by the Crop Sci. Soc. of Am. Cooperative investigations of the Research Div., Virginia Polytechnic Institute and State Univ., and ARS, USDA, Blacksburg, VA 24061. Received 24 Oct. 1975.

[2] Research Agronomist, ARS, USDA, Blacksburg, VA 24061.

P.S. Benepal, Department of Life Sciences, Virginia State College, Petersburg, VA. 23803.

Accessions received: 1976 - 1507
1977 - 930
1978 - 355

Objectives: To screen *Phaseolus vulgaris* accessions for resistance to insects and diseases.

Status: No report received

G.B. Briggs, Department of Horticulture, VPI&SU, Blacksburg, VA. 24061.

Accessions received: 1978 - 3 (U.S. National Arboretum)

Objectives: To evaluate woody plants for their landscape potential, hardiness, and disease and insect susceptibility in Western Virginia.

Status Report: Rooted cuttings of *Enkianthus campanulatus* (NA 40007), *Escallonia rubra* (NA 38645), and *Escallonia virgata* (NA 38646) were received this spring and potted. They have not yet been set out due to their small size.

REPORT FROM THE NATIONAL PROGRAM STAFF

Quentin Jones

I. The National Plant Germplasm System (NPGS)

Budget

Considering the very tight constraints on funds and personnel slots, the NPGS has fared rather well. For FY 1978 we got new money totaling about $1.6 million. One million of this was for clonal repositories; $300,000 was for the Information System, and the rest was to bolster existing germplasm programs.

For FY 1980 we were allowed to ask (at SEA level) for $2.7 million. This thrust has so far survived intact but we cannot predict its degree of survival in the Department and in OMB. The fact that there is a thrust on plant genetic resources is of itself encouraging.

The Regional Technical Committees play a very important role in the budget process. First, I believe more RTC members are talking to their Directors because we seem to be achieving a greater awareness of the germplasm program and its critical importance. Second, the RTC's, working with the Regional Coordinators, are doing an increasingly better job of annually up-dating needs of the projects. This is most helpful because we need this kind of information at our fingertips when budget development, with its short deadlines, hits us each year.

Reorganization

The reorganization of 1972 is mostly completed. The reorganization of 1978 is well advanced but apparently many details still need to be addressed. Federal Research (FR, formerly ARS), we are told, will have a National Program Staff but no PAC Staff, as such.

Curators

The role of Curator is a key one in the NPGS. Because the NPGS is, almost by necessity considering the organizational structure of FR and the State Agricultural Experiment Stations, a loose association of program units held together by interdependency and common goals, a great deal of responsibility and demands are placed on the Curator. To the extent that the Curators fulfill these responsibilities and demands the NPGS will function properly.

It is also obvious that unless the Curator is given the support and tools that he needs he cannot fulfill the responsibilities and demands laid upon him. We ask him to maintain the germplasm and to make available to users this germplasm. To do this he must have the necessary resources in funds, staff, and facilities. He must also be in a position to interact with the user community. This means a flow of information and materials back and forth. This will not happen unless the Curator has responsibility for both

materials (germplasm) and the information pertaining to it. This of course does not mean that others cannot use (or manipulate) that same information. Indeed they should be encouraged to do so. They should not however be given responsibility for assuring the inputs to that developing body of information. The Curator would very quickly become a passive performer in seed exchange.

The National Plant Germplasm Committee has commissioned me to complete the task of formalizing curatorships. This will mean contacting potential curators already identified by this RTC and others, explaining the functions and responsibilities of a Curator, meeting with their appropriate line supervisor and obtaining understanding of and agreement to official appointment of a person as Curator.

II. The National Plant Genetic Resources Board (NPGRB)

The NPGRB was established by Secretary Butz on July 3, 1975. Its 2-year term expired on July 3, 1977. Secretary Bergland reestablished the Board on February 23, 1978. The latter fact is rather remarkable and indicates the importance the present administration attaches to the work of the Board because 85% of such boards and commissions were eliminated by the Carter administration.

The NPGRB held its first new term meeting on May 18, 1978. Assistant Secretary Cutler chaired the meeting for the first 40 minutes, then he had to leave to testify on the Hill. His Deputy, Dr. Unger then served as chairman for the rest of the meeting. Dr. Unger was impressed by the Board, its members, and its mission. The Board endorsed the National Plant Germplasm Committee and applauded its efforts in establishing clonal repositories and an Information System to service the National Plant Germplasm System.

The Board is writing a report which will go to the Secretary in early July. It is planned that three Board members will present the report to Mr. Bergland and articulate to him the major concerns of the Board.

III. Germplasm Resources Information Project (GRIP)

Staff of Information Sciences/Germplasm Resources (IS/GR), University of Colorado, Boulder, and of Communication and Data Services Division (CDSD), SEA, who are managing this project are here and will update you on progress. I will only say that the team is doing an outstanding job and is, for the most part, receiving enthusiastic cooperation by curators and users.

IV. Exotic Organisms (Executive Order 11987 of May 24, 1977)

On June 16 a USDA Committee on Exotic Organisms met to formulate Department policy to implement the President's Executive Order. Animal and Plant Health Inspection Service (APHIS), USDA, had drafted a proposed rulemaking based on authority now vested in APHIS. Their authority covers regulation of introduction and quarantine of plants and invertebrates. Fish and Wildlife Service (FWS) in the Department of the Interior has authority to regulate importation of vertebrates. Ultimately, APHIS and FWS will get together to announce a combined rulemaking in the Federal Register.

The approach being used at this time is to come up with reasonable and effective guidelines which can be implemented and tested under practice for several years. If they work well, fine. If changes are needed then new legislation or other corrective steps can be taken. To be sure that organisms or groups of organisms do not fall in the cracks between USDA and DI, a memorandum of understanding between the agencies involved will spell out specific responsibilities for organisms of disputed status.

June, 1978

Report of Germplasm Resources Laboratory to the Regional Technical Committees on Plant Germplasm

Laboratory Personnel

We were all saddened by the sudden death of Dr. E. E. Leppik on February 4, 1978. Up until his heart attack in January, Dr. Leppik continued to work regularly at his office.

Dr. Craddock suffered a heart attack, underwent open heart surgery in April, and returned full time to work on May 30.

Sharon Kenworthy jumped the gun and gave birth to Jason Paul prematurely. He joined Sharon and Bill at home on May 21. Cathy Mayo of Plant Introduction and Sheryl Ford, Small Grains Documentation, will add to their families - hopefully, not until July and August.

Muriel O'Brien was awarded the Society for Technical Communications Award of Excellence for Bulletins for Agricultural Handbook 474, "Potato Diseases."

Jack Oakes and Jim Brewbaker (University of Hawaii) collected Leucaena in Mexico in February and March. Although Mexico was the primary source of germplasm, Dr. Brewbaker also collected in other Central American countries. The germplasm collected by Oakes comprised 202 accessions consisting of 6 species. Brewbaker has not returned as yet, and his contribution to the collection is yet to be determined.

Harold Winters and Bob Knight covered much ground in Brazil, Argentina, and Paraguay during January and early February. Their collecting efforts were quite successful and added 306 accessions to the P.I. program. The collections included tropical fruits, oilseed palms, and ornamentals.

John Moseman has been a busy world traveler with trips to India, Mexico, and Korea. These travels are related to disease problems and germplasm related to barley, wheat, and other small grains.

New names in the Laboratory include:

Erick Abadie, Biological Aide, working with Dr. Oakes.
Rosalie Curtin, Clerk Typist, working with Dr. Porter.

Glenn Posey, Clerk Steno, in Plant Introduction.

John Bear, Agronomist, plans to retire on June 30. We will miss John as he has helped in so many ways. His broad experience with peanuts, new crops, and other crops has certainly come in handy.

Notable P.I.'s

'Bedford', a new soybean cultivar released jointly by Mississippi State University and USDA, contains P.I.'s 88788, 89772, and 86731-1 in its parentage for resistance to cyst nematodes.

Longwood Gardens released ten cultivars bred from the New Guinea Impatiens collection introduced in 1970 by H. F. Winters and J. J. Higgins. The names 'Calliope', 'Cannonball', 'Chariot', 'Fortune Teller', 'Juggler', 'Magician', 'Ring Master', 'Roustabout', 'Showboat', and 'Trapeze', were taken from show business.

The National Arboretum released the 'Whitehouse' ornamental pear, P.I. 420995. It is a seedling selection from the same *Pyrus calleryana* parent as the 'Bradford' but develops into a narrow columnar tree instead of ovoid.

The Carlisle Nursery, Independence, Kentucky, has released the patented callery pear clone 'Aristocrat', which differs from the 'Bradford' in being more spreading.

The 'Corvallis' home garden pea, released by Oregon State University, contains resistance to enation mosaic inherited from P.I. 140295.

The University of Wisconsin has released Wisconsin (BBSR)130, a bush green bean breeding line with excellent resistance to bacterial brown spot (*Pseudomonas syringae*). It is also tolerant or resistant to six other bean diseases.

Three limpograss, *Hemarthria altissima*, cultivars, 'Redalta', 'Greenalta', and 'Bigalta', were released jointly by the University of Florida and USDA, Soil Conservation Service. The USDA Plant Introduction numbers of these cultivars are P.I. 299993, 299994, and 299995, respectively. This material comprised a portion of the 1964 South African grass collection made by A. J. Oakes.

Plant Introduction and Exchange

In 1977, documented plant introductions consisted of 6,651 items, including 1,800 vegetables, 1,760 forages, 921 oilseeds, 919 cereals, 446 ornamentals, and various other crops. Distinct groups of valuable germplasm included 250 vegetables from the People's Republic of China, 337 ornamentals from Japan and Okinawa (Dr. Ackerman's collection), and 368 forages (Langford-Smith - mainly *Trifolium* - from Italy, Greece, Crete, and Switzerland. Two unique groups involved 622 forages as a result of the United States-Japanese National Resources Project with Japan and 106 *Phaseolus* accessions from the Norvell collection. The P.I. office provides support for plant explorations including contacts, supplies, small equipment, shipping and quarantine requirements, clearance letters to embassies (Agricultural Attaches and restricted countries, etc.). The volume of procurement of plant germplasm through correspondence and contacts with domestic and foreign scientists is lower than a few years ago, caused by increased plant exploration, but remains high nonetheless. The number of documented P.I.'s for 1977 is down, but barring serious problems with the Flexowriter and conversion to a computer, the number in 1978 will be very high. Some important collections identified for introduction and incorporation into the U.S. Plant Germplasm System include:

Foreign:	Sorghums - 2,788 from Ethiopia. (Prohibited quarantine-wise) Approximately 4,500 from Yeman. *Chrysanthemum* - Ecological types from Japan; promised but not yet received. Cereals - Collections of wheat, barley, and corn by University of North Wales from India, Pakistan, and Nepal. Rice - Collection comprised of 167 accessions from a PL 480 Project in Pakistan.
Domestic:	Sunflowers - Fargo, North Dakota - approximately 266 with 13 species; Bushland, Texas - 896 with 46 species.

As part of international cooperation, 2,105 shipments to 115 countries consisted of 180,139 items, including 55,709 small grain nursery samples to various countries and 3,725 cotton samples for increase in Mexico. Major recipients of the U.S. materials were Canada, Sweden, Brazil, Mexico, Kenya, Chile, Argentina, Colombia, Italy, and England. An additional 572 crop samples went to 16 countries via our AID Project. The Mayaguez Station provided 1,039 samples of Phaseolus and cowpeas to 14 Latin American countries. AID requests are being more specialized, fewer in number, and for larger quantities.

We have encountered a serious backlog of P.I. documentation with the Flexowriter operation. A Datapoint 5500 Computer System with two data stations (inputs) has been placed in Room 319 across from the P.I. office. The software (programming) and forms-preparation are underway. We have put considerable effort into formatting to make P.I. information more readily retrievable, but a narrative will be retained. Software is being developed that will permit record printing and generation of the inventory manuscript. Formatted information must be largely non crop specific. Hopefully, this system can be operative by September or early October.

There is a very general lack of understanding of our National Plant Germplasm System and of U.S. and foreign country quarantine regulations. We have encountered problems both ways. Some countries require import permits - especially for cotton and fruits. The Setaria italica samples from the from the Fogg collection in Taiwan were prohibited. This office arranged to have Dr. Glenn Burton, Tifton, Georgia, increase these in the greenhouse under his quarantine permit. As the old saying goes, "When in doubt, ask." We will be glad to assist with quarantine-related matters. We plan to publicize Laboratory procedures and quarantine requirements to improve the efficiency of processing plant materials.

Agronomic Crop Germplasm

Some 7,500 rice accessions have been increased in 1976 and 1977 with 2,600 planned for 1978 under cooperative agreement at El Centro, California. Agronomic data from this detention nursery and other locations are being received, checked, and transferred to DSAD for addition to the computerized rice data bank. Two hundred sixty-seven new accessions were added to the collection in 1977. Plans call for moving the rice seed collection into Building 047, adjacent to our Small Grains Collection, Building 046.

Evaluations of the Hemarthria collection and a portion of Digitaria collection for winter hardiness were completed and manuscripts submitted for publication. Manuscripts were submitted to Tropical Agriculture with results of the screening of Hemarthria for winter hardiness and resistance to the yellow sugarcane aphid. Final characterization of the collection for leafiness, leaf-stem ratio, and genome composition is progressing. The perennial ryegrass collection shows interesting variation in winter hardiness and resistance to rust (cooperative with Dr. Braverman, NE-9). This work is scheduled for completion in 1978.

The cooperative evaluation of ornamental grasses by Jack Oakes and Harold Winters was hampered by weed problems and drought conditions. In cooperation with the Plant Introduction Officer, useful agronomic crop germplasm was identified, procured, or requested.

Horticultural Crop Germplasm

Harold Winters has been active in identifying and obtaining needed germplasm with species of Asparagus, Curcurbita, Solanum, and Anthurium being notable examples. He and Ray Clark, NC-7, plan to collect additional tomato germplasm early next year in Guatemala and Mexico.

The evaluation of rosemallow hibiscus seedling progenies was continued toward selection for flower color, durability of flower, and stem strength. Each generation has produced advancements for these genetically inherited characteristics. Two outstanding pink flowered clones being propagated for release were severely injured by cold during the winter of 1976-77. Artificially induced tetraploids have proved to be poor parents either when crossed with each other or with diploid selections.

A new generation of New Guinea Impatiens seedlings, raised from selections showing branched pedicels, is being evaluated. If genetically stabilized, this trait would be of considerable interest to plant breeders.

Revise M.P. 801. Excellent progress was made on the revision of M.P. 801, "Some Fruits and Nuts for the Tropics," with completion scheduled in 1978.

The International Board for Plant Genetic Resources, Advisory Committee on Phaseolus, is scheduled to meet on July 26-27, 1978, at Cambridge University. Harold F. Winters, Beltsville, Maryland, and Leland W. Hudson, Pullman, Washington, will represent the United States on this committee.

Pathology of New Crops and Horticultural Crop Germplasm

The yellow mottling and vein clearing in *Stokesia laevis* in greenhouse and field could be caused by a nutrient deficiency, possibly lack of magnesium. No virus particles or mycoplasma-like bodies, normally associated with the symptomatology, were observed in leaf-dip preparations from affected leaves. In preliminary greenhouse experiments with commercial fertilizers containing trace elements, treated *S. laevis* plants greened significantly vs. non-greening of untreated controls. Isolations from seed heads of Stokes aster in field plantings yielded fungi normally associated with plant sensescence, primarily *Alternaria* spp., *Botrytis cinerea*, and *Diaporthe* sp. and its *Phomopsis* state. *Phyllosticta* sp. was consistently isolated from the leaves.

One paper on resistance in spinach to *Fusarium oxysporum* f. sp. *spinaciae* has been published; two more are in press. A fourth paper on increase in resistance levels to Fusarium wilt is being prepared.

Cooperative efforts with APHIS, on the isolation and pathogenicity of *Phyllosticta cryptomeriae* on *Cryptomeria japonica* continued. *Cercospora* was not isolated from diseased leaf and stem material from mature Cryptomeria trees growing in the U.S. Arboretum. Affected trees are monitored for further disease development and to determine if *Cercospora cryptomeriae* might be involved in their decline.

Distributed AH 474, "Potato Diseases," from Germplasm Resources Laboratory totaled 97 copies, of which 48 were foreign requests from 30 countries.

Tissue from the kenaf cultivars 'C-2032' and 'Tainung No. 1' was collected periodically from guard rows of a fertilizer experiment at Glenn Dale. Preliminary *in vitro* tests demonstrate that *Botrytis cinerea* rarely infects the tissues of rapidly growing, virescent plants, and that infection levels rise with plant aging. In our tests, no penetration of *B. cinerea* into stem tissues, nor destruction of the fibers, could be observed.

New Crops

Early planting (May 11) resulted in the greatest dry-matter yields from post-frost harvests of two kenaf cultivars (Tainung No. 1 and Cuba 2032). N levels had no significant effect on yields of these cultivars. Initial populations ranging from 247,000 to 741,000 plants/ha had no significant effect on Tainung No. 1 yields but affected Cuba 2032 yields.

The best yields were 4.75 mt/ha for Tainung No. 1 at 371,000 plants/ha and 4.81 mt/ha for Cuba 2032 at 494,000 plants/ha.

Sunn hemp data were not collected because of severe lodging. An inoculation technique for infecting one-week-old kenaf seedlings with Botrytis cinerea was developed. In two replicated tests, the cultivar Everglades 71 was significantly (.01 level) more resistant to the organism than Cuba 2032 when evaluated two weeks after inoculation. One hundred forty-six kenaf cultivars and introductions were evaluated for cold tolerance under an initial germination temperature of 10°C every 7 days. After one month, there were significant (P=.01) differences in seedling damage among entries. Two introductions from Tanzania were damaged less than the best check cultivar, Cuba 2032. Sunn hemp plots were not harvested because of severe lodging.

Long-day (late-maturing) types of Stokesia laevis appear to be cross-pollinated. Flowering is more difficult to induce in the short-day (early) accessions; thus, mode-of-pollination studies are continuing. Approximately 1/3 of the planned diallel crosses have been completed.

All available Limnanthes germplasm was field planted in October 1977. Selections for earliness, vigor, yield, and seed retention will be made to produce gene pools and interspecific crosses. A broad-based population involving 20 Lesquerella fendleri introductions has been produced.

Only one apparent hybrid between Crambe abyssinica and C. kralikii was obtained from about 35 crosses each of C. abyssinica with C. filiformis, C. hispanica, and C. kralikii. The "hybrid" is sterile; production of an alloploid is being attempted with colchicine. C. abyssinica germplasm was intercrossed to produce a broad-based gene pool. Selected introductions have been crossed to the cultivars Meyer and Indy.

In Oregon, 1977 Limnanthes' yields were low, but selection 703A has superior seed retentiveness as compared to 'Foamore'. Of four seeding rates, the 22.4 kg/ha gave the best seed yield of L. alba. Wide variation was shown for percent oil and percent of the unique C22:2 fatty acid in 44 Limnanthes accessions (seven species). In Arizona, good stands of Lesquerella were obtained in all nurseries indicating that selection for non-dormancy in L. fendleri has been effective. Selection for larger seed size in L. fendleri is underway.

Small Grains Collection

New accessions added to the Small Grains Collection totaled 2,633 (foreign-2,432; domestic-201). Seed stocks were increased in the fall-sown nurseries: Mesa, Arizona, 6,819 rows; and at Aberdeen, Idaho, 1,556 rows. The spring-sown nursery at Aberdeen, Idaho, consisted of 5,263 rows and 2,434 hills of *Avena sterilis*. Notes were taken in the field, and seed was harvested and returned to Beltsville. There were 957 pots grown for seed increase in the Beltsville greenhouse. Plant scientists received 176,326 packets of seed from the collection. There were 80,698 samples sent in 267 foreign shipments, and 95,628 samples sent in 264 domestic shipments.

The Wheat Variety Handbook and its first supplement were distributed to 191 domestic research workers and 36 foreign. The Wheat, Oats, and Barley Registration listings were updated and are being distributed upon request.

Dr. Porter developed a revised coding scheme for use in evaluation and subsequent data entry of accessions in the small grain collection, patterned after one used by IRRI in order to be more consistent with international usage. This is a joint project with IS/GR.

Contacted recipients of new wheat introductions who regularly evaluate for specific characteristics in order to further systematize the entry of these data into the computer data file. With this additional computerized information, materials can be chosen more closely to suit requestor needs. Started investigation of the characteristics of a descriptor which makes it most useful for increasing probability of detecting errors which occur in field planted materials. Procedures and forms changed to increase accuracy of keying, provide more computer documentation of information entered into the system, and decrease amount of time needed for retrievals. Passport information is being reformatted to facilitate its retrieval by computer.

International Nursery and Cereal Germplasm Pathology

Four international and five uniform wheat and oat nurseries were prepared in 1977 and sent to cooperators at 191 locations in 44 countries. Eight reports on reaction of wheat and oats to rust, mildew, and other diseases were prepared and distributed to cooperators. Screened 9,513 wheats to 4 virulent cultures of the powdery mildew fungus. Selected 131 entries for resistance to 8 genes. Screened 2,400 wheats to *Helminthosporium sativum*. Evaluated *Aegilops* species for reaction to powdery mildew, stem rust, *H. sativum*, and *H. rostratum*. In cooperative studies with Dr. Baenziger, Field

Crops Laboratory, of the effects of powdery mildew on growth of wheat in nutrient culture, severe infection of a susceptible selection resulted in growth reductions of 36-49 percent root growth, 45-58 percent root weight, 13-14 percent stem length, and 48-60 percent stem weight as compared to intermediate and resistant selections.

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"I think that I shall never see anything as beautiful as a tree."

Report No. 6
Germplasm Resources Laboratory

1978 Report of the
National Seed Storage Laboratory
to the
National Plant Germplasm Committee
and to the
Regional Technical Committees on Plant Germplasm
by
Louis N. Bass, Director

The National Seed Storage Laboratory has a twofold mission: (1) Germplasm preservation and (2) Research on seed viability and storage. Approximately 75% of the funding for the Laboratory is spent on germplasm preservation and the other 25% is used for research.

The professional staff of the Laboratory and their major duties are: Mr. Dorris C. Clark, Botanist, who is in charge of data processing and also assists the Director with seed acquisitions which includes arranging for seed increases when needed and with seed distributions; Dr. Phillip C. Stanwood, agronomist, who is in charge of germination testing, packaging and storage of germplasm accessions, and packaging seeds to fill requests; Dr. Eric E. Roos, Plant Physiologist, who supervises much of the research program; and Dr. Louis N. Bass, Plant Physiologist, Laboratory Director, and Research Leader for Seed Viability and Storage. A listing of the current staff members is attached.

The past year's activities are summarized as follows:

Germplasm Preservation

The 630 fruit and vegetable and 2,544 field crop samples added during 1977 brought the total seed lots in storage on January 1, 1978, to 17,049 fruit and vegetable and 78,611 field crop accessions. Based on results from the research program of the Laboratory, a portion of each new accession and each retested accession is dried to 4 to 7% moisture, sealed in a metal

can, and stored at -10°C or colder. Sample size is recorded by both weight and number of seeds. Seed disbursements are recorded in number of seeds.

Approximately 11,000 germination tests were made on stored and incoming seed samples. ADP germination records were verified and germination retest and seed increase programs were developed. Retest schedules are computer generated annually by species and location. Sealed samples are regerminated less frequently than unsealed samples. The germination record card was revised to accommodate procedural changes and provide information in a format more easily transferred to the automated data bank.

Arrangements were made for seed increases on approximately 2,000 accessions that were either low in germination or in number of seeds. Increase samples received totaled 1,939. Samples distributed during 1977 were 120 fruit and vegetable accessions to 22 scientists, 1,381 field crop accessions to 55 scientists, and 1,878 virus indicator samples to 59 scientists.

The ADP records were updated and proofread. Two retrieval systems (Mirads and Quick Qwery) are being used to obtain information from the NSSL data bank. Mirads, an acronym for Marshall Information Retrieval and Display System, was developed by the Marshall Space Flight Center, Montgomery, Alabama. Mirads is an on-line data storage and retrieval system which allows the user to extract and process information from stored data bases.

Quick Qwery, developed by CACI, Inc., Los Angeles, California, is used primarily as a report generator, but it can be used for analysis of data. Quick Qwery is a very convenient system to use since it works

directly off the master file rather than requiring a specifically formated data file.

Mirads is used primarily for short reports and small (but sometimes complex) queries, while Quick Qwery is used to generate large reports. Mirads uses an indexed data base which allows rapid access to information. Quick Qwery uses a sequential search of the data file.

Seed inventories were distributed upon request. Additional editing of data is required before inventories can be published for general distribution.

Repair and maintenance funds were provided in the FY 1978 budget for upgrading the refrigeration capabilities of rooms 209, 210, 211, 212, and 213. An engineering firm is preparing recommendations on what needs to be done to provide -10°C or colder temperatures in these rooms. A contract has been let for recaulking the joints and repainting the outside of the building. Funds were also provided for a second LN_2 storage chamber.

Viability and Storage Research

At any given time the Laboratory has in progress a large number of storage projects. However, this does not mean that germination tests are made on seed in each project every year. In many cases, germination tests are made only every five years, while others require germination tests every few weeks or months. For example, projects that have been in progress for more than ten years on the relationships of storage temperature, seed moisture content, and packaging material to seed longevity require infrequent germination tests, but new studies on the

effect of freezing in LN_2 (-196°C) on seed viability require frequent germination tests.

Projects underway at present include, but are not limited to, the following:

1) Evaluation of use of LN_2 as a possible storage medium for long-term preservation of seeds. To date, Dr. Stanwood, Project Leader, has surveyed 50 agricultural and 66 flower species. Sesame and flax seed and seed of 14 flower species have shown some decline in germination following exposure to LN_2 for seven days or longer. The source of the damage appears to be in the freezing and thawing process. Investigations are in progress to determine the relationship between seed moisture content, rate of freezing and thawing, and seed injury. Very dry seed (3 - 5% M) appear to be damaged by rapid freezing (-200°C per minute), while very moist seeds (18 - 20% M) are damaged by slow freezing (-1°C per minute).

Seed of several species have been stored as part of a long-term (50 ± years) study on the effects of LN_2 on seed longevity. Future work with LN_2 will include cooperative studies with other agencies on forest tree seed in which viability retention, seedling vigor, and possible genetic changes will be evaluated.

2) Genetic changes in seeds during storage. Dr. Eric E. Roos is the Project Leader. The purposes of this study are (a) to determine the nature and frequency of genetic changes which may occur in seeds during long-term storage, and (b) to compare such changes with those resulting from frequent seed increases. Methods for detecting genetic shifts and

criteria for determining when seed stocks need to be increased to maintain genetic uniformity will be developed.

Studies in progress are designed to standardize methods for detecting chromosomal aberrations, both mitotic and meiotic, which are known to occur in deteriorating seeds. Studies using barley and pea seed, which have been subjected to artificial aging conditions have shown that in artificially aged peas, the first mitotic divisions in root tips of germinating seed are delayed, and the mitotic index is lowered with increasing period of aging. Root length at which first mitosis occurs is negatively correlated (r + -.96) with percent germination. In unaged barley seed, the first mitotic divisions occur simultaneously in the primary and lateral roots. Root length is a better indicator of time of first mitosis than is time from the beginning of imbibition.

In artificially aged barley seeds, germination was delayed with increased time in storage, and first mitosis occurred at progressively longer root lengths.

To determine whether seed longevity (or storability) is affected by individual genes, seed of isogenic lines of pea, corn, and bean produced under uniform conditions will be subjected to various deterioration treatments, then tested for germination to ascertain differences in deterioration that are genetically controlled. Studies already completed using various chlorophyll-deficient (CD) mutants of pearl millet have shown no differences among lines in keeping quality.

Population genetics is important in germplasm preservation. Hopefully, storage practices will provide a static situation in which total genetic

variation of a seed sample will remain constant.

To evaluate possible differential deterioration, a mixture of equal numbers of seed of eight snapbean cultivars differing in seedcoat and/or pod color was artificially aged, then planted in the field. Seed separations were used to evaluate the productivity of each component of the mixture.

Two cycles of deterioration and regrowing have been completed. The first cycle of aging resulted in a drastic reduction in viability, with the total loss of three of the eight lines, 'Kinghorn Wax', 'White-Seeded Tendercrop' (both white-seeded), and 'Tendercrop', the parent of White-Seeded Tendercrop.

In the second cycle, populations from the first cycle were continued, deterioration was much less, and all five remaining cultivars survived.

The composition of these populations was altered through differential deterioration and survival in the field, and yield per plant. Generally, the relative yielding ability was not affected by artificial aging.

Results to date indicate that with time a mixed population of beans will gradually shift toward genotypes with good storability and productivity unless special precautions are taken to prevent such a shift.

Cooperation with IBPGR

The National Seed Storage Laboratory is cooperating with the International Board of Plant Genetic Resources. In addition to storing reserve samples of rice for IRRI, the Laboratory has recently received over 2,000 additional corn samples from CYMMIT. The Laboratory has been asked to store a reserve sample of each of the 13,500 accessions in the CIAT

Phaseolus collection (12,600 *P. vulgaris* and 900 *P.* sp.) and each of the 1,500 accessions in the world Winged Bean (*Psophocarpus tetragonolobus*) collection. Dr. White is also working to obtain another large collection which is in jeopardy in its present location.

Facility Needs

With the increase in rate of acquisition of additional accessions generated by cooperation with the International Board of Plant Genetics Resources, it appears likely that available storage space will be fully utilized within the next five to eight years. Therefore, planning for additional facilities for germplasm storage, including space for seed handling and storage of supplies and equipment, must be started soon. In planning for new space, careful consideration must be given to the possibility of providing some space for storage in LN_2 as well as in conventional refrigerated storage. Any suggestions you have to offer will be greatly appreciated.

For the past several years I have spent considerable time writing, rewriting, editing, and proofing Agricultural Handbook 506, "Principles and Practices of Seed Storage," which I am coauthoring with Dr. O. L. Justice. Tentative release date for Handbook 506 is approximately May 21, 1978. Copies will be available through the GPO.

STAFF ASSIGNMENTS IN THE NATIONAL SEED STORAGE LABORATORY

Dr. Louis N. Bass, Laboratory Director
Mr. Dorris C. Clark, Botanist
Dr. Eric E. Roos, Plant Physiologist
Dr. Phillip C. Stanwood, Agronomist
Ms. Arlien Schmohl, Secretary
Mr. Isidore Rivera, Janitor

SECRETARIAL UNIT

Ms. Arlien Schmohl, Supervisor
Ms. Cherri Rogers, Clerk-Dictating Machine Transcriber
Ms. Linda Sonnen, Clerk-Dictating Machine Transcriber
Ms. Kim Gavette, Stay-in-School Student Aid
Ms. Bobby Kelley, Handicapped Trainee
Ms. Rita Knoll, Stay-in-School Student Aid

DATA PROCESSING UNIT

Mr. Dorris C. Clark, Supervisor
Ms. Neona Merritt, Clerk-Typist

GERMPLASM PRESERVATION UNIT

Dr. Phillip C. Stanwood, Supervisor
Ms. Kathy Dawley, Biological Aid
Ms. Patricia Klein, Biological Aid
Mr. Dennis Moss, Biological Aid
Mr. Dennis Zaborski, Biological Aid
Ms. Debbie Schelhaas, Stay-in-School Student Aid

GERMPLASM RESEARCH UNIT

Dr. Eric E. Roos, Supervisor
Mr. Donald Davidson, Biological Technician
Mr. Joseph Manalo, Biological Technician

Dr. Louis N. Bass, Supervisor
Mr. Patrick Bergquist, Biological Aid
Mr. Eugene Keys, Biological Aid

At the present time, nine students are employed under the Colorado State University Cooperative Agreement.

Report for 1978 Meetings of the
S-9, NC-7, and W-6 Technical Committees

Northern Regional Research Center

General Developments at NRRC--Much effort has been expended during the past year in budget development for FY 1979 and 1980. Termination of our kenaf and fescue research has been threatened for FY 1979, and the possibility of a program increase for FY 1980 in the field of new crops and renewable resources from agriculture has been actively pursued.

Horticultural and Special Crops Laboratory has increased its capability in several areas of research. A full-time botanical taxonomist has been transferred into the laboratory to help in collecting and identifying new germ plasm for our screening program, and a new group of 1 SY and 2 technicians have taken over the responsibilities of chemical analysis of the SEA soybean breeding program, when the analytical services were terminated in Champaign-Urbana, IL. During the first year we analyzed 12,000 soybean samples for oil and protein. Rapid accurate analytical procedures are being developed for amino acids, fatty acids, sugars, and other soybean constituents.

New Crops Screening--With the addition of a technician, who has extensive botanical and taxonomic background, to the staff of the Instrument Analysis Research group, collection of new germ plasm has increased greatly. Many of these new seeds, generally from Illinois, are species which were not previously in our collection. Chemical screening of these collections have recently been started.

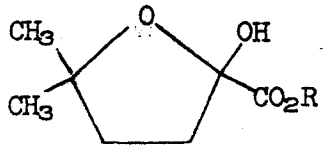
Seed from a total of 380 uncultivated species were received from various sources, an increase of about 300 over the previous year.

Among the 45 oils examined for fatty acid composition were 23 Umbelliflorae. These 23 samples were also examined for petroselenic acid content by gas chromatography-ozonolysis. Of interest, both taxonomically and for possible industrial utility, was that all five Garryaceae had an average of 75% petroselinic acid in their seed oils.

The increased interaction with plant breeding programs made necessary the development of some new techniques. In order to efficiently analyze the protein levels of 100 foxtail millet samples (for George White) and about the same number of Luffa samples (Frank Martin, Puerto Rico), we developed a whole seed

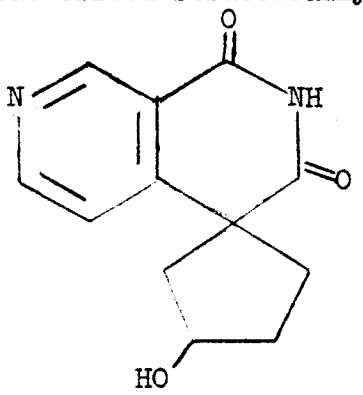
autoanalyzer method that has potential for analyzing about 30 samples per hour. The use of wide line NMR for rapid accurate oil content determination is now under consideration. This technique will probably be used for the Oregon Brassica breeding program. Oil from about 500 samples of Brassica were determined by the slower and more tedious Butt extraction technique this previous year. This Brassica program also requires fatty acid analysis. With some new esterification methods adapted this past year, oils can be converted to fatty acid methyl esters at the rate of about 200 a day compared to 20 a day by the previous method.

Antitumor and Pest Control Agents--A new procedure has been developed for converting cephalotaxine (an inactive Cephalotaxus alkaloid) into harringtonine (a potent antileukemic compound) via a series of cyclic intermediates. The immediate precursor of harringtonine is the following:



[R = cephalotaxine moiety]

Sesbanine, a new antileukemic alkaloid from Sesbania drummondii seed has been characterized structurally as follows:



This compound contains a previously unknown organic ring system. Another new antileukemic alkaloid has been derived from Cephalotaxus mannii, one that is unrelated to harringtonine and other typical Cephalotaxus alkaloids. As a result of continued screening of seed extracts, two new high-priority actives have been established during the past year from seeds of Bolboschoenus maritimus (Cyperaceae) and Engelhardtia picata (Juglandaceae).

In cooperation with Dr. Ray Clark of Iowa State University, a fungal resistance factor in tomatoes is being isolated. Chloroform-soluble extracts have been obtained from different varieties of tomatoes whose in vitro behavior correlates with the degree of fungal resistance of the varieties from which they were derived. The role of the glycoalkaloid tomatine in these relationships is not yet clear. In cooperation with Dr. Roy Sigafus of the University of Kentucky, Lithospermum arvense is being fractionated to isolate the principle active against mosquito larvae. With the advice of Dr. Wilbur Guthrie of SEA's Ankeny, IA laboratory, a procedure has been developed for using European corn borer larvae to assay plant extracts for pesticidal activity.

Kenaf.--One-half ton of kenaf thermomechanical pulp (KTMP) prepared by an industrial cooperator was bleached to newsprint brightness with a two-stage hypochlorite/hydrogen-peroxide procedure. A portion of the KTMP was bleached to >60% brightness, blended with kenaf soda pulp (2:1) and 5% bleached southern kraft softwood pulp. The admixture was formed on the pilot fourdrinier machine into a coating raw stock. The major portion of KTMP blended with bleached kenaf soda pulp, 65 and 35%, respectively, was formed into newsprint having properties nearly identical to those of a standard commercial newsprint. Both experimental webs were tested for serviceability in commercial printing presses. The coating raw stock tested under unmodified standard printing conditions performed well with multiple color letterpress, offset, rotogravure, and flexograph techniques, even without coating. The kenaf newsprint showed good print quality, essentially identical to that of commercial newsprint and repulped newsprint. The development is significant because 65% of U.S. newsprint is imported (value of $2.25 billion), and because kenaf can produce up to 5 times the amount of pulp per year per acre that can be produced by means of either hardwoods or softwoods. Continuing are efforts to further develop the technology of high-yield pulping for kenaf.

As in 1976, kenaf was grown on Illinois strip-mined land. Harvested yields determined 1 month after a killing frost were 3,000, 2,300, 4,300, and 3,600 pounds per acre, respectively, from plots having treatment variables of unfertilized control, commercial fertilizer, low and high levels of activated sludge. Superficial examination of interim data suggests that kenaf responds favorably to sludge throughout the growing season. Yield responses to sludge treatments are positive. Analyses of selected stem samples show that heavy metals contents increase with improved soil fertility.

Good pulp characteristics were observed for a nematode resistant kenaf strain grown on infested soils, but properties of pulp from Everglades 71 grown on uninfested soil were slightly better.

As everyone is keenly aware, concern for energy and the concomitant interest in renewable resources has prompted a resurgence of interest in latex producing plants and, in particular, in guayule for rubber. We are examining guayule cellular residue to determine its potential as a fiber resource.

When we selected kenaf for development as a fiber crop, there were several other promising genera indicated by our screening results. Energy considerations now place several of the nitrogen-fixing legumes (e.g., Crotalaria and Sesbania) in favorable position for further study.

Scanning electron microscopy studies on the parasitism of Hibiscus by the root-knot nematode, Meloidogyne incognita, tend to exclude morphological causes for the resistance of H. sabdariffa (roselle) relative to the 'susceptibility' of H. cannabinus (kenaf). Characteristic changes in xylem tissue proximal to nematode feeding sites suggest that syncytia form via cell wall dissolution rather than mechanical destruction, but as yet roselle and kenaf are not distinctly different with respect to giant cell and syncytium formation. M. incognita penetrates both Hibiscus species easily, but in kenaf more nematodes develop into egg-laying females. Chemical differences that might affect this development are being pursued in comparative analyses of kenaf and roselle.

Synchronized cultures of M. incognita in tomatoes exhibit peculiar fluctuations in the viability of harvested egg masses as if in response to rhythmic variation in host plant physiology. Such potential interactions promise to complicate understanding of the biochemistry of nematode maturation in Hibiscus, but they suggest a new approach to parasitic nematode control.

Hydrocarbon and Rubber-Producing Plants--The program for screening native wild plants for rubber, other hydrocarbons, and whole-plant oils has continued; nearly 300 species have now been evaluated.

The surprising discovery was made that five Gramineae contain 0.6-1.7% trans-1,4-polyisoprene (gutta) having a molecular weight of about 100,000. The gutta contents of these wild grasses are comparable to the rubber content of a producing Hevea tree on a dry-plant weight basis. Thus, such grasses may be potential practical sources of gutta if their yields can be increased several fold through chemical yield stimulation and plant breeding. Gutta would have large-scale applications as both a thermoplastic and a thermosetting resin if it were available at prices competitive with petroleum-derived polymers.

The composition of whole-plant oils from 14 plant species, which have good potential as hydrocarbon- and rubber-producing crops, was examined. A prominent feature of most of these oils was their large component of nonglyceride esters. Such oils could become valuable new feedstocks for production of plasticizers for rubber and plastics and new sources of waxes, long-chain alcohols, sterols, terpenes, fatty acids, and other products. A petroleum refinery could conceivably be operated on whole-plant oils.

Studies on chemical yield stimulation are continuing. Rubber- and gutta-producing species are being grown on a test plot for treatment with a variety of chemical agents in a statistically designed experiment. Also, product development research and testing of oils and polymeric hydrocarbons is continuing.

Guayule processing studies have produced a patent application on a novel treatment of fibrous plant materials to make solvent extraction of polymeric hydrocarbons much more efficient and economical.

Tissue Culture--Cells cultured from tissue of *Cephalotaxus harringtonia* produce antitumor alkaloid esters at very low concentrations, but they elaborate these alkaloid products into the culture medium and presumably should be capable of continuous production at a constant rate. In contrast, whole plant levels of the active esters vary substantially with growth phase. Initial studies show that preharvest changes in the tree are more important than post-harvest changes. Trees sampled in April during the season of rapid growth contained no detectable alkaloid esters but large amounts of the free alkaloid, cephalotaxine, and its oxidation products. Topping a laboratory-grown plant to force regrowth produced a similar alkaloid pattern as if stored alkaloid esters were hydrolyzed to the free alkaloid during periods of rapid growth. The alkaloid pattern found in tissue culture closely resembles the stressed laboratory plant.

Glucosinolates in Cruciferous Vegetables--A survey of 14 varieties of Chinese cabbage (*Brassica campestris*) showed 170 to 1360 ppm total glucosinolates (GS's) compared with 300 to 1290 ppm GS's from common cabbage (*B. oleracea*). In general, the GS's of Chinese cabbage have a carbon chain one unit longer than those found in common cabbage. GS content of Chinese cabbage seed ranges from 2.3 to 4.3%; five GS's are present, with 3-butenyl GS predominating.

Assay of the different parts of common cabbage heads shows the concentration of GS's in the cambial cortex to be about twice that in the leaves or pith. The pith contains different kinds of GS's than the leaves or cambial cortex. The cambial cortex and the pith together comprise 5-10% of the total head.

Analyses of domestic horseradish root show no significant differences among four varieties. Total GS calculated as allyl GS (sinigrin) ranged from 13,600 to 17,000 ppm. Of this 65-75% is allyl GS and 7-17% is phenylethyl GS. These two give rise on hydrolysis to the pungent volatiles allyl isothiocyanate and phenylethyl isothiocyanate. Current studies involve other cruciferous vegetables.

The physiological activity of GS hydrolytic products is under current investigation. Neither 1-cyano-3,4-epithiobutanes (A), 1-cyano-2-hydroxy-3-butene (B), sinigrin (C), or epi-progoitrin (D) are teratogenic in the rat. However, compound A is thyrotoxic and compound B is nephrotoxic. A feeding trial of 1-cyano-3,4-epithiobutanes to rats has been completed; the results await histological interpretation.

Toxicants from Umbelliferae--Two toxicants that occur in carrot roots to extent of a few ppm are myristicin, a hallocinogen chemically related to engenol, and falcarinol, a 17-carbon acetylenic alcohol. A quantitative method for estimating these two has been developed but requires validation. Both toxicants are separated from carrot tissue by steam distillation with concomitant extraction into hexane. The concentrated hexane is then chromatographed on two GLC columns (Silar and SF-96) using an internal standard for quantitation.

Advances in New Oilseed Crops

Crambe--A number of plantings for increase of seed were made in 1978 in Indiana, Illinois, Missouri, and Kentucky. One commercial company is interested in developing crambe for its product line and is increasing seed for large-scale plantings in 1979. A familiarization study in their oilseed processing plant in the spring of 1978 involved flaking and extraction of ca 100 tons of crambe seed by a straight solvent extraction process, the largest run of this type ever for crambe.

Cuphea--A German chemical company has taken note of our early work on Cuphea as a source of short-chain fatty acids, and has done a large-scale evaluation of approximately 50 Cuphea species. Now they are growing hectare quantities of several species for the purpose of replacing imported coconut oil and petroleum products as chemical intermediates for surfactants and lubricants.

Vernonia--An English company has increased 50 grams of Vernonia pauciflora to 200 kg in two growing seasons in Kenya. This species appears more promising than V. anthelmintica on account of its 40% oil content and 80% epoxidation in the seed oil and its superior agronomic characteristics. This early success has led a European investment group to explore the possibilities of going to full-scale production. An American company will undertake a complete evaluation of the epoxy oil in their coatings and adhesives lines. One half

of the Kenya seed production is being shipped to our laboratory for processing studies and oil and meal evaluations. U.S. consumption of epoxidized vegetable oils in the plastics industry is now estimated at 150,000,000 pounds annually. These oils are produced commercially in a economically and energetically expensive way, whereas Vernonia and Stokesia species can produce such oils directly through direct conversion of solar energy.

Jojoba--Jojoba oil at $8 to $10 per pound is disappearing more rapidly than it can be produced at this stage in its development, according to speakers at the symposium on jojoba oil at the American Oil Chemists' Society meeting in St. Louis, MO, in May 1978. Prices are expected to decline regularly until the early 1990's. An early price reduction may be effected when plans are realized this year to harvest 1,500,000 acres of wild jojoba stands in Mexico. An increased interest in product development may be warranted to utilize jojoba oil more satisfactorily in lubricants, soaps and cosmetics, candles, and other low- and high-volume applications. Also, chemical evaluation of jojoba germ plasm variability and processing variables appears imminent to improve production of desirable oil and meal products.

Report of Regional Station Activities
to
S-9 Technical Committee
July 1, 1977 - June 30, 1978

Plant Introduction

Seed or plants of 2451 new introductions have been received since July 1, 1977. A few large collections, namely 1256 mungbean introductions from Taiwan, 436 Cenchrus from South Africa and 288 Trifolium from Greece and Italy, constitute much of the new material. The other 471 accessions represent a wide assortment of species. Seventy five items were received from the Peoples Republic of China. These new additions increased the inventory of seedstocks held at the Regional Station to more than 36,000 accessions. Some of the larger collections are:

Arachis spp. (peanut)	4395 accessions
Sorghum spp.	3700
Cajanus cajan (pigeonpea)	4150
Capsicum spp. (pepper)	2265
Vigna (cowpea, mungbean)	4866
Warm season grasses	6586
Cucumis spp. (cantaloupe)	2053
Citrullus spp. (watermelon)	650
Winter legumes	2200
Other (sesame, guar, castors okra, eggplant, summer legumes)	5434
TOTAL	36,299 accessions

Production of Seed

2521 introductions are being grown at the Regional Station for seed increase and preliminary evaluation. With financial support from the National Seed Storage Laboratory arrangements were made with Dr. D. E. McCloud, University of Florida, to increase the seed of 1000 peanut introductions for use at the regional station and placement in NSSL. Similar arrangements were made with Dr. J. S. Kirby, Oklahoma State University, to increase the 1256 new Mungbean accessions for the regional station and NSSL. Seed of more than 600 accessions of Trifolium and Medicago were obtained from plots at Overton and College Station, Texas last year. Dr. E. C. Holt has agreed to harvest additional seed for us again this year from plots at Beeville. Dr. A. E. Kretschmer, Ft. Pierce, Florida, is increasing the seed of 500 tropical and semi-tropical legumes for the regional station. Many of these are species of interest as forage crops in southern Florida. Two years ago the Southern Directors, SAES, increased our budget $12,000 annually to grow seed of short-day plants at a tropical location. These funds have been used for increasing seed of tropical corns and sorghum, Vigna spp., Dolichos, Psophocarpus and other tropical species at the Institute of Tropical Agriculture, Mayaguez, Puerto Rico.

Cataloguing and Distribution of Seed

The Southern Region Administrative Office, SEA-FR, agreed to print seed catalogues for the regional station this year. Seven catalogues have been submitted for printing. The first will be ready for distribution about the second week of July. The new catalogues will be of a new format that is more suitable for library reference.

Distribution of seed and plants in the Southern Region since July 1, 1977 is summarized in the following table:

Packets of seed and plants distributed in Southern Region
FY-78

State	S-9	NE-9	NC-7	W-6	Other	Total
Alabama	290	54	105	0	20	469
Arkansas	7	4	0	0	0	11
Florida	2302	328	216	9	1249	4104
Georgia	704	0	21	183	64	972
Hawaii	0	0	0	0	0	0
Kentucky	109	0	11	14	0	134
Louisiana	1973	1	0	0	10	1984
Mississippi	489	0	661	508	0	1658
North Carolina	206	0	70	0	6	282
Oklahoma	1696	0	0	0	0	1696
Puerto Rico	1884	3	12	4	71	1974
South Carolina	214	23	566	0	3	806
Tennessee	236	1	0	0	0	237
Texas	785	20	187	7	121	1120
Virginia	0	74	0	1012	0	1086
Totals	10,895	508	1849	1737	1544	16,533

W-6	1227
NC-7	1258
NE-9	1340
Foreign	2773
NSSL	1332
TOTAL	18,825

Screening for Disease Resistance

Watermelon Anthracnose: Final results from the 1977 field test of the most promising PI's for resistance to race 2 anthracnose, indicate significant differences in late-season resistance. (Table 1.)

Table 1: Severity of race 2 anthracnose in field and greenhouse tests as measured by disease index (0-5)

Entry	Field Early	Field Late	Greenhouse
PI 203551	1.8 a	2.0 a	3.5 b
PI 271779	2.0 ab	4.0 de	1.3 a
PI 299379	2.2 abc	4.0 de	2.0 a
PI 271778	2.2 abc	2.2 ab	3.8 b
PI 271775	2.5 bcd	2.2 ab	1.0 a
PI 189225	2.8 cde	2.8 abc	1.3 a
PI 270550	2.8 cde	3.0 abcd	5.0 c
Check (susceptible)	3.5 fg	5.0 e	3.0 b

Cooperative tests with Dr. Norton of Alabama and Dr. Rhodes of South Carolina to document this resistance in three areas are in progress. Three PI's which were resistant in the field were not resistant in a greenhouse test. Variability between field and greenhouse results as well as plant to plant variation on reaction within an apparently uniform population of the host will create problems for the plant breeder who attempts to select resistant progeny in the greenhouse.

Gummy Stem Blight of Cantaloupe: Results from a replicated test in the greenhouse indicate that 11 PI's are equal to PI 140471 in their resistance. These are being tested in the field this summer.

Pepper, Tobacco Mosaic Virus: 980 PI's of *Capsicum annuum* were screened for resistance to a common isolate of TMV. Seventeen showed resistance in preliminary tests. A local lesion reaction was produced by the virus on all plants of PI 159233 and PI 159234. No local lesions were produced on *Nicotonia glutinosa* by sap from the young leaves of these PI's, indicating the virus was confined to the local lesions. PI 241650 is apparently immune to the common strain since TMV produced no symptoms on inoculated plants and the virus was not recovered from 20 of these plants.

Seed-borne Bacterium on Watermelon: Seed of watermelon PI's grown at Experiment, Georgia in 1977 were heavily infested by *Pseudomonas pseudoalcaligenes* subsp. *citrulli*. This bacterium was described as a new subspecies (Schaad, N. W., G. Sowell, Jr. et.al. 1978. *Pseudomonas pseudoalcaligenes* subsp. *citrulli* subsp. nov. Int. Jour. Systematic Bacteriology 28:117-125.). The bacterium was detected in the irrigation pond and apparently was disseminated by the overhead irrigation system. As in past years the bacterium was not associated with any significant symptom on watermelon in the field. In the greenhouse, however, the bacterium caused severe water-soaking and necrosis of the cotyledons followed by death of many seedlings. Several cantaloupe introductions showed a severe leaf spot different from those associated with common diseases of cantaloupe.

Pathogenicity and physiological tests indicate that the watermelon bacterium was responsible for the cantaloupe disease. Inoculation tests indicate that certain PI's of cantaloupe are highly susceptible to the bacterium. Watermelon seed samples supplied by breeders in Kentucky, Louisiana, Texas and Hawaii did not carry the bacterium. Distribution of watermelon PI's is now restricted to a few anthracnose-resistant PI's which have not shown evidence of the pathogen in greenhouse tests. This seed is treated with a 16-hour soak in 1000 ppm streptomycin before shipment.

Screening for Insect Resistance

Cowpea aphid - Preliminary screening of the *Vigna* collection for resistance to the cowpea aphid, *Aphis craccivora*, has been completed. No outstanding resistance was found but fair levels of tolerance were observed. Breeding lines currently in use apparently possess some tolerance to the aphid. The commerical varieties Climax, Mississippi Silver, Combine Pea, Crimson, Dixie Lee, Florcream, Producer, Louisiana Purchase, and Top Set which were in the P.I. collection were among the most tolerant when tested as young plants. Future work will include an attempt to quantify the resistance of the more promising accessions and to determine their resistance as older plants.

Melon aphid - Preliminary screening for resistance to the melon aphid, *Aphis gossypii*, has been completed on 1,000 of the *Cucumis* accessions. No markedly superior resistance to that found in 'Smith's Perfect' was observed.

It was noted in last year's report that 'Smith's Perfect', Georgia 47, and a selection from G. W. Bohn, Brawley, California (No. 90234) were apparently equal in resistance to the aphid. Further study has proved this wrong. 'Smith's Perfect' is much superior to the Bohn selection which in turn is somewhat better than Georgia 47.

Budget

Funds for operating the Regional Station during FY-78 and the proposed budget for FY-79 are shown in the following table:

Regional Station Budget

Source of Funds	FY-78	FY-79
Regional Research Funds (Pooled)	$ 77,475	$ 64,740
Regional Research Funds (Georgia Station)	21,850	28,737
USDA - SEA-FR	161,400	170,100
TOTAL	$260,725	$263,577
Expenditures		
Personal Services	$188,033	$194,920
Equipment	14,124	10,000
Seasonal Labor	10,100	12,000
Operating Expenses	17,759	20,157
Travel	4,209	4,500
Seed Increase at Other Locations	26,500	22,000
TOTAL	$260,725	$263,577

New Facilities and Equipment

The new seed storage building, constructed with Regional Research Funds, was completed and put to use last September. This facility has 2 large storage rooms, 24' x 38' each, and a small work room for filling seed packets.

Two sections of greenhouse, 20' x 25' each were completed and put to use November, 1977.

Other equipment purchased during the year is listed below:

1. Camera equipment for taking photomicrographs
2. 2 Evaporater coolers for new greenhouses
3. Rotovator
4. Steam boiler for sterilizing soil
5. Computer terminal

Authorization was obtained to use $125,000 of SEA-FR funds to construct a building for drying, cleaning and fumigating seed. Plans and specifications for the building are now being developed by the Southern Region Administrative Office, SEA-FR.

Report for 1978, S-9 Technical Committee
Mayaguez Institute of Tropical Agriculture
Mayaguez, Puerto Rico 00708

Franklin W. Martin

At the Mayaguez Institute of Tropical Agriculture we are preparing for our participation in the national system of fruit and nut repositories. Although our role has not been perfectly defined, and although funding for our part is probably still far away, nevertheless, we feel that we should take whatever steps we can now to prepare us for our role. With this in mind we are developing plantings of those tropical fruits that are not likely to be planted on a reasonable scale in the continental U.S. We already have a good number of mangosteen trees and can already serve as a principal seed source. We are now planting about 100 trees each of durian, lanson, and duku. We have attempted to grow rambutan and pulasan with very poor results. The mineral deficiency that characterizes the seedlings of these species has not been alleviated by changes in soil or soil mixtures, or by supplemental mineral drenches or sprays. This problem requires careful study by a plant nutritionist, or it is unlikely that we can build up stocks of these species.

Considerable interest has been expressed in Puerto Rico concerning our program of fruits. Judging from public reaction as well as our own limited experience, the pummelo is the most promising of the 8 fruits we are emphasizing. Although we have about 20 varieties on hand, we are limited in germplasm, and indeed have not yet seen the fruits of most of these and are thus not ready to recommend specific varieties.

The canistel has proved to be a very satisfactory fruit for our area. Scions from good trees from Florida were grafted on seedlings from the same area, only three years ago, and some of these trees are already fruiting. As our resources permit we wish to expand the collection of canistel materials, and eventually develop named varieties.

The pejibaye or peach palm has been added to the previous 7 fruits as a fruit to be emphasized. We have begun by cleaning up old trees for evaluations, and by a search for new germplasm, so far only moderately successful.

Over the long run these tropical fruits can be of great interest and satisfaction in Puerto Rico and the American Tropics, and with time can be exported for specialty markets in the United States.

The vegetable program continues with evaluation of species especially suitable for the hot, humid tropics. The first of our bulletins on tropical vegetables has been published, the winged bean, and 5 other bulletins are in various stages of writing: okra, chaya, eggplant, loofah and bottle gourd, and amaranth and celosia. All but one of these bulletins have involved the evaluation of a collection of materials.

We maintain seed stocks of the vegetables that we recommend, but as requests are increasing in number we need some new guidelines concerning our own role in plant distribution.

We are presently preparing for our next three bulletins and are evaluating collections of pepper, vegetable corns, and horseradish tree. This past year we discovered a new but still unidentified sweetener in the seeds of the horseradish tree.

Among the vegetables of outstanding value that we have tested this year are the following:

1. Lance. A truly tropical lettuce of the species Lactuca indica.

2. Los Baños. A bush asparagus bean used as a snap bean, and of very high quality.

3. MITA 58. A climbing cowpea with long life and resistant to many diseases.

4. Sierra Leone. A Celosia that yields edible leaves over a very long period.

5. Toaño. A vigorous, high yielding, disease-resistant winged bean that is almost day neutral.

6. Sulfur. A sweet potato with brilliant yellow decorative foliage as well as a good, dry-fleshed tuber.

We have put the vegetables together in a small vegetable gardening system that produces continuously over the year with minimum inputs.

The program of improvement of beans and cowpeas is about to yield new, high quality multiple disease resistant beans as the result of the program of 9 years with plant introductions. The superior materials identified and then developed further are in wide demand, and with time can be expected to change the varietal picture in Tropical America. Progress is being made in the development of multiple disease resistant scarlet runner beans and tepary beans. The latter have the potential of displacing common bean in some situations. Soybean varieties are also near release. Some of those developed at MITA appear to outproduce all introduced materials.

The sorghum work at Mayaguez continues to receive wide recognition. Tropical sorghums now converted to dwarf day-length neutral types now number about 200. Populations with wide resistances to diseases and insects are now under develop-

ment from introductions, and these provide elite materials for new breeding efforts anywhere in the tropics.

Surprisingly, the island of Puerto Rico produces little corn although much is imported. Using some old and adapted native varieties as well as plant introductions we are beginning a program to develop tropical field corn. The sweet corn developed and released recently, Suresweet, continues to be in demand throughout the tropics.

MITA has begun an effort to produce okra seed as a new grain crop for the tropics. Presently, a world collection is being screened for variation, especially in seed production, seed quality, and for oil, protein, and gossypol contents. Okra has the advantage that edible seed can be produced even during the rainy season.

Much of the introduced plant material is screened for its potential as sources of leaf protein concentrate. Outstanding sources and new techniques together promise the possibility of an industry in this area.

At the present time MITA maintains lists of seeds available for distribution as follows: winged bean varieties, yams and other tuber crops, and selected leafy vegetables. We hope to expand this to an annual or biennial catalog.

S-9 Technical Committee Report, June 22, 1978
Subtropical Horticulture Research Unit
Miami, Florida

R. J. Knight, Jr., and P. K. Soderholm

In spring 1978, propagations of 22 different plant introductions were distributed to cooperators. Three of these plants are edible fruits: the wampi, a citrus relative (Clausena lansium, M-24396); the miracle fruit, West African source of a low-calorie sweetener (Synsepalum dulcificum, M-22522); and a new Bolivian introduction of jaboticaba, a grape-like myrtaceous fruit (Myrciaria cauliflora, M-22522). The other distributions were of ornamentals (or plants suggested for such use) and included Coffea arabica 'Tight Growth' (P.I. 205122), cold-tolerant Eugenia eucalyptoides (P.I. 36043), two species of Peperomia, and three Philodendron species.

R. J. Knight, Jr. and H. F. Winters spent 33 days exploring Brazil, Argentina, and Paraguay and brought back 306 introductions that included fruit trees, oil and edible-fruited palms, and ornamental plants. Of the collection, 271 were planted at Miami and the first distribution of this plant material is slated for summer 1978. Other accessions for the year included avocados, citrus, Cola acuminata, mangos, pineapples, and additional tropical ornamentals.

Avocados that fruited in 1977 were unusually cold-tolerant because their flower buds survived the extremely severe January weather. Six hundred seedlings that resulted from this 1977 fruit have been started for the next round of selection work. Most of the seedlings derive in part from M-18686, an introduction from Brooksville, Florida (north of Tampa). Most outstanding among foreign avocado introductions was 'Ettinger' (P.I. 218196), a commercial cultivar from Israel. 'Ettinger' trees bore large crops in 1977 and are doing so again this year after a winter whose cold was more prolonged than that of 1977-78, even though temperature minima did not descend to 1977 levels. Because of its consistent production of quality fruit, 'Ettinger' deserves to be tested in areas where other hardy avocados are presently grown.

Carambola seeds produced in an isolation garden by 2 cultivars of low oxalic acid content have been planted. The seedlings are being grown for field testing and genetic studies.

In the year from June 1, 1977 through May 31, 1978, 1,674 distributions of tropical and subtropical plant germplasm were made from the Miami station (table I). During the same period, 593 new accessions were recorded, bringing the total number of station accessions through May 31, 1978, to 25,089 (table II). Seeds of 46 cold-tolerant coffee cultivars were distributed to the southernmost coffee research station in Brazil.

Flowering in a population of 256 African tulip seedlings (Spathodea campanulata) derived from crossing red and yellow flowered trees of M-21575 indicated simple Mendelian inheritance of flower color, with red genetically dominant to yellow.

A student from Washington University, St. Louis, plans to work at the Miami station with the enzymes present in Hevea brasiliensis latex, attempting to synthesize rubber outside the living plant.

Table I. Distributions of Plant Introductions in USDA/SEA/FR, Miami, Florida, from 1 June 1977 through 31 May 1978

Destination	Number	Percent of total
Florida	1,235	73.7
California	41	2.5
Rest of Continental U.S. and Canada	229	13.7
Hawaii, Puerto Rico and Virgin Islands	52	3.1
Rest of Antilles, Bahamas, Bermuda	8	0.5
Mexico and Central America	41	2.5
South America	10	0.6
Europe	16	1.0
Asia	24	1.4
Africa	13	0.8
Pacific Basin[z]	3	0.2
Total:	1,674	

[z] Australia, New Zealand, Philippines, Pacific Islands

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Table II. Germplasm Receipts at USDA/SEA/FR, Miami Florida, from 1 June 1977 through 31 May 1978 (Accession Number M-25089)

Material	Number of introductions received
Miscellaneous ornamentals and shade trees (includes orchids and ferns)	245
Tropical and subtropical fruits	267
Oil palms	21
Cacao	13
Coffee	11
Medicinal, chemurgic, and tropical vegetables	36
Total:	593

Publications: Sherman, W. B., Knight, R. J., Jr., and Lyrene, P. M. 1978. Probable apomixis in 'Anna', a diploid apple cultivar. HortScience 13(2): 162.

Torres, A. M., Diedenhofen, U., Bergh, B. O., and Knight, R. J., Jr. 1977. Enzyme polymorphisms as genetic markers in the avocado. American J. Botany 65(2): 134-139.

APPENDIX B

Plant Exploration Proposals

1. Exploration for *Festuca* species, *Dactylis* species, *Trifolium* species, and *Lotus* species in Yugoslavia - R. L. Haaland.

2. Exploration of Mexico for Cucurbitaceae - G. Sowell, Jr. and T. W. Whitaker.

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May 29, 1978

Dr. C. S. Hoveland
Department of Agronomy
and Soils
Auburn University
Auburn, Alabama 36830

Dear Dr. Hoveland:

I was pleased to learn of the proposed plant exploration trip to Yugoslavia, for the purpose of collecting Festuca, Dactylis, Trifolium, and Lotus species. I have shared this information with other members of the forage research team at Mississippi State Universtiy. It is our feeling that this effort would provide some useful and much needed germplasm of the aforementioned species. We presently have very little germplasm of any of these species from this area. Dr. W. E. Knight pointed out that he has found some useful germplasm of annual Trifolium species from Yugoslavia and eastern Eurpoe. This trip could also greatly enlarge the collections of the species involved, some of which are quite small compared to other cultivated species.

Our department is highly supportive of this effort and we feel that it is an excellent opportunity to collect germplasm in an area that is not always readily accessible. Since much of the groundwork has already been laid in Yugoslavia, we would urge Dr. Haaland and yourself to proceed with your proposal as soon as possible.

Sincerley,

C. E. Watson Jr.

C. E. Watson, Jr.
Assistant Professor
of Agronomy

PLANT EXPLORATION PROPOSAL

TO: SEA Plant Germplasm Coordinating Committee

VIA: Dr. W. R. Langford, Coordinator
Regional Project S-9 and the S-9 Technical Committee

FROM: Dr. R. L. Haaland, Agronomy & Soils Department
Auburn University, Auburn, AL 36830

DATE: May 26, 1978

1. TITLE: Exploration for *Festuca* species, *Dactylis* species, *Trifolium* species and *Lotus* species in Yugoslavia.

2. OBJECTIVES:

   a. Collect *Festuca* species with forage and/or turf potential for breeding purposes in the southern U. S. A.

   b. Collect *Dactylis* species to improve the genetic base for breeding this forage species in the southern U. S. A.

   c. Collect as many *Trifolium* species and associated nodules as possible to improve the genetic base for breeding species for this forage and ground cover in the southern U. S. A. Emphasis will be on miscellaneous *Trifolium* species rather than *T. repens* or *T. pratense*.

   d. Collect *Lotus* species and associated nodules with emphasis on forage potential to expand the gene pool useful for breeding trefoil in the southern U. S. A.

3. JUSTIFICATION:

Fescue, *Festuca* sp., is a major forage, turf and soil conservation grass species in the U. S. A. Tall fescue, *Festuca arundinacea*, is the most widely grown forage grass in the southeastern U. S. A., most of which is the cultivar, 'Kentucky-31'. Cultivars such as 'Kentucky-31' have very little growth potential during the winter due to a dormancy phenomenon and therefore cannot take advantage of the temperate winter climate of the Southeast. Experimental lines of tall fescue developed at Auburn from Mediterranean and Australian plant introductions have shown excellent winter forage production potential (11). A narrow leaved genotype from a North Africa plant introduction produced more tillers than genotypes selected from germplasm originating in North America (1). Tall fescue grown in the Southeast is susceptible to crown rust, *Puccinia coronata* Corda. var. *coronata* (3). Several species of root pruning nematodes are also pathogenic on tall fescue (7). Root size has been shown to be related to nematode tolerance as well as water uptake (8). Tall fescue plant introductions from the Mediterranean area have shown great diversity for root diameter and number (Haaland, unpublished data 1977).

Grass tetany, a metabolic disorder in ruminants, has been associated with low Mg and high K levels in tall fescue. Low soil O_2 depresses the uptake of Mg and enhances the tetany potential. Mediterranean plant introductions have been a source of variability for Mg uptake under low O_2 soil conditions (4, 6). Meiotic irregularities in Festuca sp. have been reported by several authors (5, 12, 14). These irregularities often lead to fertility problems and low seed production. An exploration for additional Festuca germplasm would broaden the genetic base within which breeders in the southern U. S. A. could attempt to solve some of the problems associated with this species.

Dactylis species and particularly orchardgrass, D. glomerata, contribute greatly to forage production in the northern U. S. A. However, because of a winter dormancy phenomenon similar to that in tall fescue, orchardgrass cannot take advantage of the mild winter growing season in the Southeast. Several pathogens including fungi and nematodes are severe problems in the Southern U. S. A. (Haaland, unpublished data). It is possible that the inclusion of germplasm from Mediterranean latitudes into the gene base now available would afford grass breeders the opportunity to extend the range of this valuable forage species into the lower southeastern U. S. A.

Trifolium species make a major contribution to forage production in the southeastern U. S. Improved animal performance is often associated with the addition of clovers to pastures (10). The addition of nitrogen to swards by clovers is a well known phenomena. However, many of the annual legumes do not fix nitrogen extremely well. The introduction of new clovers with associated nodules would improve the possibility of developing annual clovers with high nitrogen fixing ability. Trifolium are susceptible to a wide range of diseases and nematodes (Haaland, unpublished data). Stands are often lost or plants severely stunted. Seed production problems have also been noted on several Trifolium species (Hoveland, unpublished data). That plant introductions have contributed to the forage economy of the southeast is evidenced by the development of 'Amclo', 'Meeche' and 'Yuchi' arrowleaf clover, T. vesiculosum cultivars (2, 9, 13). Trifolium species also play an aesthetic role in the Southeast. Most of the highway departments include annual clover mixtures in the seed that is used for establishing ground cover on highway rights-of-way. Annual clovers are often used as attractive additions to parks, etc. Additional collections of miscellaneous Trifolium species will make a significant improvement in the Trifolium gene base available to plant breeders in the Southeast.

Trefoil, Lotus species, are non bloating forage legumes that have been grown for years in the northern U. S. A. The northern cultivars have extremely poor seedling vigor and establishment rates. However, trefoil germplasm originating in southern Brazil has shown excellent seedling vigor and forage potential (Hoveland, unpublished data). Recently, a large number of trefoil plant introductions from

several South American and Mediterranean countries including Yugoslavia have been evaluated at Auburn University. Several of the introductions have shown excellent seedling vigor and growth potential. Differential disease susceptibility was also noticed. Many of the introductions were so vigorous that natural reseeding was prevalent (Haaland and Hoveland, unpublished data). Because of the initial success in observing plant introductions of Mediterranean origin additional introductions from Yugoslavia will broaden and strengthen the gene base so that cultivars of this important legume species can be developed for the Southeast.

Yugoslavia has a rich natural flora of the above species in pastures growing in several environmental niches and altitudes. Much of the following proposed collection area has not been fully explored for these species, so it is likely that valuable additions to our existing plant introduction collection could be made.

4. COLLECTION PLAN:

Dr. Carl Hoveland spent four weeks in April-May 1978 visiting institutes and making contacts in Yugoslavia. The staff at the University of Zagreb were extremely interested in arranging a collection expedition. The grass breeding group there made a collection trip for *Dactylis* and *Festuca* two years ago to Dalmatia and interior Croatia. They collected and are maintaining some excellent material in nurseries at Zagreb.

Tentative arrangements, on areas of Yugoslavia to be covered, were worked out (assuming that funding of this exploration is possible) with Dr. Jan Cizek and Dr. Franjo Satovic, experienced scientists at the University of Zagreb. Dr. Satovic, a well-trained forage scientist, would make further contacts and travel on the exploration. He speaks excellent English and has been to the U. S. A. several times.

The expedition should require approximately 6 weeks, from mid June through July. Collection would begin in Macedonia near the Greek-Albanian borders and proceed northward into low elevations of Bosnia (cooperating with Dr. Osman Saric, University of Sarajevo), westward through Hercegovina to the Dalmatian coast on the Adriatic. Dr. Satovic claims that some of the Adriatic islands have a large array of *Trifolium* species. The island of Krk will receive special attention on this expedition.

5. NAMES AND ADDRESSES OF PARTICIPANTS:

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6. ESTIMATED COST:

Air Fare, Auburn, AL to Zagreb & Return	$1,200
Car Rental, gas, oil	1,800
Per diem for Haaland and Satovic 6 weeks @ $35/day/person	2,940
Supplies and Misc.	260
	$6,200

NOTE: Haaland's salary will be paid by Auburn University and Satovic's by University of Zagreb.

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PLANT EXPLORATION PROPOSAL

Title: Exploration of Mexico for Cucurbitaceae

Objectives:

a. Taxa, Principal. Cultivated and wild C. pepo, other cultivated Cucurbita species, Citrullus lanatus, Cucumis melo and Cucurbita foetidissima.
Other: Cucurbita calfornica, C. fraterna, C. galleattii, C. mammeata, C. moreii, C. pedatifolia, C. radicans, C. scabridifolia, C. kellyona and C. martinezii. Other crop species showing strong evidence of disease or insect resistance.

b. Characteristics Sought. Unusual vigor, disease and insect resistance, early maturity and other potentially useful horticultural characteristics. Cucurbita pepo with divergent fruit types.

c. Use. Screening studies for disease and insect resistance. Basic genetic and taxonomic studies. Sources of improved horticultural characteristics.

Justification:

Plant pathogens and insects are active in Mexico and chemical control is not used extensively in many small plantings. Under these conditions selection pressure for disease and insect resistance is high. Northeast Mexico is the center of origin of squash or pumpkin, Cucurbita pepo. Whitaker et al. (5) reported specimens dated at 7000 B.C. from the Ocampo caves, Tamaulipas. The U.S. national collection of this species maintained at the Northcentral Regional Plant Introduction Station, Ames, Iowa, contains only six introductions from Mexico. Results in screening the present collection of C. pepo for resistance to diseases have been disappointing. Sowell and Corley (3) failed to find resistance to powdery mildew in the collection, and Demski and Sowell (1) screened the collection for resistance to watermelon mosaic virus 2 without success.

Primitive cultivated types of Cucurbita pepo collected in Mexico should have high potential for resistance to powdery mildew caused by Sphaerotheca fuliginea and for resistance to watermelon mosaic viruses 1 and 2. Powdery mildew causes serious losses where ever squash is grown in the United States, and all squash breeders are anxious to utilize any resistance to this disease. One or more of the virus diseases cause severe losses in all growing areas and WMV-2 is so severe on the coastal plain of the southeastern United States that fall squash has been discontinued as a crop in some areas.

Cucumis melo and Citrullus lanatus do not have a long history of cultivation in Mexico but in a relatively short time they have been subjected to heavy selection pressure for resistance to many of the same diseases which cause heavy losses in the United States. These include watermelon mosaic viruses 1 and 2, downy mildew, gummy stem blight, and anthracnose. One of the seven plant introductions of watermelon with resistance to race 2 anthracnose was collected in New Mexico (Sowell, unpublished). According to the USDA Plant Inventory (4) this introduction, PI 203551, is reported to have been "Formerly cultivated in corn fields by native Mexicans". This indicates that additional sources of disease resistance may be found in Mexican watermelons.

Resistance to several diseases have been reported in wild species of Cucurbita. Rhodes (2) transferred the genes for resistance to powdery mildew from C. lundelliana to C. moschata. Cucurbit breeders regard these species as having good potential as sources of disease resistance and for basic studies (R. A. Robinson, Geneva, N.Y., personal communication). The wild species listed in the "Taxa" section above have been listed by Robinson as unavailable to breeders in the United States. C. foetidissima is needed by researchers at the University of Arizona for studies on breeding, domestication and utilization of the Buffalo Gourd.

Collection Plan:

The exploration will concentrate on the area of Mexico near the center of origin of Cucurbita pepo - that is the Cd. Victoria - Tampico - San Luis Potosi area of the states of Tamaulipas, Nuevo Leon and San Luis Potosi. Collections will also be made in Guanjuato and Querentaro. The exploration will begin approximately August 15 and continue through September 30. Dr. J. A. Laborde of the Horticulture Department, Instituto Nacional de Investigaciones Agricolas has been contacted to initiate arrangements for one Mexican scientist to accompany the United States team.

Names and official addresses of proposed participants:

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Dr. Thomas W. Whitaker
Research Geneticist (Collaborator)
Imperial Valley Conservation Research Center
4151 Highway 86
Brawley, California 92227

Estimated costs and sources of funds:

Cost items	USDA Funds Required		
	Collector #1	Collector #2	Total
Travel including rental vehicles	$1976	$ 300	$2276
Per diem	$1274	$1274	$2548
Supplies	$ 150	$ 150	$ 300
TOTAL	$3400	$1724	$5124

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