MINUTES

of the

Meeting of the Technical Committee
Southern Regional Cooperative Project S-9, New Plants

Louisiana State University
Baton Rouge, Louisiana

December 1-2, 1960

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G. B. Killinger, Chairman

The meeting of the S-9 Technical Committee was called to order by Chairman G. B. Killinger at 9:00 a.m. December 1, 1960. Following is a list of members present and others in attendance.

MEMBERS PRESENT

R. D. Lewis, Adm. Adviser	Director, Texas Agric. Exp. Station
G. B. Killinger, Chairman	Dept. of Agron., U. of Florida
W. E. Roever, Secretary	Dept. of Hort., U. of Tennessee
W. R. Langford, Coordinator	Sou. Regional Plant Introduction Station
H. W. Bennett	Dept. of Agron., Mississippi State University
John L. Creech	New Crops Res. Br., ARS, Beltsville, Md.
A. M. Davis	Dept. of Agron., U. of Arkansas
A. H. Dempsey	Dept. of Hort., Ga. Exp. Station
E. N. Fergus	Dept. of Agron., U. of Kentucky
W. T. Fike	Dept. of Agron., N. C. State College
W. C. Kennard	SFSD, ARS, Beltsville, Md.
J. A. Martin	Dept. of Hort., Clemson College
R. S. Matlock	Dept. of Agron., Oklahoma State University
J. C. Miller	Dept. of Hort., Louisiana State University
E. L. Whiteley	Dept. of Agron., Texas A & M College
Roy Woodbury	Dept. of Plant Breeding, U. of Puerto Rico
W. C. Young	SCS, USDA, Athens, Ga.

OTHERS PRESENT

F. G. Dollear	SURDD, ARS, New Orleans, La.
J. N. Efferson	Dean, College of Agric., LSU, Baton Rouge, La.
J. P. Fulmer	Dept. of Hort., Clemson College, Clemson, S. C.
J. J. Mikell	Asst. Dir., La. Agr. Exp. Sta., LSU, Baton Rouge, La.
Grover Sowell, Jr.	Sou. Regional Plant Introduction Station
C. H. Upp	Dir., La. Agr. Exp. Sta., LSU, Baton Rouge, La.

WELCOME

The group was welcomed to the Louisiana State University Campus by Dean J. N. Efferson, College of Agriculture, Louisiana State University. Director Charles W. Upp, Agricultural Experiment Station, Louisiana State University, also welcomed those in attendance and talked briefly about development of new crops. He cited the value of soybeans in American agriculture and asked whether other such potential crops might be found growing somewhere. Director Upp also emphasized the importance of considering new plants for drugs, oils, waxes, gums, and proteins.

AGENDA

The agenda proposed for this meeting and distributed among committee members several weeks in advance was discussed and then adopted without any major change. Dr. J. C. Miller announced plans for an afternoon tour of new crops research in the greenhouse and horticulture farm and a trip to Idlewild Farm of the Louisiana Agricultural Experiment Station where the domestic collection of fruit stocks is being assembled for propagation.

MINUTES OF 1959 MEETING

W. R. Langford stated that two motions approved by the National Coordinating Committee and discussed by Dr. R. D. Lewis at the last S-9 Technical Committee meeting were inadvertently omitted from the minutes of that meeting. Dr. Lewis reviewed the two motions again and suggested they be incorporated into the minutes of the 1960 meeting. The motions as approved by the National Coordinating Committee are as follows:

1. "That the Agricultural Research Service be requested to provide leadership to work cooperatively with the Regional New Crops Committees and the State Experiment Stations in developing as rapidly as possible an adequately documented inventory of valuable germ plasm of food, drug, fiber, oil, and other industrial crops presently being maintained through asexual propagation."

2. "That Crops Specialists Committees be appointed by the Chairman of the National Coordinating Committee with the advice and consent of the Regions and the Agricultural Research Service to evaluate the following inventories of materials for possible inclusion in proposed repositories:

   a. deciduous fruits and nuts
   b. sub-tropical and tropical crops
   c. small fruits
   d. vegetables
   e. forage and turf"

Minutes of the 1959 meeting were then approved as mimeographed and distributed.

APPOINTMENT OF COMMITTEES

The following were appointed by Chairman Killinger to serve as a committee to nominate new members of the S-9 Executive Committee:

A. H. Dempsey, Chairman
W. T. Fike
J. C. Miller

They were instructed to make nominations for chairman and secretary for the coming year.

TEN-YEAR REPORT OF ACCOMPLISHMENTS OF S-9

A mimeographed report of the accomplishments of Regional Project S-9 during the ten-year period 1949-1959 was distributed among those in attendance. Dr. Lewis urged that the report be printed in a more permanent form. He suggested that it be published as a Southern Cooperative Series Bulletin and that the Georgia Station be given the first opportunity to print it. He further asked that each committee member discuss the report with his station director and get his approval for publication of the report as a bulletin.

During discussion of the ten-year report a number of suggestions were made for improving it. Among these were:

1. Include a summary of the progress made with new crops for industrial uses

2. Include a discussion of fruit crop introductions used in the South

3. Revise the list of contributing projects

Comments regarding publication of the report and further suggestions for improving it before publication are to be sent to W. R. Langford by January 1, 1961. Copies of these comments and suggestions should be sent to Dr. Lewis.

REPORT OF REGIONAL STATION ACTIVITIES - W. R. Langford and Grover Sowell, Jr.

The number of introductions received, catalogued, and distributed by the Regional Station between July 1, 1959 and September 30, 1960 is summarized in Table 1.

Seed or vegetative stocks of 1,667 new accessions were received during the last year. Two-thirds of these consist of peanuts, sorghum, and pepper. Other sizeable collections received last year include 51 accessions of sesame, 54 accessions of *Trifolium* spp., 49 accessions of *Cucumis melo*, and 32 accessions of guar.

Approximately 600 introductions of *Arachis* were received. These consist of the South American collection made by Dr. W. C. Gregory, 188 introductions

from Venezuela, and 100 from Nyasaland. The collections from Nyasaland and Venezuela were grown by Dr. Hammons at Tifton and by Mr. Bailey at Beltsville. Dr. Gregory increased his South American collection at Raleigh and Rocky Mount, North Carolina. All of these with exception of a few failures will be available for distribution next spring. Dr. Gregory has already made a limited distribution of a few of the wild types that he collected. Some were sent to the Georgia Coastal Plain Experiment Station and to the Oklahoma Experiment Station.

Table 1. Introductions Processed by the Southern Regional Plant Introduction Station, July 1, 1959 to September 30,1960

New introductions received	1,667
Number grown at Regional Station	1,931
Number grown under contract	1,095
Number catalogued	1,527
Seed packets distributed	
(a) within southern region	6,386
(b) outside of region	4,002
S-9 cooperators received from other stations	4,566
Total received since 1949	17,502

Four hundred seventeen accessions of sorghum were received last year. Many of these came from India and arrived too late for planting this year. Sorghums received in time to be planted during 1960 were grown at Chillicothe, Texas and at the Regional Station. Many of those planted at Experiment this year failed to flower. Mr. Quinby has experienced the same difficulty with a number of sorghums each year at Chillicothe. After the 1959 growing season there was a backlog of 190 sorghum accessions that had not been increased because of their short-day requirement. Arrangements were made with Dr. Roy Woodbury to increase these in Puerto Rico this winter.

Slightly more than 200 accessions of Capsicum collected in South America by Dr. Paul G. Smith were received. These were increased and evaluated under contract by Mr. J. A. Martin at the South Carolina Experiment Station.

Seed of approximately 100 accessions introduced prior to last year were added to the regional collection of seed stocks. J. R. Quinby supplied the station with seed of 70 lines of sorghum, some of which were introduced about 1900. The earliest number in this collection was P.I. 2363. Some of the Trifolium introductions received at the Regional Station only last year were introduced a number of years ago and had been maintained by the SCS nursery in Beltsville. We expect to add other such items to the regional storage this winter from two other sources. These are (1) certain accessions of the 1953 Texas grass collection that are not on our inventory but have been maintained at Big Spring, Texas; and (2) Dr. Jack Harlan's collection of Old World bluestems.

Three states - Alabama, Mississippi, and Louisiana - participated in the project to collect domestic fruit stocks. Thirty-five Prunus accessions collected in Louisiana have been documented and assigned P.I. numbers. A

number of other fruit plants in these three states were marked for collection this winter.

Slightly over 3,000 introductions were grown for seed increase during the last year. Some of these were old items that were low in supply or low in viability. The Regional Station grew 1,931 accessions, and 1,095 were increased at other locations under contractual arrangements. Crops increased by contract include peanuts, sorghum, pepper, and Trifolium spp. Good seed increases were obtained from most of the plantings at the Regional Station. Failures in the regional nursery consisted mainly of sorghums that failed to flower, but even these made abundant vegetative growth.

From the above plantings 1,527 items not previously catalogued will be added to the regional seed lists. Rather than annual supplements to previous lists, future catalogues will contain a complete list of all introductions available for distribution. Complete lists of sorghum, watermelons, and winter forage species have already been prepared. Cumulative lists of peppers and muskmelons are near completion. Complete lists such as these have added considerably to the requests for seed. Last year 10,388 packets of seed were sent from the Regional Station. Plant scientists in the South received 6,386 packets and 4,002 were shipped to people in other regions and abroad. In exchange, cooperators in the South received 4,566 packets from other regional and federal stations.

The plant pathology program of the Regional Station has consisted of four phases: (1) screening tests for disease resistance, (2) compilation of plant disease data reported by other research workers, (3) field evaluation of disease resistance in the Regional Station nursery, and (4) research on diseases which have not been reported previously in this country.

The greenhouse screening tests have involved growing the plants for approximately one month in flats, inoculating them with pure cultures of the causal agent of the disease, incubating the plants under conditions optimum for disease development, and evaluating their disease resistance. Twenty seedlings of each introduction were inoculated in preliminary tests. The most promising introductions in the preliminary tests were further tested in a replicated greenhouse experiment. Bacterial spot of peppers, caused by Xanthomonas vesicatoria, was the first disease to which this procedure was applied. Out of 659 introductions of Capsicum frutescens tested, 15 were found to be highly resistant. Results of this research were published in Plant Disease Reporter 44: 587-590. 1960. Following a series of replicated greenhouse tests, nine introductions were selected under very severe disease conditions as possessing the highest level of resistance. Greenhouse-grown selfed seed of these introductions will be available to plant breeders for use as sources of bacterial spot resistance in the near future.

Gummy stem blight, caused by Mycosphaerella melonis, is apparently the most serious disease of watermelons and cantaloupes for which no source of resistance has been available. In the 20th Annual Report of Vegetable Breeding in the Southeastern United States, vegetable breeders of our region expressed more concern for locating sources of resistance to this disease than for any other disease of vegetable crops. Following the publication of this report, a program to screen all introductions of Citrullus vulgaris and Cucumis melo

for resistance to the disease was initiated at the Regional Station. Out of 430 introductions of watermelon maintained by the Regional Station, 16 showed moderate resistance to gummy stem blight in the preliminary greenhouse test. Upon further testing, five of them showed approximately 60 percent defoliation and 40 percent dead plants as compared to 80 percent defoliation and 75 percent dead plants for the susceptible standard Charleston Gray variety. While the level of resistance of these introductions is somewhat less than is desired, they are sufficiently resistant to be of value to plant breeders. Single plant selections will be made within these five introductions with the hope of obtaining lines having a much higher level of disease resistance than that of the original introductions.

The utilization of these disease resistant introductions by plant breeders reflects the economic importance of bacterial spot and gummy stem blight in this region. Dr. A. H. Dempsey of the Georgia Experiment Station has already made crosses of a bacterial spot resistant introduction and peppers of the bell and pimiento types. At least three other plant breeders have obtained seed of some of the resistant introductions for use in their breeding programs. Dr. J. R. Wall of the U. S. Vegetable Breeding Laboratory, Charleston, South Carolina, plans to utilize the sources of resistance to gummy stem blight in his breeding program. The results of screening for disease resistance indicate that the seed collection maintained by the Regional Station is a tremendous reservoir of genes for resistance to plant diseases.

Tests have been conducted in the nursery to determine whether lines found to be resistant in the greenhouse show satisfactory disease resistance under field conditions. Results from such a test involving some of the bacterial spot peppers showed that greenhouse tests yield reliable information on disease resistance under field conditions.

Our knowledge of the reaction of plant introductions maintained by the Regional Station to specific diseases is very limited. Data about plant diseases published in previous seed lists are of limited value because the location and environmental conditions of the test are not known in many cases. As our knowledge increases about the number of strains of a particular pathogen and of the specific causal agents involved in such diseases as those previously reported as "mosaic," it becomes necessary to re-evaluate old results and to obtain additional data if our reports are to be of maximum value to plant breeders. Noteworthy among recent data obtained from research workers is a report on the reaction of a large group of pepper introductions to tobacco mosaic virus, tobacco etch virus, and cucumber mosaic virus. These data were obtained from Dr. A. A. Cook of the University of Florida. Only one introduction was found to be resistant to tobacco mosaic and tobacco etch virus while none was resistant to cucumber mosaic. Even though most of these data are negative, they will be published in the new pepper catalogue within the next few months. These data will be valuable not only in providing plant breeders with information on a source of resistance to two virus diseases but also in minimizing duplication of screening tests. Our objective is to compile a complete list of the sources of disease resistance available to plant breeders. A card file has been established listing sources of disease resistance among plant introductions reported in the literature. With the cooperation of the plant pathologists

at the other regional stations, it should be possible to compile a complete list of all sources of disease resistance available among plant introductions. This list should be completed within the next year.

Evaluating introductions for disease resistance in the Regional Station nursery consists of making observations of diseases that occur on plants grown for seed increase. These data are reported in periodic seed lists usually under the simple designation of R=resistant and S=susceptible. These data are of limited value. They indicate accessions worthy of further testing under controlled conditions. Although considerable time is involved in recording these notes, very few noteworthy observations have been made within the last year. Notes on diseases present on field plantings of approximately 300 introductions of Sorghum vulgare indicate that resistance to gray leafspot caused by Cercospora sorghii and rough spot caused by Ascochyta sorghina is present. It will be necessary to evaluate this material under controlled conditions before specific introductions can be recommended as sources of resistance.

The following advances in the identification and study of new diseases on introductions are noteworthy. Cercospora leafspot, caused by Cercospora citrullina, has not been recognized as an important disease of watermelon and cantaloupe. This disease has been quite common in the Regional Station nursery. Two diseases not previously reported on Guizotia abyssinica in this country were observed on plantings of this species. They are Cercospora leafspot caused by Cercospora guizotiae and powdery mildew of Guizotia abyssinica caused by Erysiphe cichoracearum.

Major purchases at the Regional Station during the 1959-60 fiscal year include:

1. A moist chamber for inoculating plants in disease investigations. This consists of an army surplus field type refrigerator equipped with temperature and humidity controls. The refrigerator was obtained without cost but equipping it with the necessary controls cost $1335. The Regional Station paid $905 of this and the remainder was paid by the Botany Department of the Georgia Experiment Station.

2. A high pressure power sprayer for controlling diseases and insects in the nursery.

3. A gas furnace to heat the recent addition to the greenhouse.

4. Three hundred feet of irrigation pipe with fittings and sprinklers.

5. Construction of a cold frame.

6. Nursery equipment.(Roto-spader, planter, rotary mower, cultivator bar for Ford tractor).

7. Office equipment (typewriter, thermo-fax copying machine).

Purchase of many of these items was made possible by use of funds budgeted to the salary of Mr. John Massey who was on leave of absence. Mr. Massey, who was in graduate school at LSU, was scheduled to return February 1, but his leave was extended to July 1, 1960.

Funds allocated to the Regional Station last year and those available for its operation this year are summarized in Table 2.

Table 2. Sources of Funds and Expenditures of the Southern Regional Plant Introduction Station

Source of Funds	1959-60	1960-61
Regional Research Funds	$22,000	$24,000
USDA - (L.A. and Salaries)	19,550*	21,437.76*
State	2,600	4,870
Total	$44,150	$50,307.76

Expenditures	1959-60	1960-61 (Proposed)
Capital Outlay	$ 4,960	$ 2,494
Operating Expenses	3,475	4,000
Personal Services	33,780	42,513.76
Travel	1,121	1,300*
Total	$43,336	$50,307.76

*Includes $500 ARS funds allocated for travel in collection of fruit stocks.

ALABAMA - C. S. Hoveland (Report sent to coordinator)

A total of 351 new plant accessions were received in Alabama during the past year by personnel of the agricultural experiment station and private ornamental nurseries. Of these introductions, 137 were ornamentals, 6 bamboos, 14 peppers, and 194 forage grasses and legumes.

Pennisetum ciliare P.I. 243199 was the only buffel introduction to survive the winter of 1959-60 at Auburn. Buffel P.I. numbers 240169, 240170, 240171, 243198, and 245375 winterkilled 90 to 100%.

Bromus catharticus P.I. 217593 from India made outstanding growth during the winter months. Mildew was serious in April but the plants made an excellent seed crop. This introduction, planted in a replicated yield trial this fall made considerably more forage on the first clipping than any other variety.

Trifolium resupinatum P.I. 163314 had a vigorous seedling and made excellent early forage production.

Trifolium vesiculosum P.I. 233816 shows much promise as a reseeding annual winter clover. It made more early growth than crimson clover during a cold spring at Auburn and did not bloom until late May. Stands from natural reseeding are excellent this fall. P.I. 234310 has made less fall growth than P.I. 233816, much less growth in late winter, and bloomed much earlier (early April). P.I. 233782 is very similar to P.I. 233816 except for more red color in the leaves.

Publications:
(1) Sorghum grass and perennial sweet sorgrass for Alabama. Auburn Agr. Exp. Sta. P.R. No. 78. 1960.
(2) Ball clover. Auburn Agr. Exp. Sta. Leaflet 64. 1960.

(The above publications were distributed to those in attendance).

ARKANSAS - (State 323) - A. M. Davis

During the past year Arkansas has received only a limited number of introductions.

Grass	26	Alfalfa	3	Bamboo	3
		Shrubs	1	Cowpeas	2

This is by far the smallest group of requests from our station in recent years. Disposition of the above material is as follows: The grasses are in their first or establishment year and no data is anticipated until next spring. The alfalfa lines were received and each line is being held in the greenhouse for crossing purposes. The bamboo was set out at the Southeast Branch Station, Rohwer, Ark., and sprouting occurred but all died before the first of July. The shrub (Ozmanthus, "Gulftide") is in a holding block of ornamentals. The cowpeas are in disease, i.e., virus studies.

Sesame was planted at 3 locations in 1959. At Hope, Arkansas, Margo and Dulce made 1200 pounds of seed per acre. Dulce was the most productive variety at Fayetteville, yielding 900 pounds per acre. The highest yield at Stuttgart was also 900 pounds made by Margo and Dulce. The best Sesame plot in the State was experimental line T-54618-5-1-2-1-2, which yielded 1300 pounds per acre equivalent.

A small flax test was grown at Fayetteville and Stuttgart. Yields were generally disappointing with Redwood producing 14.54 bushels per acre at Fayetteville for the highest yield in the test. The lines CT-1909 and 1910 produced 10 bushels per acre each, the highest at Stuttgart. With flax selling for about $3.00 per bushel (49 lbs.), this leaves much to be desired; one factor in its favor seems to be its ability to stand some cold once it is up. It is thought that it may be seeded as early as mid-February and get a crop out in time to plant soybeans. This would be a good practice when a small grain crop failed in the fall. Flax would be,in essence, a catch crop.

The single clone of P.I. 220969, Sorghum sudanense, continues to look promising as a forage for pasture. It seems to be as winter hardy as Johnson grass.

Work planned for next year: Continued collection and screening of P.I. crosses of legumes and further variety plantings of flax and sesame. No publications have been prepared under this project this year.

(Dr. Davis indicated that difficulties had been encountered in getting Rubus introductions from NC-7. Dr. Creech stated that he would look into this matter.)

FLORIDA - (Hatch 767) - Gordon B. Killinger

Over 403 grass and legume species (Plant Introductions) were evaluated at the Gainesville Station.

More than 750 species or accessions of forage types were placed in observation plots at branch stations.

Sorghum accessions numbering 52 were planted in rod rows at the Gainesville Station for evaluation. None of these sorghum varieties were equal to existing varieties in yield of either grain or forage. The Old Plantation Field Laboratory at Fort Lauderdale received 535 accessions of sorghum. This large sorghum nursery was destroyed by hurricane Donna, however, sufficient seed was reserved and a fall planting was made which has not matured at this time.

The North Florida Station at Quincy received 1310 accessions of Cucumis spp. for evaluation as introductions and as a source of valuable germ plasm.

The Watermelon and Grape Investigation Laboratory at Leesburg received 435 accessions of Citrullus vulgaris which have not been fully evaluated.

In 1959, 575 Sesamum indicum plant introductions and a Sesamum alatum P.I., and a Sesamum capense introduction were grown at Gainesville. In 1960, nine new Sesamum alatum were tested. Selections from 40 of the 577 Sesamum plant introductions tested at Gainesville in 1960 were saved for further evaluation. Of these, 18 were selected primarily for their manifestation of disease resistance, and the remaining 22 lines were selected for demonstrating characteristics such as desirable maturity date, seed size and flavor, and yield potential which includes vigorous branching plants with many capsules. No desirable traits were found in the ten new P.I.'s tested in 1960. Eight of the 40 P.I. selections made in 1959 and re-evaluated in 1960 will be tested further in 1961. Some of these show promise from the standpoint of yielding ability and other characteristics.

Bothriochloa intermedia A-5410 from Punjab, India appears to have excellent feed qualities and yield potential as a pasture or hay crop. Buffelgrass Pennisetum ciliare strains "Chipinga" P.I. 243198 and "Grassland" P.I. 243199 from South Africa have survived three complete seasons with yields of four to five tons of dry forage per acre.

Coleus cuttings (rooted) were received at several Florida locations from the Glenn Dale Station. There were 33 P.I. numbered and named accessions in this group and all have flourished. Variations in colors within this group of coleus make some them desirable to commercial outlets.

Certain seedlings of Dioscorea floribunda P.I. 201783 planted in September 1957 on Everglades peat and harvested at 18 and 30 months after planting have given high tuber and diosgenin yields. These preliminary investigations have indicated that more detailed research on this medicinal plant is warranted. Such work has been planned and is being initiated at the Everglades Experiment Station under State Project 1026 "Agronomic Studies of Dioscorea in South Florida;" Leader C. C. Seale and Cooperators: J. R. Haun (USDA), M. H. Gaskins (USDA), and P. K. Soderholm (USDA). 11/7/60.

Seeds of citrus and seed and plants of many ornamental, fruit and shade tree plants were received by nurserymen, individuals and various Experiment Station personnel.

Breeding of lupines and Digitarias involving P.I. numbered accessions is continuing with a hope of developing virus resistant lupines and cold or winter hardy Digitarias. Several Paspalum notatum species (P.I. Nos.) have been retained and will be increased for yield and palatability studies.

(Kodachrome slides of promising grass introductions were shown.)

GEORGIA - (Hatch 96) - A. H. Dempsey

A total of 1572 plant introductions were received during 1959-60 by State and Federal workers in Georgia. Approximately 74 percent of these were agronomic crops and the others were fruits, vegetables, and ornamentals. Many of the ornamental introductions were requested by commercial nurserymen and most of the ornamental stocks were obtained directly from Glenn Dale, Maryland by the cooperators. One of the most popular items with the nurserymen has been the coleus collection.

Pepper (Capsicum frutescens): P.I. 164471, a pepper introduction from India, reported by Sowell in Plant Disease Reporter July 16, 1960 to be resistant to bacterial spot, Xanthomonas vesicatoria, has been crossed with Truhart Perfection, a commercial pimiento variety, to obtain resistance to this disease. P.I. 164471 is pungent, resistant to bacterial spot and has fruits of medium size. Truhart Perfection is sweet, susceptible to bacterial spot and has large, sweet, fruits with thick flesh walls. The F_1 of the cross Truhart x P.I. 164471 is intermediate in resistance to bacterial spot, pungent, and the fruits are approximately one-third the size of the Truhart fruits. The F_1 progeny of the cross (Truhart x P.I. 164471) is being crossed with P.I. 182925 which is outstanding for fruit size and resistance to Xanthomonas vesicatoria with the hope of obtaining pimiento types with large fruits and increased disease resistance.

F_1 Hybrid Sudan Grass: A F_1 hybrid Sudan Grass has been developed by Dr. Julian P. Craigmiles of the Georgia Experiment Station. This hybrid is the result of seed produced by controlled pollination between P.I. 156549 (Sorghum arundinaceum) a male-sterile Rhodesian Sudan Grass and Tift Sudan Grass. The male-sterile is used as the female and Tift as the pollinator. Seed are produced by growing alternate rows of the two parents and harvesting seed from the male-sterile row.

This F_1 hybrid Sudan grass has been tested at four locations in Georgia (Experiment, Blairsville, Plains, and Calhoun) for four years. Results obtained from these tests show the F_1 Hybrid Sudan to produce 31 percent more forage than the average Sudan grass tested and 22 percent more than Piper, the highest yielding commercial variety in the test. The hybrid Sudan is a good late forage producer. A definite decision relative to a name has not been made; but plans for release are being developed.

Sorghum: About 225 sorghum introductions have been used by Mr. Haskell Harris of the Georgia Station in his improvement program. His objective is to develop combine types with disease resistance and good yields of grain and forage. Some of the most promising F_1 lines will be compared in replicated yield trials in 1961.

Winter Forage Legumes: Several promising winter forage legumes include *Trifolium vesiculosum*, *Trifolium nigrescens*, and *Trifolium michaelaneum*. Some of the best are being evaluated in a yield test conducted by Mr. Julius Elrod.

(Kodachrome slides were shown illustrating work with peppers. Dr. Dempsey reported that Georgia produces 75 percent of the pimientos grown in the United States and processes 90% of them.)

KENTUCKY - (State 166) - E. N. Fergus

Approximately 169 items were brought into Kentucky in 1960 under the "New Plants" project. These included the following accessions:

25 from 11 genera of ornamental shrubs	10 of *Lespedeza stipulacea*
8 of *Phaseolus vulgaris*	3 of *L. striata*
1 of *P. lunatus*	3 of *L. cuneata*
2 of *Cucumis sativus*	1 of *L. juncea*
4 of *C. moschata*	1 of *L. cyrtobotyra*
1 of *C. maxima*	1 of *Trifolium cherleri*
6 of *Zea mays*	3 of *T. fragiferum*

Approximately 100 coleus plants also, representing 34 varieties, were received in 1960. Most of these were dead on arrival. Surviving plants have been accessioned.

All of the items accessioned in 1960 have been planted and studied for possible usefulness. No selections as yet have been made from any of the ornamentals or vegetable crop accessions. The lespedeza accessions are being tested for reaction to *Thielaviopsis basicola* under a project pertaining to crop plant resistance to this organism. The *Zea mays* accessions (P.I. 217405, 214201, 213802, 214195, 221872, and 221868) secured this year as well as in 1959 are being used to provide genetic diversity in the white corn germ plasm used in the corn breeding program at this Station.

The seed lots of the two species of *Trifolium* listed above were obtained by the Kentucky Agricultural Experiment Station in the usual manner. However, many more species of this genus were received under contractual

arrangements between the Southeastern Station of the Federal Plant Introduction Section and the Kentucky Agricultural Experiment Station that became effective in 1960. Under this arrangement, Dr. N. L. Taylor of the Kentucky Station grew 300 accessions of Trifolium spp. for seed multiplication, taxonomic studies, and agronomic evaluation. Thus, the studies of Trifolium species began at the Kentucky Station under its project supporting Regional Project S-9 were expanded greatly in the current year. From these studies, Dr. Taylor hopes to secure species that will be useful in the red clover breeding program at the Kentucky Station, especially in his efforts to hybridize T. pratense and other species of Trifolium. To date, one such hybrid has been secured. T. diffusum (P.I. 204517), accessioned in 1954 as T. pratense, has been crossed with T. pratense, producing a new species. (Agronomy Abstract, 1959, p. 67)

A modest selection program with sesame is under way at this Station, using sesame accessions of previous years as parent material. The objective of the program is a variety that matures somewhat earlier than the varieties tested.

LOUISIANA - (State 687) - J. C. Miller

During the period covered by this report, emphasis has been placed on screening and taking notes on the various accessions. The following introductions were brought in during 1960:

Nursery stock	350 different species
Pepper	50 introductions
Okra	15 introductions
Sweet potato	16 introductions
Irish potato	2 introductions
Tomato	1 introduction
Cantaloupe	6 introductions

Nursery stock: Over 350 various species of nursery stocks have been brought in by Louisiana State University, the various colleges and nurseries. The locations of the nurseries have been recorded, and it is planned to take notes on this material in the future.

Pepper: Fifty different introductions were brought in and screened for resistance to the etch virus and for possible use as a commercial variety. These, along with 6 previously introduced lines, were planted at three different locations this past year. Two plantings were made at Baton Rouge, one on the Hill Farm and one on Mississippi alluvial soil at the Ben Hur Farm. The third planting was made in the center of the pepper district at St. Martinville. Sixteen lines were found to possess desirable Tabasco characters and resistance to etch virus and are now being used in crossing with Tabasco in order to find a Tabasco type which is resistant to the etch virus. Six have been saved for increase as possible new commercial varieties for the pepper industry of Louisiana.

Okra: Over 200 seedlings and varieties of okra were maintained and grown at Louisiana State University during the past year in addition to the 14

accessions which were brought in for testing for nematode resistance and commercial type. Of the 14 introductions and five varieties which were tested for resistance to the rootknot nematode, P.I. 120833 showed light infection and 11-96, 11-101 and 11-103, introductions from Turkey, showed very light infection. We are using this material in our breeding program in order to obtain maximum resistance.

Breeding and selection to increase the oil content is another phase of the okra program, and we now have many selections with 18 percent oil.

A third objective of this program is to increase the fiber content and height of stalk for the possible use of this crop as a fiber plant. Dr. Wolff and his associates at the U. S. Regional Laboratory at Peoria, Illinois, found from samples which we furnished, that the okra fiber was equally as good or better than that of many plants now being used for fiber studies. Kenaf and Crotalaria juncea are being grown along with okra for comparison in the fiber studies which are being conducted in cooperation with Dr. Wolff and the New Crops Section.

Another commercial aspect of the okra crop which is being investigated is its mucilaginous property and its uses, and we now have a new approach to this problem. We have found that the mucilage content in the upper 6 inches of the tender top of the plant and leaf is as great as that found in the tender pods. This makes it much more conducive to large scale operation. By utilizing the small, tender plants it will be much more economical to grow large acreages, as the plants can be cut by an ensilage cutter and also several cuttings can be made from a single planting in one season. As previously reported, we now have a pilot plant at Lafayette which is utilizing material grown on more than 200 acres.

These are possible industrial aspects of the okra crop in addition to its commercial value for the fresh market, canning, and freezing which is a several million dollar enterprise here in Louisiana.

Sweet potato: This past year we received 16 introductions which we had requested from various countries. These are being tested for resistance to several diseases and for desirable genetic characters. These are now in the greenhouse and will not be given a thorough test until next season.

During the past season we introduced the Centennial variety. Much of the parental material of this variety came from introduced stocks from various countries throughout the world, particularly those stocks originating in the West Indies. The Centennial is a high yielding variety and produces on the average 100 bushels more per acre under Louisiana conditions than most of the other commercial varieties. It has a wide range of adaptability and is being received enthusiastically by the growers.

Irish potato: We received two new introductions of Solanum acaule this past year from the Potato Introduction Station at Sturgeon Bay, Wisconsin. The purpose of this project is to introduce varieties carrying resistance to cold to be crossed with our cultivated varieties. As has been mentioned previously, we have individual introductions which will withstand temperatures of 25° F. or below, and this year we plan to test F_3 progeny on a

larger scale for cold resistance and for further use in our breeding nursery. Two years out of five we get frost damage in most of the southern states, and a variety which will withstand even a light frost would be of great value to our growers.

Tomato: Dr. Teme P. Hernandez, who is in charge of our tomato breeding project, is testing the one introduction which was received this year.

Cantaloupe: Six introductions were sent to our Plaquemines Parish Experiment Station for testing for resistance to mildew and other genetic characters which might be incorporated into our breeding program with this crop.

Dioscorea: Of the older projects, more than 200 clones of Dioscoreas are now being tested at LSU and at the Plaquemines Parish Experiment Station. The Eastern Research Laboratory has analyzed samples. These analyses are a basis for discarding the lines as only those showing high cortisone are being kept for breeding stocks. The promising lines are being planted in a plastic greenhouse where they can be protected from frost during the early fall when these plants are in full bloom in order that crosses may be perfected and mature seed harvested. This is a long time program, and we do not anticipate any immediate results.

Castor bean: The project on castor beans is another of our older endeavors with introduced material. We are still carrying many dwarf lines and making selections for large seed. Although the Dawn variety has a decidedly dwarfed plant, the seed is small. We feel that a variety with a very dwarfed plant and large seed would be a distinct advantage. The chances are that we will never grow a large planting of castor beans in Louisiana, but the country has benefitted from our maintaining these breeding stocks here at Louisiana State University.

Fruit exploration: This project is now under way, and we plan to call a special meeting of the leaders on this project at the Southern Agricultural Workers meeting at Jackson. This will be the first time that all of us have had a chance to get together and discuss the work.

We have made 35 selections, mostly of plums, to which P.I. numbers from 268019 through 268053 have been assigned. These have been planted at the Idlewild Farm, 30 miles north of Baton Rouge near Clinton. We hope to bring in a lot more material of the deciduous fruits this winter.

It should be remembered that most of the introduced material must be used as parental stocks and that, in many cases, it will take from three to five generations in order to produce a commercial variety which will possess some superior character that was brought in through the introduced material.

MISSISSIPPI - H. W. Bennett

Plant scientists in Mississippi received 124 accessions from the Southern Regional Plant Introduction Station during 1960. They obtained 171 introductions from other regional and federal stations. Dr. Bennett reported that ornamental horticulturists now have an introduction of white crepe

myrtle that is widely established on the Mississippi State University campus.

Dr. Bennett stated that he experienced much difficulty in getting reports on certain introductions. Many items are sent into the state for which he has no record. Dr. Langford stated that future seed packets sent from the Regional Station would carry the following request to the recipient of the seed:

> "Please assist the plant introduction program by reporting the merits and uses of this material to your State S-9 committee member, Dr. H. W. Bennett, Mississippi State Univ., State College, Mississippi."

A kodachrome slide of a seed packet with this statement was shown. Dr. Bennett agreed that such a notice on seed packets would be quite useful in getting reports on materials distributed from the Regional Station, but he stated that introductions of certain crops by-pass the Regional Station. He cited cotton, small grains, and sweet sorghum as examples.

Dr. Creech stated that introductions of cotton and small grains are distributed through research branches of ARS working with these crops. Dr. Bennett discussed the need for keeping a permanent record of all introductions going into a state. Dr. Roever suggested that a long-term permanent Plant Introduction Record Book containing all acquisitions of plant introductions be kept in each state. This book should contain P.I. number, scientific and common names, and other pertinent data concerning the value and use of the introduction. Dr. Lewis suggested that these two problems: (1) that of keeping accurate records of plant introductions within the state, and (2) the difficulty of getting reports on introductions distributed directly through other branches of ARS be put on the agenda for discussion at the next meeting of the National Coordinating Committee.

NORTH CAROLINA - (Hatch 196) - W. T. Fike

Eleven cooperators received 504 introductions from September 1, 1959 to December 1, 1960.

- 121 Ornamentals - 3 nurseries, 3 gardens, and Station Ornamental horticulturist
- 105 Grape introductions - 2 cooperators
- 11 Pear introductions
- 79 Grass introductions
- 166 Legume introductions
- 22 Miscellaneous introductions (Bamboo, Crambe, Vernonia, Dimorphotheca, Dasheen, and Hibiscus spp.)

The many previous introductions obtained by N. C. cooperators have been reported on in the S-9 Regional Summary for the past 10 year period. Over 200 introductions of orchardgrass and fescue have been tested and a large proportion of these have been incorporated into the breeding program.

Dr. Gregory increased 269 introductions of cultivated peanuts brought back in 1959 from South America. The peanuts haven't been threshed yet, but will be

sent to Experiment, Georgia, in the near future. An equivalent number of wild types were being grown under isolated conditions and some of these have already been sent to Drs. Matlock and Hammons. A second exploration starting where the first left off is being planned for early 1961.

Two additional phases of the N. C. program are the testing of potential new crops for present needs and adaptation trials for crops known to be of industrial value as determined by the New Crops Section of the Crops Research Branch and the Chemical Screening and Development Section of the USDA Utilization Research Branch.

Crotalaria spectabilis and C. striata have been grown on many acres of land in N. C. as a green manure crop. It was known that the seed of C. spectabilis was poisonous but in 1959 it was found that the seed of C. striata was also poisonous. These crops were banned for use in N. C. Corn or soybeans would not be accepted by the buyers if any trace of Crotalaria seed was present. A planting of 200 legume and grass introductions and commercial varieties was tested in the sand hill area of the state. The finding of a plant which would yield as much dry matter as C. spectabilis and C. striata, but which would not set seed or which would have non-toxic seed was the main objective of the screening program. The small number of seed received of the plant introductions were planted in rod rows for seed increase. The seed per row was harvested and yield will be calculated. A second objective of this screening will be the sending of seed of those high seed-yielding introductions to the utilization laboratory at Peoria, Illinois for analysis. Many of the introductions performed much better than the check species. All of the better introductions will be more extensively tested in 1961. Two of the best introductions, Crotalaria paulina, P.I. 198003, and Sesbania sp., P.I. 219851, did not produce seed under North Carolina conditions and a source of seed will have to be found. The yield data of the introductions in this test will be reported at a future meeting of the S-9 Technical Committee.

Trifolium balense, P.I. 201209, T. vesiculosum P.I.'s 233782, 233816, and 234310 were planted in a test with crimson clover in October 1959. All produced seed, but stands were poor compared to the crimson clover. When more seed is available, these tests will be repeated.

Regional variety tests of sesame and castor beans were planted at three locations in the state. Drought conditions at two of the locations lowered yield of both crops. All plots have been harvested but yields have not been calculated.

The second phase of our research program is adaptation studies on new crops that show some potential for industrial use.

An annual crop fiber test comparing three varieties of kenaf, Crotalaria juncea, jute, okra, sesbania, sunflower, and five varieties of corn from Mexico and Colombia was planted in the extreme southeastern portion of the State. A rate of seeding test of kenaf comparing five row widths and six in the row spacings was also planted. These plots have been harvested but yields have not been calculated.

A long time perennial fiber yield test comparing loblolly pine and Phylostachys vivax (300 rhizomes of P.I. 82047) was initiated along with a bamboo

spacing test using Phylostachys viridis (1000 rhizomes - P.I. 77257). The bamboo was planted as soon as it arrived, which was late - March 31 - and only 5% of P. viridis and 8% of P. vivax produced shoots. Bamboo will be planted again next year.

Four species of Dimorphotheca were planted at four locations. Only on those sandy areas which were very well drained were seed produced. D. annua did not produce seed at any location and was not as vigorous as the other species.

D. sinuata	161#	Seed yield per acre of highest yielding plant. The average of all plants per each species was 50#/acre
D. aurantiaca	453#	
D. calendulacea	119#	

Seed of the following plant species were planted at six experiment stations over the State. There was an interaction between site, soil texture, and crop stand. All seed was harvested but yields per acre have not yet been calculated.

Vernonia anthilmintica - The plant grows 3-4 feet tall and produces numerous flowers. As it flowers indeterminately harvesting will be a problem. Seed yield is high compared to other species.

Calendula officinalis - Flowered well but seed set was poor. Grew best in the mountain region with its cooler temperatures.

Brassica napus and B. campestris - Good seed yields with the higher yields obtained from the cooler mountain region.

Daucus carota - No stand obtained. Fall plantings made in September and October indicate that a cool temperature is required for germination. Seed yields were obtained from farmers' fields to arrive at an acre yield.

Trigonella foenum-graecum - Seed germinated well, but plants grew only to a height of 2-3 inches. Plants did set seed, however, and the legumes produced were up to 6 inches long.

Limnanthes douglassi - Plants do not do well when planted in the spring in the warmer areas. A few plants did set seed in the cooler mountain region. Plantings made in the fall give best results and survive the winter very well. Plots are now established for next year's yield tests.

Crambe abyssinica - Good stands and yield were obtained at all locations. Plant spacing tests will be conducted next year.

Eruca sativa - Good stands develop from spring plantings, but only a small seed yield was obtained. Plantings made in the fall do overwinter and set seed in March.

All the above plant species have been planted at two locations on three dates this fall and will be harvested in the spring of 1961.

During 1961 more introductions will be tested as time permits. All plants that have produced well in observation plots will be grown on a larger scale with management and cultural tests the chief concern. The legume test will be put out in broadcast plots and D. M. yields will be obtained for a better comparison with check crops. Bamboo will again be planted and all other long time tests will be continued.

(Kodachrome slides of many of the species under study in North Carolina were shown.)

OKLAHOMA - (Hatch 1057) - R. S. Matlock

Valuable Characteristics Noted in Certain Accessions of Vetch and Field Peas Were Summarized As Follows by Dr. Richard Bates and Dr. Roy Chessmore

P.I. No.	Botanical Name	Valuable Characteristic or Reason for Maintenance
220882	Vicia dasycarpa	Early growth and winter hardiness
220880	Vicia atropurpurea	Early growth and bruchid resistance
193683	Vicia onobrychoides	Ditto
220906	Vicia sativa	"
238378	V. sativa var. leucosperm	Bruchid resistance and seed color
212044	Vicia dasycarpa	Early growth and winter hardiness
232958	Vicia villosa	Early growth and winter hardiness
238376	Vicia glabosa	Early growth and bruchid resistance
237565	Vicia sativa	Ditto
205239	Vicia sativa	"
203064	Pisum sativum	Early growth and mildew resistance

Mr. M. Hardin, Geary, Oklahoma furnished the following report on his evaluation of horticultural introductions.

Thirty-three accessions of Pisum sativum were evaluated. They were planted too late and most of them failed because of hot weather. P.I. 206781, Alaska; and P.I. 210635 made good yields and both were adapted at Geary, Oklahoma. P.I. 210684, President Wilson, made a good yield of large pods. The latter matured early, produced high quality seed and may have breeding value. One accession (P.I. 244191) was disease free, produced good yields, and may have breeding value.

The 10 Lactuca accessions will require further evaluation before reporting.

Okla. accession 249007 had plants 8 feet tall, very long pods which bore over a long period.

P.I. 212636 was listed as Vigna but is a lentil that made a fair yield. P.I. 221729, Vigna sinensis, was used in the breeding program because of its terminal podding.

Cucurbita accessions: P.I. 195311, C. moschata, segregated producing plants with long necks and cushaw type fruit. It has breeding value. P.I. 162888, C. moschata, was a cushaw type, brown seed, salmon red flesh, long keeper,

and was disease free. It was used in breeding work, and a promising selection was developed which was earlier, had smaller plants with higher quality fruit than the original accession.

William R. Kneebone, Woodward, Oklahoma reported that sideoats grama, P.I. 241045, was winter injured at Woodward during 1960. It must not have evolved from Wyoming. Kneebone has no further interest in it. He will report on the performance of weeping lovegrass introductions next year.

Dr. David White, Head, Department of Horticulture, Oklahoma State University has several Bambusa and Phyllostachys accessions under observation. P.I.'s 80872, 82047, 128778, and 73452 are now being evaluated for hardiness and growth.

Cowpeas: Accessions of four species of *Vigna* were increased in the greenhouse to obtain seed for further evaluation. This makes a total of seven species of *Vigna* available in the program. The four species shown below represent the extremes in genetic diversity for small seed, shattering, pubescent pods, and leaf shapes.

Okla. Code No.	P.I. No.	Latin Name
C-595	190262	*V. vexillata*
C-596	226295	*V. schimperi*
C-597	255750	*V. coerulea*
C-298 and C-598	181585	*V. wilmsii*
C-599	238110	*V. vexillata*
C-601	241883	*V. vexillata*

Sixty-six accessions of *Cyamopsis tetragonoloba* and one accession of *Cyamopsis senegalensis* were received between September 1959, and September 1960. They were evaluated by Mr. Ted Hymowitz, Graduate Student, Agronomy Department, Oklahoma State University. Seed were carefully planted in small plots for increase and observation notes were taken on the habit of growth, lodging, height, leaf spot resistance and maturity. The following introductions were planted but those with an asterisk did not germinate.

C. tetragonoloba

P.I.	Okla. G number	Habit 1/ of growth	Height (inches)	Remarks
164593*	237			
164692*	291			
180286*	222			
198297	238	EB	68	
212986	227	E	41	Large pods, early maturing
214041	228	EB	42	
215590	243	EB	50	
217923	229	EB, BB	46	
217924	292	E, EB	52	
250211	219	EB, BB	48	
250212	223	BB	48	

C. tetragonoloba (continuation)

P.I.	Okla. G number	Habit 1/ of growth	Height (inches)	Remarks
250213	234	EB	46	
250214	233	EB, BB	44	
250357	218	EB, BB	50	
250358	293	EB, BB	52	
250359	294	EB, BB	61	
250360	220	EB	38	
253182	232	E	46	
253183	221	E, EB	50	
253184	231	EB	50	
253185	230	EB, BB	48	
253186	224	E, EB	44	
253187	226	E, BB	45	
254367	235	EB	44	
254368	225	E, EB	30	Early maturing
255928	236	E	42	Large pods, early maturing
262149	248	BB	23	
262150*	249			
262151	250	EB	32	
262152*	251			
262153	252	BB	46	
262154	253	EB	51	
262155	254	BB		
262156	255	BB	34	
262157	256	BB	42	
262158*	257			
263698	262	EB, BB	46	
263874	263	EB	40	
263875	264	EB	36	
263876	265	EB		
263877	266	BB	36	
263878	267	EB, BB	52	
263879*	268			
263880	269	EB	38	
263881	270	E	28	
263882	271	BB	48	
263883	272	EB	51	
263884	273	EB	41	
263885	274	EB, BB	53	
263886	275	BB	35	
263887	276	E	24	Very early maturing
263888	277	EB	53	
263889	278	E	52	
263890	279	EB, BB	36	
263891	280	BB	46	
263892	281	BB	55	
263893	282	EB, BB	41	
263894	283	BB	40	
263895	284	BB	36	
263896	285	BB	47	

C. tetragonoloba (continuation)

P.I.	Okla. G number	Habit 1/ of growth	Height (inches)	Remarks
263897	286	EB	39	
263898	287	BB	40	
263899	288	EB	50	
263900	289	E	19	Very early maturing
263901	290	EB	42	
		C. senegalensis		
263525	259	BB		Shatters badly, small square shaped seed, very productive, semi-prostrate in growth, offer considerable genetic diversity.

1/ E = Erect; EB = Erect Branching; BB = Basal Branching

A greenhouse study involving 24 accessions of Chickpea (Cicer arietinum) was conducted by Juan Cardenas, undergraduate student majoring in agronomy. His report follows:

Introduction: The chickpea (Cicer arietinum), is an edible legume which is part of the diet of many people, particularly in India, Mexico, Central America and South America. The plants are generally semi-erect, short, dark green annuals, with conspicuous white or purple flowers and green pods. Other common names for chickpea include gram and garbanzo. Gram is common in the Far East and garbanzo in the Spanish-speaking countries.

Materials and Methods: The experiment was planted December 5, 1959, in the Agronomy greenhouse. Three seeds of each of 41 plant accessions obtained through the Southern Plant Introduction Station were planted an inch deep in gallon containers. The soil used was a silty loam. The plants were watered every other day during the experiment. The plants were supported to avoid breakage of the stems. Notes were taken regularly following emergence. Pods were harvested as they matured.

Results: a) The average number of days required for the chickpea seeds to germinate under greenhouse conditions was 6.3 days. The range was from 4 to 9 days. b) The average number of days from planting until the appearance of the first flower bud was 48.9 days with a range of 35 to 65 days. c) The average number of days from planting until the first flower appeared was 61.4 days with a range from 41 to 75 days. d) The average number of days from the appearance of the first flower bud and full bloom was 12.5 days. e) The average number of days from full bloom until the first pod appeared was 10.8 days. f) The average number of days from planting until the plants were beyond physiological maturity was 132.5 days with a range of 114 to 144 days. g) The flowers were white and various shades of purple. The purple flowers ranged from dark purple to pale purple. A purple flower and white flower were borne on the same branch on CP-23. Chickpea flowers were a centimeter in diameter and contained two wings, a standard and keel, petals and six sepals that remained attached to the pod. The flower buds were greenish-

yellow in color and the first bud was terminal. After the appearance of the first terminal bud, secondary lateral buds developed lower on the plant above the stipules. As the flower bud developed, a peduncle formed to support a pod. The flowers usually opened early in the morning. h) The average number of nodes to the first flower bud that appeared terminally was 17.3 nodes and the range was from 10 to 25 nodes. i) The average height at the time the first flower bud appeared was 33.4 centimeters, and the range was from 24.5 to 38.5 centimeters. The internodes of the plants varied in length from 1.01 to 2.11 centimeters. The plants with short internodes were bushy and small and usually leafy.

The plants range in height from 24.1 to 57.2 centimeters. The plants do not spread profusely. Correlated with height was internode length, bushiness and leafiness. The tall plants had long internodes, were not bushy and were either leafy or medium leafy. The short plants appeared bushy, leafy and contained short internodes. j) The leaves were pinnately compound with the number of leaflets ranging from 3 to 15. Both odd and even number of leaflets per leaf were found. The leaflets are almost opposite each other on the leaf and in the majority of the leaves observed there was a single terminal leaflet perpendicular to the rest of the leaflets. Some leaves did not have this terminal leaf. The leaflets are net-veined and are serrated about one-third to one-half on the tip and resembling common alfalfa leaves. The size of the leaflets ranged from 0.3 to 1.05 centimeters in length. The size of the leaflets vary depending upon its location on the plant. The leaflets towards the base of the plant appear to be smaller than the leaflets located in the middle of the plant. k) The stems of the plants differed considerably in diameter. The range of stem diameter at the soil level was from 4.1 to 2.3 mm. The diameter of the stem at the middle of the plant ranged from 1.1 to 3 mm. The latter was true of the terminal part of the plant. In general, those plants with larger stem diameter at the base were taller and less leafy.

The chickpea plant appears to be an erect plant. Only in one case was there a tendency towards vine-like growth. Although it is an erect plant, its succulence weakens the stem so that as the plants became larger they tended to have the stems overhanging or drooping due to the excess weight of foliage and pods upon them. l) There appeared to be two distinct types with respect to foliage density. The non-leafy with few leaves in comparison to the size of the plant and the leafy which had a greater number of leaves in proportion to size. Those plants which had a bushy growth habit with thin stems and abundant basal branching had very dense foliage. In the case of the denser foliaged plants, the leaflets were smaller than those of non-leafy plants. m) Basal branching was determined as follows: Those plants which had branches arising from the main stem at a distance of less than one inch from the soil level were considered to have basal branching. Those plants which had predominantly one main stem with no branches arising from the main stem at a distance of less than one inch from the soil level were considered non-basal branching. The number of branches arising from basal branching stems ranged from one to five. During the early period of growth basal branching was limited but by the time the first flower bud appeared lateral branches had developed. n) The seeds are small, somewhat rounded with a protruding "beak" on one end. They vary in size (weight per 100 seed), color and seedcoat texture. The size or weight of the seeds ranged from 7.7 grams per 100 seed to 22.2 grams per 100 seed. The color of the seeds included such colors as

TABLE 1

SUMMARY OF DATA OBTAINED FOR FIELD PEAS STRAINS AND INTRODUCTIONS PLANTED IN NOVEMBER AND MARCH ON THE STILLWATER AGRONOMY RESEARCH STATION, 1959-1960

Okla. Code No.	Strain	Mean No. of Plants Survived on June 27,1960	Mean Height (ins.)	Mean No. of Branches	Mean No. Days to: Bloom	Bloom to Pod	Mean No. of Days: Planting to Harvest	Mean Seed Yield per Plot (grams)
				NOVEMBER PLANTING				
Sp 127	First and Best	0	0	0	0	0	0	0
Sp 128	Valley	1.5	29	3.5	167	7	202	3.5
Sp 129	Dashaway	2.0	38	3.0	188	8	215	3.5
Sp 131	OAC 181	2.5	37	3.5	171	9	202	1.5
Sp 133	Stral	4.0	34	4.0	163	8	215	12.5
Fp 5	Multipler	3.0	37	4.0	169	7	202	3.0
Sp 126	PI 257592	5.0	29	4.0	160	7	202	11.5
Sp 134	PI 257593	7.0	34	3.5	160	7	202	15.0
Sp 125	PI 257594	1.5	34	3.5	160	7	202	3.5
				MARCH PLANTING				
Sp 127	First and Best	11.5	30	2.5	55	8	93	10.0
Sp 128	Valley	2.5	29	2.5	68	10	93	0.5
Sp 129	Dashaway	2.0	36	2.5	61	11	93	7.0
Sp 131	OAC 181	4.0	35	3.0	49	9	93	4.0
Sp 133	Stral	3.0	29	4.0	68	8	93	3.5
Fp 5	Multipler	0	0	0	0	0	0	0
Sp 126	PI 257592	14.0	34	3.5	55	8	80	21.5
Sp 134	PI 257593	6.5	37	2.5	49	8	93	22.0
Sp 125	PI 257594	12.5	38	3.5	55	8	93	19.5

TABLE 2

SUMMARY OF DATA OBTAINED FOR CHICKPEA STRAINS AND INTRODUCTIONS PLANTED IN NOVEMBER AND MARCH ON THE STILLWATER AGRONOMY RESEARCH STATION, 1959-1960

Okla. No.	P. I. No.	Mean No. Plants per four foot row on: 12/23	12/31	1/20	Mean No. of Plants Survived 6/27	Mean Ht. of Plant (cm.) 3/31	Mean Number of: Branches 3/21	Days to Bloom	Days Pod to Bloom
					NOVEMBER PLANTING				
Cp 3	207470	0	0	3.0	0	13	3	167	-
Cp 5	211010	1.5	1.5	2.0	0	11	2	171	-
Cp 6	211722	1.5	1.5	5.0	0	14	2	171	-
Cp 7	212091	1.0	1.5	2.0	0	12	2	167	-
Cp 8	212092	1.5	3.0	4.5	0	17	3	169	-
Cp 9	212595	0.5	3.0	4.0	0	13	3	167	-
Cp 10	214311	0	0	2.5	0	10	2	-	-
Cp 16	218068	1.0	2.5	6.5	0	14	2	165	10
Cp 17	219727	0.5	1.5	5.0	0	16	3	171	-
Cp 20	219730	0	0	1.5	0	14	2	163	-
Cp 21	220649	0	0	1.0	0	-	-	-	-
Cp 22	220776	0	0	2.0	0	13	3	171	11
Cp 27	222771	1.5	2.0	8.0	1	12	3	167	10
Cp 28	222772	0	4.0	6.0	0	15	3	160	7
Cp 31	228433	2.0	3.0	5.0	0	12	2	167	-
Cp 32	257583	1.5	3.5	6.5	0	11	2	165	8
Cp 33	257584	1.0	3.5	5.5	0	-	-	-	-
Cp 34	257585	1.5	3.0	5.0	0	13	2	163	8
Cp 35	257586	0	1.0	4.0	0	20	3	160	11
					MARCH PLANTING				
		4/2	4/5	4/8		6/8	6/8		
Cp 8	212092	1.0	5.0	8.0	0	15	2	56	8
Cp 9	212595	0	3.0	7.0	0	18	2	52	-
Cp 10	214311	0	5.0	7.0	0	22	3	52	-

TABLE 2 (Continuation)

Okla. No.	P. I. No.	Mean No. Plants per four foot row on: 4/2	4/5	4/8	Mean No. of Plants Survived	Mean Ht. of Plant (cm.) 6/8	Mean Number of: Branches 6/8	Days to Bloom	Days Pod to Bloom
					MARCH PLANTING				
Cp 16	218068	2.0	5.0	8.0	0	21	2	53	8
Cp 17	219727	2.0	5.0	8.0	0	25	3	53	8
Cp 21	220649	0	4.0	6.0	0	15	3	52	-
Cp 22	220776	0	4.0	5.0	0	15	3	-	-
Cp 27	222771	0	2.0	5.0	3.5	15	3	61	10
Cp 32	257583	0	4.0	5.0	0	13	3	-	-
Cp 33	257584	1.0	4.0	6.0	0	13	2	-	-
Cp 34	257585	0	1.0	4.0	0	10	2	-	-
Cp 35	257586	0	3.0	5.0	0	13	3	52	-
Cp 36	OAECp-59-1	0	1.0	3.0	0	11	2	-	-
Cp 40	OAECp-59-5	2.0	5.0	6.0	0	15	2	-	-
Cp 45	OAECp-59-8	2.0	4.0	6.0	0	11	3	-	-

yellow, white cream, brown and black. Most accessions had yellow seed followed by black. The black color seeds appeared to be earlier maturing than the yellow seeded types. The black seeds were smaller and weighed less less per 100 seed than the yellow seeds. o) The pods were green and contained pubescence, and the number of seed borne per pod varies from none to three. The developing pods were greatly affected by high temperatures and many never developed. Often one mature, fully developed seed was found with a completely undeveloped "seed." As pods approach maturity they lose their green color and some were tan, non-translucent color, and some dark tan, transluscent color with the seed visible. The mature pods do not shatter or drop off. Where two seeds were present in the same pod, they were arranged so that both seeds were attached to the underside of the pod almost on the same spot.

The pods vary in size ranging from 1.2 to 1.7 centimeters in length. Sometimes the pod splits on the underside due to the pressure of the expanding developing seed. The maximum number of seed per pod found was three. p) General Observations: All the plants were covered with a fuzzy-like pubescence on the stem, leaves, leaflets and pods. During warm weather, the hairs exuded a sticky, bitter fluid, oxalic acid.

The root system of the chickpea plants consisted of a long taproot of about 40 to 50 centimeters with numerous secondary roots. The whole plant was succulent up to physiological maturity, thereon turning woody and brittle as the plants matured. Under greenhouse conditions, the plants turned yellow, shed their leaves, became woody and brittle and died.

During the experiment, all the plants tended to turn yellow. The cause of this "yellowing" is not known. The plants were sprayed for controlling insects and a nutrient solution containing Ca, K, Mg, S, P and micronutrients was applied. Containers were moved from sun to shade without effect. The sequence of the "yellowing" started by the leaves from green to yellow. This yellow color progressed from the tip of the leaflet down the leaflet through the leaf. The stem did not yellow. Though it never killed the plant, the leaves upon turning yellow dried, turned tan and became brittle and shed.

The chickpea plant appeared to be somewhat drought resistant. On several occasions on hot days it was observed that while the crabgrass growing near the chickpea plant was wilting the chickpea plant remained fresh.

Table 1 Summary of Data Obtained for Chickpea Accessions Under Greenhouse Conditions, 1959-60

		MEAN Number of Days from Planting to:					
Okla. Cp. No.	P.I. Number	Emer-gence	First Flower Bud	First Bloom	First Pod	First Mature Pod	Last Mature Pod
5	211010	5	42	62	82	111	121
6	211722	5.5	47	55	62	100	121
8**	212092	6	39	69	82		
9	212595	7	35	56	59	107	135
10	214311	8	63	71	82	109	144
12	214313	7	52	60	65	109	128
13	215588	6	65	69	82	107	142
16	218068	7.3	64	69	82	107	118
17**	219727	6	54	71	77		
18	219728	6	60	75	83	107	142
20	219730	6	62	67	83	107	130
21	220649	5	36	47	54	100	121
22	220776	6	52	60	81	107	135
23	222095	4.8	55	69	85	112	124
25	222709	8	40	67	76	114	144
27	222771	7	36	58	67	100	135
28A	222772	9	36	50	66	100	138
28B	222772					114	114
29	222774	7	62	67	85	109	135
33	257584	6	35	41	47	80	142
34	257585	9	37	54	63	97	142
35	257586	6	35	46	48	83	121
36	OAECP 59-1	7	55	60	73	102	138
41	OAECP 59-7	8	63	69	77	112	144

Table 1 (Continued)

Okla. Cp.No.	Flower Color	No. Nodes to 1st Flower Bud	Mean Ht. at 1st Flower Bud (cm.)	Lgth. of internodes (cm.)	Maximum Ht. Attained (cm.)	Leaflets No. per leaf	Leaflets Range
5	Pale Purple	18		1.94	47.0	9.75	3-15
6	Pale Purple	15	36.0	2.11	49.6	9.0	4-13
8**	Purple	24	37.0	1.30	50.8	10.4	3-14
9	Purple	16	36.7	1.70	40.3	10.3	4-14
10	White	21	31.3	1.10	35.6	9.8	4-13
12	Pale Purple	20	24.5	1.50	30.7	10.0	5-13
13	Purple	25	30.8	1.01	32.4	10.1	5-14
16	Dark Purple	18	30.8	1.10	37.3	8.9	3-12
17**	Purple	13	34.7	1.50	45.7	9.2	5-14
18	Purple	24	38.5	1.50	41.9	9.5	4-14
20	Purple	25	37.1	1.20	55.9	10.1	5-14
21	White	12	38.0	1.70	38.9	9.9	6-13
22	White	20	36.5	1.50	38.8	9.2	4-14
23	Purple	23	37.5	1.20	55.0	10.7	5-14
25	Purple	14	36.6	1.40	48.9	10.1	5-14
27	Purple	12	27.0	1.40	38.1	9.3	4-13
28A	Purple	12	26.9	1.54	41.9	7.7	3-14
28B	Purple				24.1		
29	Purple	18	32.2	1.10	41.9	9.4	3-13
33	Purple	12	38.5	1.60	48.1	8.9	5-14
34	White	10	31.9	1.70	43.2	10.0	5-14
35	Purple	12	31.0	1.65	42.3	12.0	7-15
36	Purple	20	32.0	1.40	57.2	11.0	4-16
41	White	18	28.6	1.20	38.0	9.3	3-14

Table 1 (Continued)

Okla. Cp.No.	Leaflet Length and Width (mm)1/ Base Wdth	Base Lgth	Middle Wdth	Middle Lgth	Top Wdth	Top Lgth	Stem Diameter (mm)1/ Base	Middle	Top	Foliage Density 2/
5	3.5	6.0	3.0	8.0	2.5	7.0	4.0	2.2	1.2	1
6	3.0	7.5	5.0	9.5	3.5	8.0	3.2	2.0	1.1	1
8**	1.8	6.0	4.0	10.0	3.0	7.0	4.0	3.0	1.5	2
9	3.0	6.0	5.0	9.0	3.0	7.0	3.7	2.0	1.5	3
10	2.8	3.0	3.5	6.0	3.0	6.5	4.0	2.0	1.1	3
12	2.0	4.0	4.0	9.8	2.0	4.5	3.0	1.8	1.0	3
13	3.0	6.0	4.5	7.0	3.0	7.0	4.0	1.7	1.2	3
16	2.0	3.5	3.0	6.0	3.0	6.0	4.0	2.0	1.0	3
17**	3.0	5.0	5.5	10.0	3.0	8.0	4.1	2.0	1.2	1
18	2.0	5.0	6.0	11.0	3.5	6.0	4.1	2.2	1.0	3
20	3.0	6.0	3.0	9.5	3.5	7.0	3.2	2.1	1.5	2
21	3.0	6.5	4.0	9.0	2.5	6.0	3.2	2.1	1.1	2
22	2.5	6.0	5.0	9.0	3.8	6.5	3.0	2.2	1.2	2
23	1.8	5.0	3.0	6.0	3.0	6.5	2.7	2.0	1.0	1
25	2.0	5.0	5.0	9.5	3.0	6.0	3.8	2.3	1.4	2
27	1.5	3.0	3.5	7.5	3.5	7.0	2.5	2.0	1.0	2
28A	2.0	5.5	5.0	9.5	3.0	5.5	3.0	2.0	1.1	3
28B			2.0	4.0			3.0	1.1	.9	3
29	2.0	4.0	4.0	9.0	2.5	6.0	3.0	2.0	1.0	2
33	1.5	2.5	4.0	7.0	2.5	5.5	2.4	2.0	1.1	2
34	2.3	4.5	5.0	9.0	3.0	5.0	2.8	1.5	1.0	1
35	1.5	4.0	3.0	10.5	3.0	4.5	2.3	1.5	1.0	1
36	1.5	4.5	5.0	9.0	4.0	7.0	3.5	2.1	1.0	3
41	2.0	4.5	4.5	9.5	3.0	7.0	4.0	2.4	1.1	3

Table 1 (Continued)

Okla. Cp.No.	Branch-ing 3/	Seed Color	Total No. of: Seeds Harvested	Total No. of: Pods Harvested	Pod length (cm.)	Grams per 100 seed
5	1	Lt. yellow	6	5	1.55	16.33
6	1	Yellow	11	11	1.70	20.73
8**	1					
9	2	Yellow	13	13	1.70	18.18
10	1	Yellow	22	22	1.20	14.25
12	1	Variable*	19	15	1.35	14.82
13	1	Yellow	16	15	1.40	15.53
16	1	Yellow & Tan	10	10	1.30	20.00
17**	2					
18	1	Yellow	27	23	1.40	15.86
20	2	Yellow, brown	14	13	1.43	14.96
21	2	Cream	11	8	1.60	18.18
22	2	Lt. yellow	22	20	1.40	14.55
23	1	Yellow tan	18	15	1.20	11.11
25	2	Black	17	13	1.30	14.63
27	2	Black	43	35	1.40	13.10
28A	2	Black	21	18	1.45	18.07
28B	1	Brown	2	1	1.31	7.50
29	2	Dark brown	15	14	1.20	13.23
33	1	Black	29	24	1.35	13.22
34	2	Yellow	17	12	1.50	14.64
35	2	Yellow	24	20	1.50	14.38
36	1	Yellow	14	13	1.40	17.91
41	1	Cream	14	12	1.40	22.23

*5 yellow, 8 buff and 3 grayish-brown seeds
**No seed produced

1/ Measured near the base, middle and top of the plant

2/ 1 = sparse; 2 = medium; 3 = dense

3/ 1 = basal branching; 2 = not basal branching

Evaluation of certain accessions of Pisum and Cicer accessions was done by Shyam Sunder Choudhary, graduate student in Agronomy.

The accessions were planted in single row duplicate plots four feet long in rows twenty inches apart in late November and mid-March at the rates of four seed per foot for field peas and two seed per foot for chickpeas.

The data collected for the Pisum accessions are shown in Table 1 and that for the Cicer accessions in Table 2.

It should be noted that the chickpeas survived the winter and spring plantings but the plants of all accessions except P.I. 222771 began dying in early May and were dead within ten days. Heavy May rainfall, prevalence of disease and a slowly permeable fine-textured soil were probably important factors causing them to die.

Observations made by Ralph S. Matlock on other plant introductions evaluated in Oklahoma follow.

Crotalaria, Sesbania, and Safflower

Okla. Code No.	Strain of P.I. No.	Latin Name	Mean Ht. (ins.)	Air-Dried	Yield per acre(lbs.)	Color of seed	Remarks
Sp 29		Crotalaria spectabilis	44	7235	208	Black	
Sp 30		" "	39	5110	207	Black	
Sp 31	189044	Crotalaria retusa	31	7603	521	Golden	Early plts.sel.
Sp 32	189043	" "	35	8584	383	Golden	Early plts.sel.
Sp 33	189044	" "	34	11037	879	Golden	
Sp 37	56206	" intermedia	44				Late, diseased
Sp 38	OAE Cr 59-1	Crotalaria spp.	6 plants			Black	
Sp 39	167069	Sesbania spp.	110	6950	937		
Sp 40	167290	" "	111	8176	820		
Sp 41	180050	" "	95	9606	1036		
Sp 42		Sesbania selection	82	8176	861		

			Ht. (ins.)	Remarks
Sa-42	257852	Carthamus tinctorius	33	Increased for further evaluation
Sa-49	183669	Ditto	36	Increased for further evaluation
Sa-50	198290	"	22	Increased for further evaluation
Sa-51	198291	"	25	Increased for further evaluation
Sa-52	199889	"	23	Lodged badly
Sa-53	199890	"	29	Lodged badly

	Ht. In.	Yield (Pounds Per Acre) Air Dried Plants	Seed
Sp. 44 Selection Clitoria ternata	28	1635	68
Sp. 45 P.I. 164250 " "	30	2248	158
Sp. 46 P.I. 218066 Cajanus cajan	64	6254	75
Sp. 47 P-3 " "	64	5314	36
Sp. 48 OAEP 59-1 " "	66	4456	25
Sp. 49 OAEP 59-2 " "	70	4292	63
Sp. 76 P.I.247310 Crambe abyssinica	24		540
Sp. 75 257588 Guizotia abyssinica	Seed contain 11.5% protein, 24.7% fat. No seed produced in 1959 and 1960. Obtained good plant growth.		

Sp. 109 Kenaf Hibiscus Height - 80 inches, air dry weight = 13,860 #/A

An attempt was made to grow several strains of trigonella and mentha accessions but was unsuccessful in securing stands.

Progress Report on Ornamental Plants Received from Glenn Dale, Md. Plants received April 8, 1958.

P. I. 237842 Ardisia japonica
One plant transplanted on north side of house, one transplanted on a south exposure. One left outside did not winter. The other died back some during the summer and on September 25, 1960, was starting to grow. To date the plant does not appear to be outstanding but should be evaluated further.

P. I. 237644 Anthurium scherzerianum
Transplanted to west exposure (dry, hot) and north exposure (wet, cool) April 22, 1958. This plant is a very promising foliage plant. It may be rooted or allowed to seed in the greenhouse during the winter.

P. I. 237850 Bedia hirsuta
Transplanted to northwest exposure (wet, cool). The plants did not survive the first summer.

P. I. 238510 Calvoa orientalis
Plants were very weak upon arrival. Part were left in the greenhouse and part transplanted to north exposure (wet, cool) in May, 1958. All died.

P. I. 241204 Hypoestes maculosa
Transplanted in May to north exposure. All failed to survive the summer.

Plants Received November 19, 1959

P. I. 243321 Agapetes sp.
Showed good appearance in greenhouse but did not survive past September 25, 1960.

P. I. 236354 Ammocharis coccinea
First bloom July 1960, and seed harvested August 5, 1960. Moved to greenhouse September 25, 1960. Now six inches tall.

P. I. 234283 Anagyris foetida
Kept in greenhouse until May 18, 1960, then transplanted outside. Had not bloomed on September 25, 1960, but was growing well and will be left outside this winter.

P. I. 241026 Antholyza aethiopica
Planted outside May 1, 1960. No blooms but leaves tended to die back. Moved to greenhouse September 25, 1960. Needs further evaluation.

P. I. 237846 Arisaema
Transplanted outside from greenhouse May 1, 1960. No plants survived the summer (September 25, 1960).

P. I. 249453 Cassia appendiculata
Transplanted outside from greenhouse in late May. On September 25, 1960, it was thirty inches tall, bushy, healthy and no blooms.

P. I. 253489 Cerastium sp.
Transplanted outside from greenhouse May 1, 1960, to a damp site on the north and left to determine winter survival.

P. I. 231135 Gaultheria cuneata
The plant died shortly after transplanting.

P. I. 238954 Iris sisyrinchium
Bloomed in greenhouse February 1960. Blooms similar to small Dutch iris. Promising miniature plant. Transplanted outside from greenhouse May 1, 1960 and was fine September 25, 1960.

P. I.'s 243870 and 243869 Magnolia globosa
These accessions had no foliage on arrival and did not survive the transplanting.

P. I. 79039 Petteria ramentacea
Transplanted outside from greenhouse May 18, 1960 but was dead September 25, 1960.

P. I. 78098 Philadelphus lemonii
Bloomed January 15, 1960 in greenhouse. Similar to simple mock orange bloom. Transplanted outside from greenhouse May 1, 1960 and leaves showing some leaf spot disease September 25, 1960. Left outside of winter.

P. I. 242262 Rhamnus crocea ssp. ilicifolia
Transplanted outside from greenhouse May 18, 1960, but was dead September 25, 1960.

P. I. 232011 Rhodendron japonicum
Transplanted outside from greenhouse May 1, 1960, but was dead by September 25, 1960.

P. I. 23032 Syringa meyeri
Transplanted outside from greenhouse May 1, 1960. Grew slowly but still living September 26, 1960. No blooms. Left outside for winter.

P. I. 237505
Transplanted outside from greenhouse May 1, 1960, but was dead by September 25, 1960.

P. I.'s 235511 and 235512 Lasianthus satsumensis
Transplanted outside from greenhouse May 18, 1960, but was dead September 25, 1960.

P. I. 259134 Comphocarpus sp.
Transplanted outside from greenhouse May 18, 1960. On September 25, 1960, plant five feet tall, bloomed all summer, produced a puffy fruit containing seed. The plant was not particularly beautiful but seemed well adapted.

P. I. 240796 Callicarpa macrophylla
Seed planted January 22, 1960, but no germination was obtained.

Accessions of Coleus received April 1960

The following accessions were extremely weak on arrival and did not survive transplanting: P.I.'s 249770, 249780, 249800, 249802, and 249807. Those listed below were moved to the greenhouse for the winter:

P. I. 249769 was a weak plant ten inches tall with green stem September 25, 1960. Moved to greenhouse for winter.

P. I. 249775 was an erect plant eighteen inches tall with large leaves, vigorous and very colorful (September 25, 1960).

P. I. 249778 had coarse dark red stems, tall erect plants thirty-six inches tall, vigorous and was very unusual (September 25, 1960).

P. I. 249781 was erect branching, vigorous, twenty-four inches tall and had dilute red stems (September 25, 1960).

P. I. 249,785 was not vigorous in sunny exposure (September 25, 1960).

P. I. 249788 plants bloomed September 3, 1960, plants spread three feet, rooted at nodes and were very vigorous.

P. I. 249792 was a delicate weakish plant ten inches tall with reddish stem (September 25, 1960).

P. I. 249797 plant spread vigorously and was vigorous (September 25, 1960).

P. I. 249806 plants erect branching twenty inches tall, bloomed September 1, 1960 and vigorous.

P. I. 249777 had erect branching plants 18 in. tall, vigorous and was very colorful (September 25, 1960).

Accessions Received April 26, 1960

P. I. 235138 Rhododendron japanicum
Transplanted outside from greenhouse May 1, 1960. Very small and did not grow much during summer. Left outside for the winter.

P. I. 249091 Aloe sp.
Transplanted outside April, 1960, but on September 25, 1960, noted no summer survival.

P. I. 249090 Aloe sp.
Transplanted outside April 1960. Broken off during summer and on September 25, 1960 had a weak growth.

P. I. 255022 Actinotus helianthi
Transplanted outside from greenhouse May 1, 1960. No plants noted surviving September 25, 1960.

P. I. 254952 Callistemon phoeniceus
Transplanted outside from greenhouse May 1, 1960. Plants ten inches tall, no bloom and no survival noted September 25, 1960.

P. I. 254993 Callistemon sp.
Transplanted outside from greenhouse May 1, 1960. Plant twenty inches tall, no blooms. Left outside for winter.

P. I. 255036 Callistemon pachyphyllus
Transplanted outside from greenhouse May 1, 1960. Plant twenty-four inches tall, no blooms. Left outside for winter.

P. I. 240914 Eurya emarginata var. microphylla
Transplanted April 1960, but did not survive hot summer.

P. I. 255037 Calothamnus chrysantherus
Transplanted outside May 1, 1960, but not any of the plants survived (September 25, 1960).

P. I. 255038 Calothamnus homalophyllus
Transplanted outside May 1, 1960 but no plants survived (September 25, 1960).

P. I. 255039 Calothamnus longissimus
Transplanted outside May 1, 1960 but no plants survived (September 25, 1960).

P. I. 255006 Leptospermum luchmanii
Transplanted outside May 1, 1960 but no plants survived (September 25, 1960).

P. I. 254428 Agonia marginata
Transplanted outside May 1, 1960. Plants eighteen inches tall and left outside for the winter.

Accessions Received October 1960

The following accessions were planted in the greenhouse upon arrival and will be transplanted outside in the spring of 1961:

1 plant	P.I. 262382	Arbutus peninsularis
2	262383	Arbutus peninsularis
1	254753	Brachycome multifida
4	247189	Cissus discolor
3	267824	Ilex 'Lydia Morris'
3	267825	Ilex 'John T. Morris'
2	231948	Ilex crenata
1	239481	Jasminum polyanthum
5	262388	Nolina microcarpa
1	262391	Penstemon sp.
1	254356	Pinus pumila
1	267823	Pinus pumila
3	239685	Plectranthus ciliatus
3	260987	Tacca macrantha
2	266388	Tecome sp.
3	249776	Coleus 'Celia'
3	249804	" 'Torch'

PUERTO RICO - (Hatch 94) - Roy Woodbury

Through the cooperation of the S-9 Regional Project, the USDA, government agencies, local and foreign agencies, 1820 accessions have been obtained from July 1, 1959 to November 1960.

Grasses lead in number of accessions with 797. Because of the recent interest and development of our cattle industry, we have introduced a large number, 797 accessions of grass species and varieties; emphasis being placed on the Sorghums, Panicums, Digitarias, Bermudas, and Brachiarias. A study was recently completed comparing Panicum maximum with Brachiaria brizantha, signal grass. Several of the above genera show promise but require more study for final remarks.

Papaya has developed increased interest as a fresh fruit for the New York market and the possible production of papain. In this respect, 360 accessions were made for screening against the virus causing bunchy top, and for forms with high yields and percent of papain. This study is still in its infancy.

Sesame. The new accessions (105) have not as yet been planted but those from last year's screening which showed promise are planted for further observation.

Grapes. The 36 accessions of grapes received will soon be sent to the Fruit Substation at Fortuna. We have hopes of producing grapes as a minor fruit crop on our dry south coast.

Ornamentals. Most of the 40 accessions of ornamentals have been sent to the

Corozal and Lajas Substations to continue observations on their performance and adaptation.

Vegetables. The seedless as well as the Congo varieties of watermelon continue to give very promising results especially at the Fortuna Substation. The Congo, on the other hand, gave very poor results on the north coast at the Isabela Substation. Variety testing of snap beans continued at the various substations. The pole bean variety Florigreen proved outstanding as to yielding, resistance to bean mosaic, and bean rust diseases. Six lines of bush beans received from the United States Vegetable Breeding Laboratory, along with 16 commercial lines, were tested and appeared promising but with the varieties Topcrop, Wade, Tenderpod, Topmost, and line B-3125-x-5-2 giving the most outstanding performance considering their yielding ability, disease resistance, and pod appearance and quality. Their production, respectively, was as follows: 3.86, 3.34, 3.33, 3.17, and 2.88 tons of green beans per acre. Several crosses were made but without success. More trials will be made but in the cooler season.

Breeding for resistance to fruit cracking, bacterial wilt, and root knot nematodes continues in work with tomatoes. The high incidence of root knot nematode species, including new ones, has added to the complexity of breeding for their resistance.

Work continued on the selection and intercrossing of selected stocks of sweet corn. A selection, F-722, obtained from this program, was recommended for release as a new variety, Puerto Rico 50. Limited amounts of seed are available for local farmers.

Legumes. Several native and foreign legumes planted in two locations (Rio Piedras and Lajas) have been eliminated due to disease or poor vigor and cover. On the other hand, several show promise as forage or cover crops.

Miscellaneous. The collections of coffee, aceituno, papaya, grapes, strawberries, achiote, and other long term crops, are still being continued for evaluation.

Work planned for next year: We will continue the introduction, breeding, and selection of desirable material. Work already in progress will be continued.

SOUTH CAROLINA - (Hatch 88) - J. A. Martin

Chufas: Three new chufa accessions were received during the past two years, P.I.'s 231256, 263116, and 263117. In 1951 one chufa accession (184949) was grown and found to be quite variable for tuber size, color, shape, and position of fruiting within the root system. Progenies from P.I. 184949 are apparently superior in many respects to the new accessions. The chufa nursery is planted at the Sandhill Experiment Station, Pontiac, S. C., on sandy loam soil and most of the chufas will remain in the soil over winter to evaluate for winter hardiness.

Okra: 711 okra accessions and breeding lines were planted at Florence, S. C., for screening for root-knot nematode resistance. The soil was known to be

heavily infested with root-knot nematodes. Single row plots, 25 feet long, were used and Clemson Spineless okra was planted to every 10th row in each plot as a check for susceptibility to the nematodes. The root-knot nematode, Meloidogyne incognita var. acrita, and a Fusarium wilt attacked the entire okra planting. All the Clemson Spineless check rows were wiped out completely in early July. During the month of October, all okra lines which produced seed were harvested as open pollinated seed and data taken as to number of lines surviving as follows:

P.I. No.	No. lines planted	No. lines harvested	No. lines killed
109215	79	3	76
109215 x Clemson Spineless	45	44	1
120833	6	3	3
120833 x Clemson Spineless	30	30	0
169695	1	1	0
172674	3	3	0
172674 x Clemson Spineless	10	10	0
178808	4	4	0
178808 x Clemson Spineless	30	30	0
180405	1	1	0
182012	2	2	0
183286	1	1	0
212586	1	1	0
212878	1	1	0
248999	1	1	0
250126	1	1	0

The results of the screening test indicate that the lines which survived may have resistance to both the root-knot nematodes and the Fusarium wilt. This work will be conducted again in 1961 for further evaluation.

Peppers: 432 pepper accessions (including old and new accessions) were planted in the field for a more thorough evaluation. 229 of these accessions were new ones and many of unusual species were included, namely: Capsicum cardenasii, C. chacoense, C. eximum, C. frutescens, C. microcarpum, C. pendulum, C. praeter-missum, C. pubescens, C. sinense, and Capsicum sp. A complete evaluation of all the pepper accessions has been completed and will be available to all interested.

There are 46 pepper accessions which have ornamental value. Plans are to test these types and also to isolate the most promising ones for seed. It is hoped that several of these accessions can be named and released in the near future.

There are 32 accessions which have commercial value as is and these will be tested further.

Bacterial leaf spot and virus diseases were present over the entire field. Records were taken as to degrees of resistance to the diseases.

Sesame: There were no new P.I. accessions of sesame this year. However, a number of old lines were planted at Sandhill Experiment Station for a recheck

and comparison of several characters along with the breeding lines. Pre-emergence weed control was conducted again this season. Chloro IPC continues to give best results. Cooperative regional yield tests were conducted at Sandhill and Pee Dee Experiment Stations. High yields of sesame seed were obtained at both locations. Diseases were at a minimum at both locations.

Tephrosia vogelii: The work with Tephrosia vogelii has been expanded at Clemson during the past year. All the Tephrosia work is being conducted in cooperation with Federal Experiment Station, Mayaguez, Puerto Rico.

Mr. B. J. Skelton, Assistant in Horticulture and graduate student, conducted his work with Tephrosia to study the mineral nutrition of the plant. The reasons for undertaking this experiment were twofold: (1) to establish definite deficiency symptoms of the elements required in the growth of the plant, and (2) to determine the optimum levels of macro- and micro-nutrients for maximum growth. Mr. Skelton completed his M. S. Degree on June 1, 1960, and a copy of this thesis entitled, "Deficiency Symptoms of Tephrosia vogelii" is on file in the Horticulture Department. A technical bulletin is now being prepared from the thesis.

A Tephrosia yield test has been underway for the past two years at Clemson. In 1959 three P.I. accessions were used in a multiple location variety trial and the results of the test at Clemson are as follows:

P. I. No.	% Rotenoids	Yield-lbs./A
241347	2.9	2704
257533	2.7	3040
215495	2.3	2559

In 1960 another yield test was set-up using three new Tephrosia accessions P.I.'s 215495, 248197, and Stat. Acc. No. 11733 and one old one, P.I. 241347. Due to the dry weather in May and June a fair stand was obtained. No yield data will be available from this test, but sufficient samples of leaves were obtained for making rotonoid assays.

A fertilizer test was initiated in 1960 with Tephrosia. Four treatments were used: check, 500, 1000 and 1500 pounds per acre of 5-10-10 fertilizer. Four row plots in a Latin-square design were used. Data has not been completed at this time. There appears to be no differences in growth of these treatments prior to harvest in November.

Plans are underway to expend the research with Tephrosia at Clemson in 1961 to include the following work:

1. Varietal yield tests, samples to be assayed for rotenoids.
2. Fertilizer tests.
3. Pre-emergence weed control tests.
4. Date of planting.
5. Cut-back to allow for flush growth.
6. Processing for use locally in killing fish in ponds prior to re-stocking.

Coleus: A number of the coleus accessions have performed quite well in the garden and greenhouse, while others showed poor growth and/or coloring. Brief evaluations of the coleus accessions are listed as follows:

AFTERGLOW (249769) - 16". Medium sized leaves; faded red with greenish-yellow border. In summer heat, rather unattractively colored. Lacked sufficient vigor.

BEAUTY (249771) - 14". Pinkish-red with darker mid-portion of leaves. Some fading in summer, but still attractive. Dwarf, but filled out well. A fairly good variety.

CAMPFIRE (249775) - 22". Robust grower, with moderately large leaves; filled out well. Variegated shades of deep red and green. No fading. An attractive item.

CRISTATA (249778) - 15". Greenish leaves, with yellow mid-zone; dark colored veins and stems. Weak grower. Lost leaves and did not hold up until fall. A poor variety here.

ETNA (249781) - 18". Robust variety of medium height; dense mound of foliage. Medium leaf size; bright red wide irregular leaf margins, with darker mid-sections. Little or no fading. A fine variety.

FRECKLES (249783) - 20". Interesting novelty, but color not too appealing. In mid-summer sun it became rather light. Color: mottling of light and dark red, with yellow spots. Fairly good growth habit.

GLITTERS (249784) - 12". Compact and dwarf. Fairly satisfactory and attractive. Small-leaved; bright red in centers, bordered by deep red, and narrow green edging.

GLORY OF LUXEMBORG (249785) - 16". Rather ordinary looking medium red, with narrow yellow border. Filled out well, although clump not too well shaped. Fading not serious.

HARLEQUIN (249786) - 12". Interesting novelty. Light cream background with shades of green and red blotches and specks. Did well, even though late propagated; expect more of it next year.

LAING'S CROTON (249787) - 10". Also late propagated; not at all robust, but fascinating novelty. Narrow notched green leaves with lighter mid-sections, and various dark red random markings.

SKYLARK (249799) - 6". Blotched and speckled red and yellowish-green. Late propagated, but made but little growth. Leaves small. Color OK, but a questionable variety for our climate.

PAISLEY SHAWL (249790) - 13". Dwarf, but well filled out; attractive and quite satisfactory. Leaves medium-small, roundly notched. Medium-green centers, wide light pink margins, with all-over red speckling.

PEGASUS (249791) - 14". Planted late so did not get a good start. Large-leaved. Blotched light green and cream, with highlights of deep red on basal portions of leaves and on stems.

POYNTON (249794) - 30". Very robust and colorful. No fading. Deep red with pinkish-red wedge in central base portion of leaves, and irregular green blotching. Large leaves; one of tallest. A good variety in our Trials.

RED CROTON (249795)- 12". Leaves very narrow and irregularly shaped. Deep red and lighter red variegation. Fills out fairly well, but has a loose airy appearance. Another interesting novelty form.

RUSSETT (249797) - 12". Poor. Three-toned leaves (russet red, pinkish-red base, and narrow yellow-green margin). But fades badly to a wishy-washy combination. A thin, poor grower. Not a desirable clone for our conditions.

SUNBEAM (249800) - 6". This variety was also propagated late. Leaves mostly light yellow-green with cream base, and slight deep red on margins. Color interesting and attractive, but might appear to be a questionable variety. Little growth; but shall watch it again next season.

TAPESTRY (249803) - 15". Coarsely toothed leaves, variously variegated in in deep red, medium red, pink, and shades of green. Kept its full color well and made an attractive plant. Good.

VESUVIUS (249806) - 16". Grew well and filled out into good mound shape. Leaves small; deep red with narrow light-green margin. But in summer sun, the red tended to become a muddy blackish shade which was quite unattractive.

WHITE GEM (249807) - Late propagated; weak and died out early.

(Mr. J. P. Fulmer discussed the work recently initiated toward evaluation of ornamental plants. He stated that 27 acres had been made available for the study of ornamentals of various types. Plant beds have been established on ~~these~~ THREE acres for evaluating annual flowering plants. He used kodachrome slides to show these areas and some of the plantings that have already been made.)

TENNESSEE - (Hatch 57) - W. E. Roever

Ninety-two new P.I. numbers were received by Tennessee Agricultural Experiment Station workers during 1960 and nineteen others during late 1959. Twenty additional acquisitions were received by commercial nurseries in the state and twenty more in late 1959. Also 1287 P.I. accessions of Zea mays were acquired for research in the Biology Division of the Oak Ridge National Laboratory.

Material received by the Experiment Station in 1960 consisted of woody and

herbaceous ornamentals including a collection of named coleus varieties. There were also thirty acquisitions of cabbage and broccoli.

J. K. Underwood reported on forty grass species received from the Pullman and Ames Plant Introduction Stations during 1959. Included were Dactylis, Phalaris, Poa, Arrhenatherum, Bromus, Calamagrostis, Festuca, Lolium, Agrostis and Euchlaena species. No definitive results are yet available on these.

J. K. Alexander reporting on 23 woody acquisitions found that P.I. 220246 (Eucalyptus niphophila) has good possibilities as a greenhouse foliage plant and that 235432 (Podocarpus nagi) is also promising as a foliage plant. The former is being increased. The latter is easy to root from cuttings. Ligustrum delavayanum (P.I. 56317) has shown excellent growth with a spreading habit. It looks good as a low hedge plant that is hardy and deciduous. Eurya ochnacea (235502) shows possibilities as an outdoor shrub which develope some fall color and slight winter injury at Knoxville. Eurya emarginata (235425) has excellent possibilities as a foliage pot plant but it is tender and not adapted to outdoor growing. Ilex mutchagara (235583) withstood the winter of 1959-60 and developed good growth during the summer. Distylium racemosa (236260) has excellent possibilities as a field plant and as a foliage plant while Itea japonica (226131) shows good growth and excellent fall foliage color.

The following chrysanthemums look promising as greenhouse cut flowers:

235050	236031	236061	235922
235951	235902	235945	236066
235920	240952	235051	235947
240831	235892	235947	240386

None of these proved satisfactory as outdoor hardy mums.

All of the coleus varieties received have been increased. Cuttings were distributed to greenhousemen in several areas of the state and are available to others. The most popular were the croton and fringed-leaf types. Stock plants will be maintained for two more years.

In conjunction with his bean breeding Mr. A. B. Strand reports that Lima bean P.I. 164893 shows practical immunity to the Mexican bean beetle and 163552 is tolerant to leafhopper and the bean beetle. He also finds P.I. 247701, a runner type shell bean from British Columbia, to be most productive and of high quality while 136683 is a wax bean of excellent quality.

TEXAS - (Hatch 717) - Eli L. Whiteley

Total of 1500 accessions received by Experiment Station and cooperators in 1959-60 crop year.

Plants For Possible Industrial Use:

Thirty accessions were planted at College Station in the fall of 1959 and spring of 1960. Several of these accessions show some promise as oil, gum,

or pulp plants. There are problems common to all of these plants, yet each accession must be treated somewhat differently in order to convert it into a field crop. The first problem encountered in handling these plants is obtaining field stands. Most of these accessions were started in "jiffy pots" in the greenhouse and transplanted to the field after they were well established. Direct field plantings were made of seeds of all the accessions by dropping the seeds in hills and covering them lightly with a mixture of peat moss and soil. The principle plantings were made on the upland soil (Lufkin fine sandy loam) at College Station. A few accessions were planted in the Brazos river alluvial soil (Miller clay). Except as otherwise stated the results obtained at the two locations were so similar that they need not be given separately. The results were as follows:

Calendula officinalis, NU 40010. Two plantings were made, one was made on March 12, 1960 and no stand was obtained, a second planting was made on April 15 and about 75% stand was obtained. The first flowers appeared June 1 and the seed were harvested July 7. The yield of seed was low, only 60 gms. from 100 ft. row. The yield can probably be improved by selection and management.

Lesquerella lindheimeri, 33082. Three plantings were made on March 8, 12, 15, 1960. The March 8th planting was made in "jiffy pots" and transplanted April 13th. About 60% of the plants survived. These plants began flowering May 11th and were maturing seed by June 15th, however, the seed yield was low. Yields could be increased greatly by better stands.

Crambe abyssinica - Abyssinian kale has been grown in the Lower Rio Grande Valley by W. R. Cowley at Substation No. 15 for several years. The Crambe (P.I. 247310) grows very well in the Rio Grande valley as a winter annual. Seed yields from this plant are about 700 pounds or more of seed per acre. We at the Texas station feel that this plant is at the stage where the development of processing procedures and markets should be investigated and developed. Mr. Cowley has planted one acre of Crambe this fall and seed should be available for large plantings in 1961. Most of the agronomic problems with this plant have been solved and it is well adapted to mechanical harvesting. The plant has a wide range of adaptation and can be grown as far north as College Station, Texas as a winter annual.

Crotalaria juncea - Lines of C. juncea were introduced by W. R. Cowley, Texas Agricultural Experiment Station, Weslaco, Texas, from Cuba or Puerto Rico in 1943. Out of this seed lot Mr. Cowley has selected day-neutral and short day lines. This plant shows a great deal of promise as a paper pulp plant. Conferences have been held with the Champion Paper and Fibre Co. to discuss its possibilities as a pulp plant. The gum contained in the seed may be of some value in the paper manufacturing process. Advanced lines are now being tested in North Carolina, Texas and Mexico. The day-neutral lines can be grown in the higher rainfall areas of East Texas for the production of pulp and seed.

Lesquerella lasiocarpa, 33090. Three plantings of this accession were made March 8, 12, and 15, 1960. Only from plants transplanted in "jiffy pots" were stands obtained. These plants flowered May 12 and the seed were mature by June 17. Seed yields were low but this could be improved by better stands and improved management.

Daucus carota, NU 40025. Two plantings were made, one on March 15 and the other March 20, 1960. No plants were obtained from the early planting and about 25% stand was obtained from the latter planting. These plants started flowering June 6 and seed were mature June 28. The seed yield was low, but would have been fair, if a good stand had been obtained. These plants were field planted.

Osteospermum sp. Four species were planted - sinuatum, 2 collections, clandestinum, pachypteris, and muricatum. Stands varied from none to 70% for field plantings, muricatum is easiest to grow from seed and clandestinum the hardest to grow from seed.

O. sinuatum, coll. 1 - First flowers May 11, seed mature June 15. Yield low.

O. sinuatum, coll. 2 - First flowers July 11, seed mature August 10. Yield low.

O. pachypteris - First flowers July 11, seed mature August 10. Yield low.

O. clandestinum - First flowers July 11, seed mature August 10. Yield low.

O. muricatum - First flowers May 21, seed mature June 17. Yield low.

Crotalaria intermedia, PQX56206. Three field plantings were made on March 19, April 7 and April 16. No plants were obtained from the early planting. The April 7 planting produced about 10% stand and the April 16 planting produced about 50% stand. Laboratory work indicates this species has hard seed. Good stands can be obtained following seed scarification. Seed yields were low, but a few plants produced fair yields. Selections were made for testing next year.

Crotalaria spectabilis, P.I. 217903. A field planting was made on April 18 and about 85% stand was obtained. Laboratory work indicates about 15% hard seed. First flowers were noticed June 3 and seed from these flowers were mature July 20. The seed pods of this species dehise at maturity and the seed may be lost unless they are harvested as soon as they are mature. Some breeding work needs to be done to eliminate this characteristic. These plants flower and set seed until October 28, 1960.

Dimorphotheca aurantiaca, CD 32946. Seed from two collections were planted on three dates, April 1, 4 and 15, 1960. The April 1 planting was in "jiffy pots" and about 90% of these plants survived transplanting. Nearly all of these plants died following 7+ inches of rain occurring during the period June 24 to 26. A few plants survived and seed were harvested from these plants.

Cynara cardunculus, CD 35743. These plants were started in the greenhouse Feb. 2, 1959 and later transplanted to the field. They failed to flower in 1959. About 80% of the plants survived the winter and began flowering April 1, 1960. Seed from these flowers were mature by July 15. All flowers had matured by Sept. 1 and new leaves were emerging from the old crowns. Seed yields of better than 500 lbs. per acre can be expected from this plant.

Cynara scolymus. These plants were started Feb. 2, 1959 and later transplanted

to the field. They failed to flower in 1959 and about 70% survived the winter. First flowers were noticed after May 1, 1960 and these flowers were mature by August 15. All flowers had matured by Sept. 1 and new leaves were arising from the old crowns. Seed yields of about 800 lbs. per acre can be expected from this plant. These plants winter-killed more easily than C. cardunculus.

Vernonia anthelmentica, NU 40159. Both field plantings and transplants were tried this year. Good stands were obtained in one plot and a fair stand in another plot from the field plantings. Good stands were obtained from the transplants. The seed were field planted March 19 and the transplants set out April 15. First flowers were noticed about May 15 and the plants continued to flower until late August. Seed yields were fair but could be improved by selection and management.

Cassia emarginata, NU 32922. This plant has a very hard seed coat which reduces germination of untreated seed to about 10%. The seed will germinate easily and quickly after treatment. This plant should grow well around here since some species are native to this area.

Hyptis suaveolens, NU 36396. Field plantings were a complete failure but transplants in "jiffy pots" produced a good stand. The pots were planted March 8, 1960 and transplanted April 4. First flowers appeared September 26, 1960. Seed are maturing and will be harvested after the first frost.

Trigonella foenum graecum, NU 33413. These plants were field planted Mar. 19, 1960. The seedlings emerged March 28 and about 90% germination was obtained. The plants began flowering about April 14. The seed pods were fully formed by May 26 and were harvested June 7. The four 25 foot rows produced about 0.6 lbs. of seed. This figures out to about 80.0 lbs. of seed per acre.

Helianthus maximilianii, 28353. These plants were allowed to volunteer in the area where they were grown in 1959. A fair stand was obtained and yields were fair.

Momordica balsamina, CD 36520. This planting was made May 16, 1960. A good stand was obtained. The vines were allowed to grow on the ground. First flowers were noted in late June and seed were harvested in August.

Momordica charantia, CD 38206. This species was planted May 16, 1960 and a good stand was obtained. First flowers were noticed in late June and seed were harvested in August.

Sesbania sonorae, CD 17759, P.I. 17759. These plants were field planted April 14, 1960 and very good stands were obtained. First flowers were noticed June 2 and the seed pods from these flowers were mature by July 15. The plants continued to flower until after Sept. 1. Growth was very good and by Sept. 1 the plants had reached a height of 8 feet. Seed yields of about 700 lbs. per acre can be produced from this species.

Sesbania exaltata, CD 25382. This species was planted April 4, 1960 and a very good stand was obtained. First flowers appeared about June 2 and the seed pods matured by July 15. The plants continued to flower until about Sept. 1. As of Sept. 1 the plants had grown to a height of 8 feet. This

species produced about 700 lbs. of seed per acre.

Crotalaria juncea, P.I. 248491. This planting was made May 27, 1960 and a good stand was obtained by June 8. The plants grew well and had reached a height of 7 feet by Sept. 1. First flowers appeared September 25, 1960 and a few seed pods were developing on October 25, 1960. The seed yields will be low. Considerable interest has been developed in a line developed by W. R. Cowley at Weslaco, Texas. This line is presently being evaluated and if the reports are favorable it will be released.

Hibiscus cannabinus (Kenaf). Two strains of this species were grown in 1960. Both strains were planted on April 19 and good stands were obtained. Growth was very good and the plants had reached a height of about 7 feet by Sept. 1. First flowers appeared October 3, 1960 on strain 41 and flowers appeared on strain 71 on October 13, 1960. Seed capsules were being formed as of November 7, 1960, but may be killed by frost before they mature.

Hibiscus esculentus (Okra). This planting was the La. strain and was planted May 27, 1960. A good stand was obtained. One-half of the broadcast plot was weeded and one-half not weeded. The weeded plot grew well and produced a fair crop. Considerable competition from weeds developed in the half plot not weeded. The yield in this plot was about one-half that of the weeded plot.

Limnanthes douglasii, NU 40136. The seed were planted (broadcast) April 2, 1960 and about 50% stand was obtained. First flowers were noted May 25. By June 9 all plants had died, the cause was not determined.

Lavatera trimestis, A 7344. These seed were field planted March 19, 1960 and a fair stand was obtained. The seed yield was fair.

Eryngium giganticum, NU 17315. Seed of this plant were planted three times, March 17, April 26 and May 10, 1960, and no plants were obtained from any planting. Some germination tests were tried in the laboratory but no seed could be made to germinate.

Four species of Dimorphotheca were tested at Lubbock, Texas, by J. S. Newman and Dr. J. R. Haun. The four species are: D. annua var. Rigens, D. aurantiaca, D. sinuata, and D. calendulacea. This test was a failure because of a vascular type disease very similar to aster yellow.

Depth of Planting Test.

Due to the difficulty encountered in obtaining stands of some of the plants in the new crops program, it was decided to initiate a depth of planting study at College Station in the spring of 1960. Eighteen plants were selected on the basis of difficulty of obtaining stands from field plantings. The seeds were planted at four depths - surface, 1/4 inch, 1/2 inch, and 1 inch in two replications on May 10, 1960. The surface planting consisted of dropping the seeds on the surface and running a press wheel over the seeds. The seeds were dropped with a Planet Jr. planter using the appropriate plates for the various sized seed. The plants and their best depth of planting are listed below. It must be emphasized that these results represent only one

year's data and that the date of planting was rather late for some of the plants.

Good stands obtained:

Plant	Depth in Inches
Calendula officinalis, NU 40010	1/4 inch
Lavateria trimestris, A 7344	1/4 "
Euphorbia heterophylla, CD 32935	1/2 "
Rudbeckia bicolor var. superba, CD 32975	1/4 "
Sesbania sonorae, CD 17759	1/2 "
Vernonia anthelmintica, NU 40159	1/2 "
Dimorphotheca, Coll. No. 1, CD 32946	1/4 "
Dimorphotheca, Coll. No. 2	1/4 "

Fair stands obtained:

Crotalaria intermedia, PQX 56206	1/4 "	(hard seed)
Lesquerella lasiocarpa, NU 33090	1/4 "	
Lesquerella lindheimeri, NU 33082	1/4 "	
Cassia emarginata, NU 32922	1 "	(hard seed)
Dimorphotheca aurantiaca, CD 32946	1/4 "	
Osteospermum pachypteris	1/4 "	

No seeds germinated:

Osteospermum clandestinum
Osteospermum muricatum
Osteospermum sinuatum, Coll. 1 and 2
Eryngium giganticum

Fall Planting 1959: Five genera were planted in the fall of 1959 to see how they would behave under the winter conditions at College Station.

Vernonia anthelmintica. About 2800 plants were set our in "jiffy pots" between October 15 and 28, 1959. These plants grew well and about 95% survived the transplanting operation. All plants were killed by freeze (30-31°F.) November 24, 1959.

Cynara cardunculus, CD 35743. The Cynara was field planted between Oct. 3 and 7, 1959. By Oct. 21 a good stand was obtained from this planting. Most of the plants survived the winter and the first flower buds appeared about April 15, 1960. These flowers opened about May 23rd and the seed from the first flowers were mature by July 1, 1960.

Salvia carduncea, 20035. A field planting was made October 8, 1959. The seedlings were very slow to emerge and a poor stand was obtained about November 15. Some plants survived the winter and some evidence of disease was evident in March 1960. A few plants flowered and produced seed, but all plants were dead by the end of April 1960.

Heliopsis helianthoides, CD 17301. Field plantings were made on Oct. 8 and 10, 1959. A poor stand was obtained by November 4, 1959. Some plants survived the winter and a few seed were harvested in the spring. All plants had died by the end of April 1960.

Papaver rhoeas, CD 19114. Field plantings of poppy were made October 28, 1959. Some plants survived the winter and seed were harvested.

Field Crops:

Sorghum - Five hundred sorghum accessions were grown at College Station to determine their resistance to sorghum midge, webworm, and corn earworm. However, the number of entries and the lack of available labor prevented proper screening of the material for sorghum webworm and corn earworm. The materials were planted on three dates and the following materials showed no midge damage at two of the planting dates: Sorghum vulgare, P.I.'s 175920, 232939, 180489,164416, 170798, and 248327. Sorghum sp., P.I. 219759; Sorghum verticilliflorum P.I. 208190; Sorghum dochna,P.I. 246595. Sorghums received at Chillicothe, Texas, were evaluated. P.I. 260273, Sorghum sp., was received as S. versicolor but is incorrect; this is a Eu-sorghum, not a Para-sorghum; probably subsection Arundinacea - J. C. Stephens. This is a vigorous grass sorghum that will be checked for forage production, and possibly used as a parent for forage hybrids. It shows some promise for paper pulp provided viable seed can be harvested. Seed were not ripe on Oct. 31, 1960. P.I. 247437, S. versicolor is a good seed producer and will be retained for its possible value in cyto-genetic or species relationship studies.

A large number of Sorghum vulgare accessions were crossed with cytoplasmic sterile plants at Garland, Texas to observe their behavior.

The following notes on sorghum may be of interest to sorghum breeders. These notes were taken by A. B. Maunder of Lubbock, Texas.

P.I. 221671 - Sorghum vulgare - 3-dwarf ht. (43 inches) - light yellow seed; could be source of 3-dwarf endosperm improvement.

P.I. 228318 - Sorghum vulgare - Apparently a form of Martin re-introduced to America. May be slightly modified e.g. leafiness and resistance to leaf diseases.

P.I. 236278 - Sorghum vulgare -51 inches - fairly good grain-type - similar to early kalo but later maturity. Source of breeding material.

P.I. 229848 - Sorghum vulgare - too late but may be good source of leafy 2-dwarf breeding material having bronze-yellow seed color.

P.I. 229860 - Sorghum vulgare - late maturity but good leafiness, medium sweetness (13.5%), shorter than most of the two dwarf P.I.'s (59 inches). Could possibly be used directly as a forage female if it is a "B" line.

P.I. 229871 - Sorghum vulgare - both have a good leaf and disease qualities
P.I. 229872 have a potential in forage breeding.

The following P.I.'s showed severe lodging.

P.I. 192875 - S. vulgare.

P.I. 208713 - S. vulgare.

P.I. 229835 - S. vulgare.
P
P.I. 236279 - S. vulgare highly susceptible to charcoal rot.

All of the sorghum accessions received at Lubbock will be entered in the charcoal rot screening test next year. In order to test for sterile cytoplasm all the accessions were used as female in crosses with "B" lines. This material will be used as a source of genetic variation and resistance to diseases.

The following P.I.'s did not germinate, either in the soil or in a germinator:

P.I. 208190 - S. verticilliflorum
198999 - S. plumosum
198159 - S. intrans
170790 - S. vulgare
186232 - S. vulgare

A number of Trifolium species were tested at Beaumont, Texas. Trifolium vesiculosum, P.I. 233816, seed are being increased for further evaluation. P.I.'s 234310 and 233782 are winter annuals which show some promise as pasture, hay or silage plants and will be subjected to further testing. T. rupellianium (P.I. 233411), winter-killed at 26°F. at Beaumont, Texas. T. balensae (P.I. 201209), T. campestre P.I. 249844, T. diffusum (P.I. 238362), T. globosum (P.I. 244678), T. hirtum (P.I. 249846), T. pallidum (P.I. 249868), T. petrisavii (P.I. 238368), T. subterraneum (P.I. 249848), and Trifolium sp. (P. I. 249855), did not appear to have any commercial value at Beaumont, Texas.

Sesame - None of the Sesamum indicum introductions received in 1960 appeared to be adapted to the College Station area. However, seven numbered introductions received in 1959, and four unnumbered introductions from Uganda (received by M. L. Kinman from A. K. Auckland, Nachingwea, Tanganyika, appeared to have some resistance to the new race (Race II) of Pseudomonas sesami, the causal organism of bacterial leaf spot. These are listed below:

P.I. No.	Original Source	P.I. Number	Original Source
251702	USSR	263457	Japan
251703	USSR	263458	Japan
257655	USSR	Selection H	Uganda
257656	USSR	Selection L	Uganda
		Selection P	Uganda
257658	USSR	Selection 90	Uganda

Horticultural Plants - Twenty pear introductions were propagated on rootstocks of Pyrus calleryanna by F. R. Brison and planted in the fruit tree nursery at the Horticultural Farm at College Station, Texas. All are living except two and will be evaluated at a future date.

Rubus. These plants were tested at Tyler, Texas by H. F. Morris, P.I. 250170 and P.I. 251718 were killed by 24°F. temperatures. P.I. 245563 produced no flowers or fruit buds at Tyler. P.I.'s 242369, 252063, 258464, 260886, and 254620 will be tested for cold resistance this winter.

Citrus - Plants received at Weslaco, Texas are planted and will be used for rootstock, cold-hardiness, and breeding work.

Citrullus vulgaris - P.I.'s 179660 and 179875 produced juvenile leaves typical of Cucumis melo (approx. first 6 to 8 leaves) before producing leaves which resembled those of Citrullus. These lines are being investigated further by H. C. Mohr.

Rauvolfia - Three species were received at Weslaco, Texas but only one, R. heterophylla survived. This species is growing well in spite of being frosted back last winter. It might be important to note that R. heterophylla will grow in the Rio Grande Valley, since the United States has no other source of Rauvolfia alkaloids.

Southern Pea - Thirty-two accessions were evaluated at Weslaco, Texas and notes on these are in the table on page 56. Twenty-eight accessions of Vigna sinensis were evaluated at College Station, Texas, but these notes are not available at present. A monograph has been proposed on Vigna sinensis by H. T. Blackhurst.

Okra - Ninety accessions were evaluated at Weslaco, Texas. The notes on Hibiscus esculentus are in the tables on pages 52,53, and 54.

Ornamentals - A large number of ornamentals were tested in Texas this year. Some of the more promising plants are listed below with some notes supplied by the growers.

Podocarpus gracilior, P.I. 241377 - Grows well in Rio Grande Valley, Houston and Dallas areas. Will be entered in the Dallas trade area as soon as possible.

Araucaria bidwillii, P.I. 249430 - Apparently well suited to Rio Grande Valley, Houston and Dallas areas. It will grow well on the heavy soils and will tolerate the heavy rains in the Houston area.

Eucalyptus sp., P.I. 254995 and E. bicolor, P.I. 254996 - are well adapted to the Rio Grande Valley (Weslaco).

Rapheotepis umbellata (P.I. 235434), Antholyza aethropica (241026), Grevillea banksii (P.I. 249467), Ilex franchetiana (P.I. 243267), Aloe sp. (P.I.'s 249090 and 249091), Mahonia japonica (P.I. 249423), Philadelphus lemoinii (P.I. 78098), Rhododendron japonicum (P.I. 232011), Callistemon pachyphyllus (P.I. 255036), Distylium racemosum (P.I. 236260), Jussiaea bullata (P.I. 249327), and Lagerstroemia fauieri (P.I. 237884) are well adapted to the Lower Rio Grande Valley area. Some of the above plants will be propagated and entered into the trade of this area.

Camellia olfeifera (P.I. 235500), Carex morrowi (P.I. 227627), Ternsroemia makof (P.I. 235436), Aravcaria angustifolia (P.I. 249685), Arancaria bidwillii (P.I. 249430), Podocarpus gracilior (P.I. 241377), Cercis siliquastrum

Vegetative and Fruiting Characteristics of Okra Introductions

Grown at Substation 15, Weslaco, Texas, 1960

Weslaco Station Number	Hibiscus esculentus P. I. No.	Ht. (ins)	Veg. Char.	Plant type	Leaf Shape	Spines	Pod Color	Pod Shape	Matu-rity	Productiveness
1	164169	32	Mod.	Br.	Se-Ml	2	W	S	M	P
2	164273	20-36	Ex-Mod.	Br.	Ml	1-3	W	S-C	E-L	VP-NP
3	164662	30	Ex-Mod.	Br.	Ml-So	3	LG-W	S-C	M	LP
4	164694			- No Plants Germinated -						
5	164714	15-25	Mod-Sml.	Br.-Nb.	Se	2-3	LG-W	S	M-L	LP-P
6	164925	15-36	Mod-Sml.	Br.-Nb.	Se-Ml	1-3	LG-W	S	M	LP-P
7	165055	25-33	Mod.	Br.-Nb.	Se-Ml	1-2	LG-W	S	M	P
8	165408	28-31	Ex.	Nb.	Se	2-3	LG-W	S-C	M-L	LP-P
9	165496	34	Mod.	Br.	Se	3	LG	C	M	LP-P
10	165501	30-26	Mod.	Br.-Nb.	Se-So	2-3	LG	C	M	P
11	167027	31	Mod.	Nb.	Se-Ml	2-3	LG	S-C	M-L	LP-P
12	167036	22-29	Sml-Mod.	Br.	So	1-2	LG	S-C	M	P
13	167108	14-33	Sml.	Br-Nb.	Se	1-2	LG	S-C	M-L	LP
14	167207	17	Ex.	Br.	Ml	1	LG	S-C	L	LP
15	167232	18-36	Mod.	Br-Nb.	Se	1	LG-W	C	L	LP
16	167376	14-36	Mod-Ex.	Br-Nb.	Se	1	LG-W	C	L	LP-P
17	169693			- No Plants Germinated -						
18	169694	24-29	Mod.	Br.	Se	2-3	G-LG	C	M	P
19	169695	20-32	Mod.	Br-Nb.	Se	3	LG-W	S-C	M	P
20	169696	18-33	Sml.	Br.	Se	2-3	LG	S	L	LP
21	169697	30-39	Mod.	Br-Nb.	Se	2	LG	S-C	L	LP
22	169698	30-38	Mod.	Br-Nb.	Se	2-3	LG	S-C	L	LP
23	169699	20-33	Mod.	Br-Nb.	Se	1-2	LG-W	C	M	P
24	169700	16-25	Mod-Ex.	Br.	Se-Ml	1-2	LG-W	C	M-L	LP
25	169701	36-42	Mod.	Br-Nb.	Se	1	LG	C	L	LP
26	169702	36-42	Mod-Ex.	Nb.	Se	1-2	LG	C	L	LP
27	169703	27-39	Mod-Ex.	Nb.	Se-Ml	2-3	LG	C	L	LP
28	169704	29-36	Ex.	Br-Nb.	Se	1	LG-Red	S-C	L	LP
29	169705	26-45	Mod.	Br-Nb.	Ml	1-2	LG	S-C	M-L	P
30	169706	11-36	Mod.	Br-Nb.	Se	0-1	LG-G	S-C	M	P

Weslaco Station Number	Hibiscus esculentus P. I. No.	Ht. (ins)	Veg. Char.	Plant type	Leaf Shape	Spines	Pod Color	Pod Shape	Matu-rity	Productiveness
31	169707	27-38	Mod.	Br-Nb.	Se	2	LG-W	C	L	P
32	169708	20-40	Mod.	Nb.	Se	1-2	LG-G	C	L	P
33	169709	22-42	Mod.	Br-Nb.	Se	2-3	LG	C	L	LP
34	169710	24-36	Ex.	Br.	Ml	3	LG	S-C	L	LP
35	169711	28-40	Mod.	Br-Nb	Ml	2	LG	S	M	P
36	169712	26-35	Mod.	Br-Nb.	Ml	2-3	LG	C	L	LP
37	171658	22-33	Mod.	Br-NB.	Se	3	LG	S-C	L	P
38	171659	30-44	Mod.	Br-Nb.	Se	2	LG-G	C	L	LP
39	171660	35-38	Mod.	Br-Nb.	Se	1	LG	S	E	VP
40	171662	30-35	Ex.	Br-Nb.	Ml	1	LG	C	L	LP
41	172672	22-31	Sml.	Br-Nb.	Se	1	LG-G	C	M	P
42	172673	30-34	Mod.	Br-Nb.	Se	2-3	LG-G	S-C	M	P
43	172674	14-20	Mod.	Br.	Se	2	DG	S	L	LP
44	172675			- No Plants Germinated -						
45	172676	30-36	Mod.	Br-Nb.	Se	2	LG-W	S	M	P
46	172677	32	Mod.	Br.	Se-Ml	2	--	-	M	LP
47	172678	27-31	Mod.	Br.	Se	2-3	LG-G	S-C	E-M	P
48	172679			- No Plants Germinated -						
49	172680			- No Plants Germinated -						
50	174000	26	Mod.	Br.	Se	3	LG	S-C	VE	P
51	174001	24-31	Mod.	Br.	Se-Ml	2	LG	S-C	M	P
52	174002	23-34	Mod.	Br-Nb.	So	2	LG	S	M	P
53	174003	24-35	Mod.	Br-Nb.	Se	3	LG-G	S-C	L	P
54	174005	26-38	Mod.	Br.	Se	1	LG	C	L	LP
55	174006	35	Ex.	Br.	Se	3	LG	C	M	P
56	174007	25-32	Mod.	Br.	Se	2	LG	C	E	P
57	174008	20-38	Mod.	Br.	Ml	0-1	LG	S	L	LP
58	175559			- No Plants Germinated -						
59	175560	23-30	Mod.	Br-Nb.	Se-Ml	2	LG-G	S	E	P
60	175561	20-31	Mod.	Br-Nb.	Se	1	LG-G	C	E-M	P

Weslaco Station Number	Hibiscus esculentus P. I. No.	Ht. (ins)	Veg. Char.	Plant type	Leaf Shape	Spines	Pod Color	Pod Shape	Matu-rity	Productiveness
61	175562	21-38	Mod-Ex.	Br-Nb.	Se	2-3	LG	S	M	P
62	175563	38	Mod.	Br-Nb.	Se	2	LG-G	C	L	LP
63	175564	35	Mod.	Br.	Se	2-3	LG	C	E	P
64	175565	32-40	Mod-Ex.	Br.	Se	2-3	LG	S-C	M-L	P
65	175566	27-30	Mod-Ex.	Br-NB.	Se	1	LG-G	C	M-L	P
66	175567	27-34	Mod.	Br-Nb.	Se	2	G	S-C	E-M	P
67	175568	31-41	Ex.	Br-Nb.	Se-Ml	2-3	LG-G	C	L	P
68	176382	32-36	Mod.	Nb.	Se	1	G	C	L	P
69	176383	28-37	Mod.	Nb.	Se	2	LG	S-C	M	P
70	176384	33-37	Mod.	Br.	Se	1	G	S-C	M	LP
71	176385	33-38	Mod.	Nb.	Se	2-3	LG	C	M-L	P
72	176386	33-37	Mod.	Nb.	Se	2-3	G	C	VE-M	P
73	176387	33-36	Mod.	Br-Nb.	Se	2	LG-G	S-C	M	P
74	176388	34-31	Mod.	Nb.	Se	2-3	G	C	VE-M	P
75	176389	30-37	Mod.	Br-Nb.	Se	1	LG-G	S	M-L	P
76	176849	31-35	Mod.	Nb.	Se-Ml	2	LG-G	S-C	M	P
77	176850	32-37	Mod.	Br-Nb.	Ml-So	2	LG	S-C	M	LP
78	176851	25-38	Mod.	Nb.	Se	1	LG	S	L	P
79	176852	25-33	Mod.	Nb.	Se-Ml	0-1	LG-W	S-C	E-M	P
80	177234	34-39	Mod.	Nb.	Se	2	LG-G	S-C	E-M	P
81	177235	29-35	Mod.	Br-Nb.	Se	2	LG	C	M	P
82	177236	27-36	Mod.	Br-Nb.	Se	2-3	LG	S-C	E-M	P
83	177238	28-40	Mod.	Br-Nb.	Se	1-2	LG	S-C	E-M	P
84	177239	29-35	Mod.	Br-Nb.	Ml-So	2	LG-W	S	M	P
85	177240	33-39	Mod.	Br.	Se	2	LG	S-C	M-L	LP
86	248939	20-33	Mod.	Br.	Ml	1-2	LG	S-C	L	P
87	240064			- No Plants Germinated -						
88	249630	16-33	Mod.	Br.	Se	1	LG	C	E	P
89	250126	20-30	Mod-Ex.	Br.	Se	1	G	C	M-L	P
90	251500	8-24	Mod-Ex.	Br-Nb.	Se	2-3	DG	S	E-M	P

LEGEND:

Vegetative Characteristics:

Sml - Small
Mod - Moderate
Ex - Excessive

Plant Type:

Br - Branched
Nb - Single Central Stem

Leaf Shape:

Se - Serreated
Ml - Mod. Lobed
So - Solid

Spines:

0 - None
1 - Few
2 - Mod.
3 - Heavy

Pod Color:

W - White
LG - Light Green
G - Green
DG - Dark Green

Pod Shape:

S - Straight
C - Curved

Maturity:

VE - Very Early
E - Early
M - Medium
L - Late

Productiveness:

VE - Very Productive
P - Productive
LP - Light Production
NP - No Production

Southern Pea (*Vigna sinensis*)
Plant Introduction Observation Trial, Spring 1960

P. I. Number	Plant Type	Immature Pod Color	Pod Maturity	Seed Size	Comments
162699	V	-	-	-	No pod set
162924	V	Light yellow	V	M	-
163142	V	Light Yellow	V	M	-
163143	V	-	V	M	Bad mosaic infection
164298	V	-	-	-	Bad mosaic infection No pod set
164337	V	-	V	S	Bad mosaic infection
164979	SV	Light yellow	M	L	-
165486	SV	Light yellow	E	L	-
165493	V	Light yellow	M	M	-
165941	V	Light pink	L	M	-
170844	V	Creamy white	L	M	-
170849	-	-	-	-	No seed germination
170850	V	Light yellow	L	L	-
170856	SV	Light yellow	M	L	-
170857	V	Light yellow	L	L	Mixed seed
170859	SV	Light yellow	M	L	Plants killed by root rot by end of season
170871	SV	Light yellow	M	M	-
170872	SV	Light yellow	M	M	-
171891	-	-	-	-	No seed germination
173164	V	Light yellow	V	M	-
173165	B	Light yellow	V	S	Plants killed by root rot by end of season
173827	V	Light yellow	V	S	Extremely long vines
174411	SV	-	V	S	Extremely long vines
175327	V	Light yellow	V	S	Extremely long vines
175331	V	Light yellow	V	S	Bad mosaic infection
175332	B&SV	Light yellow	M	M	-
175959	V	Light yellow	V	M	Extremely long vines
175962	SV	Light yellow	M	M	-
175963	V	Light yellow	V	L	Extremely long vines
176796	V	Light yellow	V	S	Extremely long vines
177101	V	Light yellow	V	M	Extremely long vines
177578	V	Light yellow	V	S	Extremely long vines

LEGEND AND COMMENTS:

Plant Type:

B - Bush
SV - Semi-vining
V - Vining

Immature Pod Color:

This pod color is recorded at the time the pod-peas would be ready to shell-out for processing purposes.

Dry Pod Maturity:

E - Early
M - Midseason
L - Late
V - Very Late

Seed Size:

L - Large
M - Medium
S - Small

The majority of the plant introductions planted in this test indicated low yielding potential, long running, sparcely podded vines which generally produced a very late pod crop.

All the dry seed that was harvested of each plant introduction will be returned to the plant introduction station for further propagation in other areas of production. We could not find any economic production potential in any of the entries.

R. T. Correa
Assistant Horticulturist

(P.I. 206951), Catalypa ovata (P.I. 228027), Betula platyphylla var. japonica (P.I. 235128), Lagerstroemia fauieri (P.I. 237884), Buddleia curvifolia (P.I. 237851) and Paulorunia fortunei (P.I. 248159) are well adapted to the Dallas area. Some of these plants will probably enter the ornamental trade in this area in the future.

Work Planned for Next Year: Work at College Station will be concentrated on plants for industrial use during 1960-61. We will continue some activity on other crops that show some promise. Fall plantings have been made of Lesquerella (15 species), Vernonia anthelmintica, Limnanthes douglasii, Brassica napus (2 var.) and Brassica campestris. If seed can be obtained, a fall planting of Crambe abyssinica will be made. Several selections from Crotalaria spectabilis and C. intermedia will be tested in the spring of 1961.

Plants Released:
Premier Sideoats Grama grass was released this year. This variety was developed from collections made in Northern Mexico in 1953 by the Texas Agricultural Experiment Station.

Dr. Whiteley indicated that attempts would be made to increase the planting of Crambe to 200 acres by 1962. Dr. Lewis raised the question of who will finance the development of new crops through the "awkward" stage that exists between basic and applied research on the one hand and well-established commercial production on the other. Dr. Killinger suggested grants from various sources, for financing this "pilot stage" of development.

Dr. Lewis read a letter from Dr. R. G. Reeves, former S-9 Technical Committee member in Texas, now teaching on a Fulbright grant at the University of Alexandria in Egypt.

VIRGINIA

In the absence of Dr. T. J. Smith, S-9 representative in Virginia, W. R. Langford reported that all peanut introductions were screened at the Virginia Tidewater Research Station for resistance to southern corn rootworm, rootknot nematodes, and thrips. Two accessions, P.I. 149636 and 158838, showed considerable resistance to rootknot nematode.

An introduction of Cucumis melo, P.I. 182953, has shown complete immunity to powdery mildew in Virginia. It has been used to develop new lines of cantaloupe that are highly resistant to this disease. One or more of these should be available to commercial growers in the near future.

Other introductions being evaluated in Virginia are apples, spinach, alfalfa, and several ornamental species.

TOUR

During the afternoon of December 1 the committee visited greenhouses and field plots on the LSU campus to observe research studies in progress with

Dioscorea, Kenaf, Crotalaria, Cajanus, castorbeans, okra, sweet potato, plums, apples, and several other species. A tour was made to Idlewild Farm of the Louisiana Experiment Station where domestic fruit stocks collected near the Gulf Coast are maintained. At the evening meal this Committee were the guests of the LSU Horticultural Club.

SOIL CONSERVATION SERVICE - W. C. Young

The Soil Conservation Service, in its plant materials testing work at its centers in the Southeast, receives the majority of its accessions through PI sources. Two centers have operated during the past year; one at Arcadia, Florida, and one at Americus, Georgia. By next year, an additional center at Coffeeville, Mississippi will be in operation.

The more promising new items that have come to the attention of our technicians during the past year follow. They were not necessarily received last year, but have become interesting enough for us to make more extended tests and observations of them.

Arachis glabrata	- 2 strains - numbers of both lacking but both probably PI's - One received from Dr. Ritchey at Gainesville about 1947, and another from Griffin. Both look promising as a perennial legume in sod - especially in Florida where field tests show it to compete readily with Pangola. Establishment and distribution are present problems.
Brachiaria dyctoneura	- A lost PI number. Plant makes an excellent sod but is not as easily established vegetatively as Pangola. Some seed production may make it possible through this means. Several other Brachiarias are promising in Florida.
Centrosema pubescens P.I. 199739	- A perennial leguminous vine but not cold-hardy. May be of value in lower peninsular Florida and Puerto Rico as a legume in sod grass.
Desmodium distortum P.I. 219840	- A large tickclover - woody in native. Froze back to ground in 1959 in Florida, but resprouted. A perennial of this type would be excellent for quail food production.
Desmodium ovalifolium	- Promising as ground cover in coffee; hardy at Arcadia but not producing seed so far. May be useful as a legume in sod grasses.
Digitaria valida P.I. 196342	- A Pangola-like grass, perennial and producing viable seed at Arcadia, Florida.
Echinochloa crusgalli var. frumentacea	- A rogue out of Setaria italica, PI 196293. A duck millet of very high seed yielding potential. For use as a wild life food plant.

Indigofera pseudotinctoria - A prostrate type semi-shrub, salt tolerant and having potential for beach erosion control. Seedlings being produced for testing at Americus, Georgia.

Panicum maximum var. trichoglume - A perennial Guineagrass at Arcadia, Florida. Very leafy of fine texture and abundant production.

Quercus castaneafolia var. incana - Probably PI but no records. A large, rapid growing oak producing large crops of large acorns valuable both as a potential timber, ornamental, and shade tree.

Stylosanthes sundaica P.I. 187098 - An annual legume, well adapted at Arcadia, Florida. Producing good crops of seed, volunteering well, and withstanding heavy mowing. Fits nicely into short sod grasses.

Stipa hyalina P.I. 197967 - A perennial grass, green through 12 months. Makes most of its growth in the spring. It is adapted at Arcadia and Americus but requires high fertility levels.

Trifolium spp. - Several new clover species have grown well and compared favorably with ones in common usage. They may fit into our needs for reseeding clovers on some sites and in some combinations where present ones are not now suited. All are annuals and all have reseeded well one or more years at Americus. A table of yields attached indicates the value of some of them. The particular species and numbers of the better ones follow:

Trifolium angustifolium	- P.I. 206758
T. globosum	- P.I. 168636
T. menenghianium	- P.I. 238156
T. pallidum	- P.I. 249868
T. nigrescens	- P.I. 206926
T. vesiculosum-early	- P.I. 234310
T. vesiculosum-mid-season	- P.I. 233816
T. vesiculosum-late	- P.I. 233782

Winter Legumes
Yield in Pounds Dry Weight Per Acre
Americus Plant Materials Center
Americus, Georgia

	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Average
Crimson Clover	1863	1042	1266	681	1213
Ga. Sub Clover	1932	681	1344	708	1266
Serradella, P.I. 189184	6298	3657	4265	7442	5416
Trifolium angustifolium, AM-89	5381	3369	3476	4002	4057
T. pallidum, P.I. 249868	762	-	1316	1271	1116
T. nigrescens, P.I. 206926	1572	2114	2373	1634	1923
T. vesiculosum, P.I. 234310	5345	4112	3140	5264	4465
T. vesiculosum, P.I. 233816	6697	4026	3285	4710	4680
Vicia lutea, AM-85	4565	3930	3212	2768	3619
V. narbonensis, P.I. 206927	0	227	314	345	222
Warrior Vetch	3432	3068	2677	3539	3177
			LSD	.05	1072
				.01	1444

Fertilized - 1000 lbs. 0-14-14 prior to planting.

Planted - November 5, 1959

Clipped and weighed at full or just past full flower, May 3 - 25.

One clipping.

RESEARCH ON PETROSELINIC ACID AND RECENT DEVELOPMENTS ON OILSEEDS - F. G. Dollear, Southern Regional Research Laboratory, New Orleans 19, Louisiana

It is indeed a pleasure to have the opportunity of addressing the Technical Committee on Regional Project S-9 "New Plants." I am also interested in learning of activities of the Southern Agricultural Experiment Stations in this field. Your program chairman has suggested that a brief review of the history and program of the Southern Utilization Research and Development Division would be appropriate since newer members of your committee may not be familiar with our activities in utilization research on farm commodities.

In 1938 Congress authorized construction of four regional research laboratories in the United States covering four geographic areas - East, West, North, and South. These laboratories were set up for the purpose of carrying out a program of research on utilization of farm commodities to increase markets and find uses which would eliminate surpluses facing the nation at that time. The Southern Regional Research Laboratory was located in New Orleans, Louisiana near Lake Pontchartrain and was ready for occupancy in 1941. Initially the Southern Regional Research Laboratory was assigned three commodities - cotton, peanuts, and sweetpotatoes. Cotton included seed as well as lint. A number of other commodities have since been added to the research program of what is now known as the Southern Utilization Research and Development Division which includes field stations in a number of locations in the South.

The Division now consists of five laboratories designated as; Food Crops, Cotton Mechanical, Cotton Chemical, Engineering and Development, and Industrial Crops together with their associated Field Stations, and two Pioneering Research Groups. Fruits and vegetables are under investigation at field stations in Winter Haven, Florida and Weslaco, Texas, as well as in New Orleans. We are very proud of the pilot plant facility which has recently been completed and is in operation for research and development of sweetpotato flakes, a new product which should be a convenience food and increase markets for sweetpotatoes. Our Food Crops Laboratory, which has as other field stations a Food Fermentation Laboratory at Raleigh, N. C. and a Sugarcane Products Laboratory at Houma, Louisiana, also works on new or improved products from rice and sugarcane.

Much work of the Southern Division has been with cotton lint and the present program is based primarily on improvement of the properties and qualities of cotton in fabrics for both industrial and clothing use. We have at the Southern Division complete pilot plant facilities for carrying out all operations needed from opening of the bale of cotton down through the weaving into finished cloth and also facilities for treating the cloth to provide various chemical modifications or additive finishes to impart specific desired properties to the fabric. The textile laboratory is under supervision of the Cotton Mechanical Laboratory where they are concerned with the measurement of mechanical and physical properties of cotton fibers, improvement in the processing of cotton, and the relation of fabric to fiber properties. Included are investigations concerned with microscopical structure of cotton fibers and fabrics.

In the Cotton Chemical Laboratory research is carried out on modification

of cotton textiles by adding various chemical materials or reacting them with the cellulose to impart properties which will improve their acceptability in textile materials. Of particular importance at the present time is the development of improved processes for the treatment of cotton to produce easier-care fabrics for wash-and-wear clothing. Also of interest is research on the treatment of cotton to decrease its resistance to deterioration by fungi and by heat. The spectroscopic properties of cellulose, the physical-chemical properties of cotton and cotton products, and changes induced by exposure of cotton products to high energy radiation from a cobalt-60 source are also studied.

The Engineering and Development Laboratory is responsible for the scaling up processes from laboratory to bench and pilot plant scale, for designing equipment suitable for pilot plant investigations, for determination of the feasibility of commercialization of processes developed in the laboratory, and for cost analyses and product evaluation. They also have responsibility for the development of improved machinery for the processing of Southern-grown agricultural commodities.

There are two Pioneering Research Groups in the Southern Division, one dealing with Plant Fibers, the other with Seed Proteins. In the Plant Fiber Pioneering Research Laboratory, fundamental studies of super molecular structure properties of plant fibers such as crystal modification of cellulose, crystallinity and crystallite size, and other related properties are carried out. The Seed Protein Pioneering Research Laboratory emphasizes basic research on the proteins of oilseeds and includes particularly those proteins which function as enzymes and are responsible for growth and metabolism.

The Industrial Crops Laboratory deals with oilseed crops and the naval stores products at a field station in Olustee, Florida. Pine gum, turpentine and rosin investigations are carried out at Olustee. In the Industrial Crops Laboratory, cottonseed, peanuts, tung, and oilseeds containing petroselinic acid are the basic commodities. Under a program in the Edible Oils Investigations, modifications of glyceride structure of cottonseed oil or peanut oil are made to develop new products which might have application particularly in the food field. These include development of cocoa butter-like or confectioners' fats having improved properties, the development of new-type fats which might be suitable coating material for food products to conserve quality and reduce moisture loss, and improvements in the processing of edible oils, particularly basic studies of the effect of hydrogenation on composition and properties which could lead to improved hydrogenated products such as margarine, shortening, etc. Acetoglycerides, a research development of this group, were recently approved for use in food products up to the 5% level, and this should provide new markets for vegetable oils.

The Oilseed Meals Investigations is responsible for research on improving the quality of cottonseed oil and meal and on research investigations on peanuts. Cooperation of the Agricultural Experiment Stations or State Universities has been important in these investigations particularly with regard to experimental feeding of cottonseed meals and their improvement as feed for poultry and swine.

Research on composition of our Southern Agricultural commodities is carried

out primarily in the Analytical Methods Investigations and Physical Chemical Investigations of fats and oils represent an important part of the research in the Industrial Crops Laboratory.

New crops research together with research on development of new or improved products from tung oil is located in the Industrial Oils Investigations. Our tung research at present is concentrated primarily on the development of exterior fire-retardant coatings for military or civilian application. We have made considerable progress and are hopeful that we will come up with something meeting requirements for military use. This could be a big boost for tung oil which is in surplus only because imports up to 26 million pounds per year are permitted. However, imports likely are needed to balance out the supply and make the oil more readily available on a continuing basis since the crop is subject to freeze-outs periodically.

I have a couple of booklets which I would like to pass out to any of you who would like more information on the work of the Southern Utilization Research and Development Division, its organization and program, and on the utilization research program of the Agricultural Research Service which includes the other Divisions in other geographic areas of the country. The latter is entitled "New Uses for Farm Products" and gives you not only an indication of the program but also some of the accomplishments of utilization research over the past nearly 20 years of existence. It is a pleasure to point out to you that the value which can be attributed to utilization research far exceeds the cost involved in support of research of this kind by the taxpayer.

When the Regional Laboratories were established, there were surpluses of farm commodities. Then as the program developed and as economic conditions changed, including activities during World War II and subsequently, we went through a period when production was not much more than adequate to take care of our domestic needs and foreign commitments for food, feed and fiber. During a considerable part of this period some of the program of the utilization research was directed toward items of specific interest to defense, and other research was directed toward improvements in food products. Basically, we are at a point today where surpluses again are really serious for a number of commodities. One of the approaches which has received attention recently aimed at the alleviation of surpluses is the development of replacement crops which could be grown on land now being used for crops which are surplus to our needs for domestic consumption and export. Such crops should be noncompetitive, particularly in the areas of food and of fiber for textiles. With this objective in mind, about 4 years ago a screening program was set up to study the wide variety of plants available which are not currently economic crops. The screening of new plants is centralized in the Northern Utilization Research and Development Division and I am going to show you a few slides and report on progress basically from some of Dr. Ivan Wolff's presentations on this subject before various groups. The potential appears to be very great. Our best example of a plant introduction which has been very successful is perhaps that of the soybean which has had tremendous growth, has provided high quality feed for livestock, has provided food products for human consumption, both oil and protein, and has provided industrial products from the oil as well. While another oilseed may never have the rapid expansion of the soybean, there is still great potential in the oilseed field. More and more fats and oils are being used in industrial

products and oilseeds are one of the important areas for new crops research.

On the first slide are shown opportunities for discovery of plants having economic crop value. Less than 1% of the quarter million known species of higher plants are now used for crop purposes and of these only a handful have major economic importance. Efforts to improve these economic crops by the development of new varieties, greater yielding varieties, and strains resistant to insect diseases and pests has been intensive and has been very successful. However, in the past, attempts to bring out entirely new materials or new crops has been quite limited and has not received the attention that we feel it deserves. New crops should be considered, not only as replacements for those in surplus, but also on the basis of the development of crops that will prove valuable and profitable in their own rights for the farmer to grow, permitting diversification when desired; crops to satisfy present or anticipated industrial needs and crops that may supply for our country needed strategic or critical raw materials. The job of screening crop potential of new plants is a cooperative one and as shown in the next slide chemical screening and development is done in the USDA Utilization Research Divisions. The procurement and crop evaluation is done in USDA's Farm Research. Cooperation is needed in these efforts from the State Agricultural Experiment Stations either individually or through cooperative regional projects, particularly in the increasing of sample size to get more raw material for chemical development research, in the adaptation of plants to cultural conditions in climates in various regions in which they might be grown and in the dissemination of information on successful performance of a new crop in a particular agricultural area.

Objectives of the new crops screening program are shown in the next slide screening seed oils to discover new fatty acids for industrial use and fiber plants as new pulp sources for paper, board, and cellophane. Screening for seed gums which might be used as paper additives and thickeners, screening for proteins for industrial or more nutritious feed use, and lastly, minor constituents which might have value for use in pharmaceutical or other industries. In discussing these I will concentrate more on the seed oils because this has been further developed and is currently of greatest interest to us here in the Southern Region. Data on the seed analysis performed in the screening program are shown in the next slide for the first 1700 samples representing a considerable diversity of materials in the plant kingdom. Of the seeds analyzed, there were 532 with 20% or more oil, 102 with 40% or more protein, 256 with 60% or more oil plus protein, and three-fourths having no starch. The latter is important because we have sufficient starchy plant materials available from economic crops. The oil and protein combination is arbitrarily based upon the productivity of the soybean.

The next slide will show you some of the unusual types of materials which have been found in the screening program. These include fatty acids having oxygen functions such as epoxy acids; fatty acids of unusual chain length, C-10, C-20, and erucic acid; fatty acids having unusual unsaturation such as petroselinic acid, conjugated trienes; and combinations of oxygen functions and unsaturation, for example, hydroxy conjugated dienes. Based upon the screening work and the discovery of interesting fatty acids having industrial potential, some of which were new, some of which were new only in the variety of plant in which they were discovered, and taking into consideration the crop potential estimated for these different types of plants

by the Crops Research Division, each of the Utilization Research Divisions was assigned a specific type of oilseed crop for preliminary development research. The Northern Division at Peoria, Illinois, was assigned erucic acid type oils. These have 22 carbon atoms and so are longer in chain length than the more common 18-carbon atom acids and have one double bond in the 13 position. The systematic name of erucic acid is therefore 13 docosenoic acid. Such acids are found in seeds of the mustard family, rape being the most common. The latter is used in Europe to a considerable extent but has never been commercialized to any degree in this country. Having the double bond in this unusual position and greater chain length offers the opportunity of producing new types of industrial products. A hydroxy conjugated diene acid from Dimorphotheca called dimorphecolic acid was assigned to the Western Division. This unusual acid has an hydroxyl group on the 9-carbon atom and conjugated unsaturation of carbon atoms 10 and 12. Hence, it is somewhat of a cross between castor and tung fatty acids and should find uses in plastics, plasticizers, coatings, lubricants, surfactants, etc. The epoxy acids assigned to the Eastern Division are those derived from such plants as Vernonia anthelmintica or iron weed. The presence of the epoxy group is interesting because epoxy compounds have been found to be important as additives for polyvinyl chloride plastics in stabilizing them against deterioration by light, heat, and ageing. Also the epoxy group may be used in a number of reactions such as with amines or fatty acids to form new plastic or coating compositions having useful properties. Petroselinic acid, assigned to the Southern Division, is similar to oleic but has its double bond in the 6,7 rather than the 9,10 position. This offers us an opportunity to prepare chemical derivatives other than those which might be derived from our normal oils of commerce. The most promising petroselinic acid containing plant for economic development, according to crops research prediction, is the wild carrot or Queen-Anne's-Lace. I'm passing around some samples of seed of this plant collected from the wild. A number of other plants of Umbelliferae also contain petroselinic acid in their triglyceride. Included are fennel, parsnip, chervil, and dill. The current source which we are using for obtaining sufficient petroselinic acid for developmental research is parsley seed. All these plants have in addition to the petroselinic acid containing glycerides, essential oils, aromatic in nature, as minor constituents sometimes in considerable quantity. These we are not researching currently. We have been able to develop a procedure for purifying petroselinic acid from these oils involving a single crystallization of the fatty acids from alcohol or petroleum ether at -25° C. to obtain a petroselinic acid concentrate of about 96% purity. A further purification by urea segregation raises the purity of this material to 99.4%.

In our development research, our principal approaches are the conversion of petroselinic acid to derivatives which we feel may have potential industrial value and which are different from those which could be obtained from presently available vegetable oils or animal fats. For example, we can split the molecule at the double bond and are working on processes for the preparation of such 12-carbon derivatives as lauric acid, lauryl alcohol, and laurylamine, all of which should have potential because of their surface activity and are now obtainable only from imported coconut oil; and 6-carbon derivatives such as adipic acid, hydroxycaproic acid, and amino caproic acid or the lactone and lactam derivable from the latter two.

We are also looking at modifications of the carboxyl end of the chain and are in the process of preparing such derivatives such as petroselino nitrile

and the amines which can be produced from it by reduction. These may be quite similar to derivatives prepared from oleic acid. On the other hand, we have hopes that they will have properties different which will make them industrially useful and noncompetitive. Certainly the surface active properties may be altered by the position of unsaturation being different in these molecules since there is a greater chance for the double bond influencing the properties, it being closer to the carboxyl group and in a position where ring closure is more feasible.

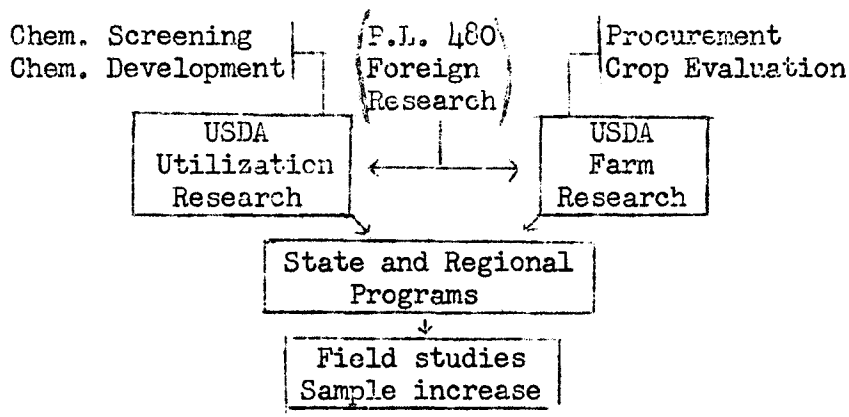
(Slide 1) NEW CROP OPPORTUNITY

250,000 Botanical species
80-90 produce crops in U.S. worth over $1,000,000
Only 200-300 used for commercial crops

Past efforts largely agronomic and new varieties.

Chemical composition of plant kingdom largely unknown.

(Slide 2) NEW CROPS PROGRAM ORGANIZATION



(Slide 3) NEW CROPS SCREENING
(Objectives)

Seed Oils → New Fatty Acids For Industry

Fiber Plants → New Pulp Sources For Paper, Board, Cellophane

Seed Gums → Paper Additives, Thickeners

Proteins → Better Industrial Proteins
More Nutritious Feed Proteins

Minor Constituents → High Value Products Sought

(Slide 4) SEED ANALYSES

SAMPLES (1778)
119 families, 545 genera, 1010 species

RESULTS
532 with 20% or more oil
102 with 40% or more protein
256 with 60% or more oil plus protein
3/4 have no starch

(Slide 5) SEED OIL COMPOSITION

Sought	Found
1. Oxygen functions	Epoxy acids
2. Unusual chain length	C-10 acids
	C-20 acids
	Erucic acid
3. Unusual unsaturation	Petroselinic acid
	Conjugated trienes
4. Combination of 1 and 3	Hydroxy, conjugated dienes

(Slide 6) PRELIMINARY DEVELOPMENT UTILIZATION RESEARCH on SEED OILS

Utilization Division	Oil Type
Northern, Peoria, Ill.	Erucic acid
Western, Albany, Cal.	Hydroxy, conjugated diene
Eastern, Philadelphia	Epoxy acid
Southern, New Orleans	Petroselinic acid

Dr. Lewis emphasized the fact that chemists are now showing objective chemical possibilities of certain plants and are challenging the fields of culture and breeding.

REPORT OF THE NEW CROPS RESEARCH BRANCH - J. L. Creech

This report to the 1960 Meeting of the Technical Committee, S-9, Project, emphasizes accomplishments of the New Crops Research Branch during the year ending June 30, 1960 and research plans for the 1960-61 fiscal year as they relate to our cooperative program with the Southern Regional Project, S-9.

The need to intensify our research on the search for new plant sources of industrial products which may be the basis of new crops as replacements for those in excess has resulted in a major departure from the more familiar lines of research in the New Crops Research Branch. This new program

(discussed at length later in this report) has to do with the procurement and crop evaluation of species of plants which have as their basis of potential use, valuable constituents discovered through utilization screening.

As the research on new crops moves into the more advanced areas of evaluation of specific plants, the facets of cooperation become highly involved and may include the New Crops Research Branch, the four Utilization Divisions, and various State Experiment Stations. These may be cooperating directly or through the Regional Programs. It is, therefore, important to consider means of coordinating and providing leadership to these efforts that will attain the objectives and benefit all parties concerned.

Of the 19 current line projects covering the World Plant Resources Investigations - CR i1 (formerly Plant Introduction Section), 10 have mainly to do with this new crops area. In the New Crops Investigations - CR i2 (formerly Crop Development Section), only 3 of the 14 current lines of work reflect new crops. This is based on the fact that the activities in the basic botanical fields must precede the crop development research. A greater activity in crop development will evolve as new leads are developed through botanical and cooperative utilization screening research.

Presently, there are 10 line projects in the New Crops Research Branch which relate to the S-9 Regional Cooperative Program. These are as follows:

World Plant Resources Investigations (CR i1)

CR i1-11 Introduction, sanitary inspection, and inventory of fruit and vegetable breeding stocks for the U. S.

CR i2-12 Introduction, sanitary inspection, and inventory of field crops breeding stocks for the U. S.

CR i2-13 Introduction, sanitary inspection, and inventory of specialty crop breeding stocks for the U. S.

New Crops Investigations (CR i2)

CR i2-1 Evaluation and maintenance of fruit and nut introductions

CR i2-5 Evaluation and maintenance of vegetable introductions

CR i2-7 Evaluation and maintenance of forage and range plant introductions

CR i2-8 Evaluation and maintenance of cereal crops introductions

CR i2-9 Evaluation and maintenance of cotton and other fiber plant introductions

CR i2-10 Evaluation, development, maintenance, and placement of drug, beverage, cellulose (except bamboo), and other promising crops for industry

CR i2-15 Evaluation and development of new or little known introduced ornamental plants

Seven of the above projects (in CR i2) have been reviewed this year and accepted by the Executive Committee of S-9 as supporting the regional objectives. The remaining three (in CRil) are now being submitted to the Administrative Adviser for acceptance.

The reports of the New Crops Research Branch to the Regional Projects will be based on progress under these projects plus additional reports on other lines of work which may reflect interest to the Southern Region.

World Plant Resources Investigations

At the 1959 meeting of the National Coordinating Committee, it was agreed "that upon the basis of suggestions from the Regional Committees, the New Crops Research Branch formulate future proposals for exploration for consideration of the National Committee." It was further understood that similar approval would not be required for domestic exploration. Accordingly, we have reviewed all pending requests from the respective regions and find certain problems arising which must be considered in future planning of explorations.

1. Annual funds for plant introduction have increased very little since the inception of the regional cooperative program. Foreign travel is becoming more expensive, and in many areas more restrictive.

2. Numerous plant requests have been received during the past three years, but many have originated with individual research workers, rather than with groups who may have mutual interests. Obviously, we should give priority support to active research programs. The diversity of crop requests as illustrated by the following list.

Field Crops	Vegetables	Fruits	Oilseeds	Specialty
Alfalfa	Artichokes	Avocado	Castorbeans*	Camellias
Andropogoneae*	Brassicas	Citrus	Flax	Guar*
Corn	Capsicums*	Hardy fruits	Peanuts*	Hardy ornamentals
Cotton*	Celery*	Raspberries	Sesame*	Kenaf*
Crotalarias*	Potatoes	Strawberries*	Soybeans*	Shelter belt ornamentals
Digitarias*	Sweet potatoes*			
Lupines*	Tomatoes*			
Paspalums*	Watermelon*			
Sorghum*				
Subtropical legumes*				
Sudangrasses				

*Requested by S-9 representatives.

3. Program leaders in the Branch and the Regional Coordinators are concerned over a backlog of plant genera not being used currently by research workers. As a result, a memorandum was prepared for the various Research Branches of the CRD and the Regional Coordinators. Its' purpose was to solicit a listing of those genera or species most urgently needed by federal and state workers, and therefore, a partial guide for planning

future explorations. On this basis, more attention would fall to group rather than individual interests.

4. The greatest problem to date, in relation to domestic exploration, is obtaining reports and preparing inventories. Procedures and policy have been defined in both regional and national committee meetings as well as through correspondence. Some improvement has been made in the past year, but more is needed. Progress reports are called for periodically at Beltsville and we need data from the regions on the same basis.

Foreign Exploration

A review was made of requests submitted from S-9 representatives during the period 1956-59. Generally this region has received proportionately as many, if not more, introductions as have the other three New Crops' regional projects NE-9, NC-7, and W-6. Explorations in Angola and the Belgian Congo in 1958, southern and central Europe in 1959, and the South American trip in 1959 for peanuts resulted in considerable germ plasm for the southern region. Requests for certain forage grass and legume species, as well as for sweet potatoes, have been submitted on more than one occasion, but special explorations in the potential areas have not as yet appeared practical. Many of these requests are being given consideration through correspondence and regular exchange activities.

As soon as prospective trips become a reality, the various state committeemen are notified through the regional coordinator's office. This was done early in 1960 when we learned on rather short notice that Dr. Jack Harlan of Oklahoma would be collecting in Afghanistan, Iran, India, and Pakistan with major emphasis on cereal grains and forages. Requests originating through S-9 were brought to Dr. Harlan's attention, but in view of the diversified nature and the short time for him to make preliminary plans, it is doubtful that many requests will be satisfied. Shipments are already being received from him and that material of regional interest will be handled in accordance with the usual distribution practices. (CR il-12)

From October 1960 through February 1961, New Crops staff members will be in South Africa attempting to collect samples of Dimorphotheca and related genera having promising oilseed potential. Again, this trip was brought to the attention of the S-9 representatives well in advance and requests were received for practically all states under this project. These requests, along with those from the other regions, are quite extensive and the explorers will not be in position to take care of all of them. Collections will be made as opportunity affords and distribution made in accordance with the established policies of program leaders in the New Crops Research Branch. (CR il-11, CR il-12, CR il-13)

A second phase of collecting peanut breeding stocks is now being planned for early 1961. The material collected by Dr. W. C. Gregory, North Carolina State College in 1959 is considered most valuable and many accessions are being increased and distributed to interested workers. Other areas in Bolivia, Brazil, Paraguay, and Peru will be covered in 1961 insofar as time and funds are available. (CR il-13)

In connection with the New Crops - Longwood ornamentals program, 920 collections have been received from Belgium, Germany, and the Netherlands as a result of Frederick G. Meyer's trip during the summer and fall 1959. A third trip is planned for northern Japan by Dr. Creech during the summer 1961, with special emphasis to be placed on hardy species. The Regional Coordinator will be informed of the final plans and contact the State Committeemen regarding ornamentals for research. (CR il-13)

Domestic Exploration

The first proposal for domestic collecting in the southern region was approved and supported by the New Crops Research Branch for the 1959-60 season. Under supervision of the Louisiana Experiment Station, horticulturists should benefit from the native and naturalized fruit stocks to be found in the Gulf Coast areas. The first segment of such collections included 35 Prunus spp. Surveys have resulted in other interesting trees being tagged for future collections such as 40 ft. pear trees, large-fruited seedling peaches, and a 70-year old chestnut tree. Support for this project is being continued in 1960-61. (CR il-11)

Support is being given during the present fiscal year to the following domestic collecting in other regions; wild blueberries in New England (NE-9); small fruits in Alaska (NC-7); and Astragalus, Danthonia, and Lupinus in Rocky Mountain states as well as wild hops from the Pacific northwest. (CRil-11)

All domestic proposals must have regional approval before consideration by the New Crops Research Branch. Continued support for this work will be based on broad regional needs rather than for one of two stations. Close liaison must be maintained by the Coordinator with the respective crop subcommittees where such exist. Reports should be submitted annually with field notes pertinent to inventory records and subsequent assignments of P. I. numbers.

Plant Resources Research

The usefulness of a plant as a new industrial crop will depend upon: (1) its chemical make-up, which governs the extent to which major and minor constituents, as principle raw materials or by-products are suited for specific end-uses; (2) profitable production by the farmer; and, (3) economical processing by industry.

New crops screening in ARS is concerned with the evaluation of plant materials with these criteria in mind. Information pertinent to the first and third criteria is obtained through successively more detailed chemical studies - beginning with objective screening of many species and progressing to property characterization research on selected plants of promising potential. These aspects of the cooperative program are primarily the responsibility of Utilization Research.

Farm Research, through the Crop Research Division, has the problems associated with evaluating potential new crops with respect to the second criterion. Agricultural engineering and economics are concerned to some

extent with all three criteria, but mostly in the later developmental phases of new crops research.

This report concerns the preliminary screening work of the New Crops Research Branch in searching for those most promising leads which merit follow-up research in the form of intensive crop development studies.

Areas of Interest

Botanical investigation, evaluation, and sample collecting are being undertaken to provide selected plant material for chemical and biological testing in the following areas of end-use interest:

1. Seed oils and proteins for industrial and feed uses.

2. Annual crop sources of fibers for paper and dissolving pulps.

3. Waxes and gums for industrial uses.

4. Constituents of interest in insect control measures.

5. Anti-cancer compounds.

6. Alkaloids affecting the cardiovascular system.

The Industrial Crops Laboratory of the Northern Utilization Research and Development Division is doing the chemical screening in the first three categories listed above. Supplying selected plant materials for the work of this laboratory represents a major segment of the botanical program of the New Crops Research Branch. Over the past 3 years, about 4,000 analytical samples have been furnished NU chemists. This cooperative work is discussed in more detail below.

Cooperative arrangements with the Pesticides Chemicals Research Branch, Entomology Research Division, provides for the biological testing of plant materials for use in insecticides, repellants, and attractants. This is now a very small program within the New Crops Research Branch, but with the current concern over chemical residues in food and feed products, it may merit increased attention in the near future.

A new screening program in cooperation with the National Cancer Institute has recently been activated. Some 5,000 plant extracts will be tested each year for cancer control activity. Crude extracts are initially tested on mice against 3 types of tumors. Those which pass this screen successfully are then chemically fractionated for isolation and identification of the active principle. So far about 1% of all samples tested have passed the initial screen. For this particular program, where there is almost a total lack of knowledge of what to look for, and where to look for it, across-the-board screening by species and by plant parts is indicated.

Cooperation continues with the National Heart Institute in searching for plant alkaloids which affect the cardiovascular system. Those having a depressing action on blood pressure and pulse rate are of special interest.

Potential New Oilseeds

Results coming out of the screening program for new oilseeds are highly promising and indicate that this is one of the more fertile areas of new crops research. The chemists have discovered that a number of species have seed oils of unusual fatty acid composition. As might be expected, most of these are species which have never been deliberately grown for their seed. Some of the most interesting unusual oils fall into chemically related groups and are found in botanically related plants. Evaluation research, both crop and chemical, is underway on these groups of oils and some of their source species, since they typify raw materials which may be derived from a large number of temperate zone plants, will have a high degree of carry-over value for other oils in the same group. While such chemical work is in progress it is highly desirable that crop evaluation research be undertaken to determine which species within each group have the greatest crop potential.

1. Hydroxydienoid oils. The genus *Dimorphotheca* and related genera of the Compositae have been previously reported on and are now subjects of intensive preliminary screening and crop development studies. Two plant explorers of the New Crops Research Branch are devoting 5 months to thorough study and collecting of these genera in their native habitats of South Africa. This field work which began in October 1960, should result in the selection of species, and biotypes within species, having the highest hydroxydienoid oil values combined with desirable agronomic characteristics.

2. Epoxy oils. *Vernonia anthelmintica*, Indian Ironweed, of the Compositae, has also been discussed before, but it is still by far the most promising source of oil of this type. Previous preliminary crop evaluation experiments with this species were all based on a single plant introduction. Results were not encouraging due to the apparent short-day requirements. A more recent introduction, planted for the first time this year, gave a much more encouraging performance. Plantings at Lincoln, Nebraska; Raleigh, North Carolina; and College Station, Texas; were all in bloom the second week in July. The plants appeared very uniform, 2 to 2-1/2 feet tall, heavily flowered, and insect and disease free.

3. Erucic acid oils. *Crambe abyssinica*, *Brassica napus*, *B. campestris*, *Eruca sativa*, and *Lumaria annua* have all been under preliminary increase and evaluation trials in the NC-7 Industrial Crops Project and in Montana, Nebraska, North Carolina, and Texas. These species are among the best in total oil yield, in erucic acid content of the oil, and in agronomic potential. The New Crops Research Branch in cooperation with the Montana State Experiment Station is providing for more intensive screening within these and other promising genera of the mustard family.

4. Petroselinic acid oils. The Southern Utilization Research and Development Division is pursuing developmental studies on oils of this type. As with erucic acid oils, there are a number of members of one family (Umbelliferae) which are good potential sources of petroselinic acid oils. So far, funds have not been available for crop development work on this group.

5. Hydroxy acid oils. A very promising lead was established when the chemists discovered that some species of the genus Lesquerella (Cruciferae) have as much as 50-60% of a hydroxy acid in their seed oils. Lesquerella is a genus of annuals, biennials, and perennials native to the U. S. and Mexico. About one-third of the 50-60 species are annuals. This lead has been followed up by an intensive collecting program to thoroughly sample the genus. Field work in Tennessee, Oklahoma, Texas, and New Mexico during the past spring and early summer has resulted in seed collections of most of the desirable annual and biennial lesquerellas. Some of this material will be grown for increase and preliminary evaluation this fall at cooperating state experiment stations. All of it will be in experimental plantings at a number of locations beginning next spring. Chemical analyses are being run on all samples and preliminary indications are that we have here a very promising new crops lead.

6. Miscellaneous oils of interest.

   a. Limanthes douglasii is a small (10-14 inches) annual herb native to northern coastal California and adjacent Oregon. The seed oil of this species is unusual in being composed of at least 95% of acids having chain-lengths greater than the common C-18. Preliminary studies, mainly in North Carolina, indicate that this is a heavy seed producer. These studies also indicate problem areas in stand establishment and seed shattering. This species needs to be tested under a wider range of conditions in regions with cool, moist summers.

   b. Cuphea llavea of the Lythraceae is a sub-shrubby perennial which flowers profusely the first season from seed. Oil from this species contains over 80% of 10-carbon acids. Because of limitations of seed availability, this species has not been under evaluation planting. It and related species have high priority in our collecting objectives.

Seed Gum Sources

Seeds analyzed for oil and protein are also screened for water soluble gums if low combined values for oil and protein are obtained. Results have been very encouraging. Gum content has ranged as high as 34% and at least 10 species so far have had more than 20% gum in their seeds. Guar, a well known seed gum producer, has 20-23%. Species of Crotalaria of the legume family appear to offer the most promise and are under preliminary evaluation plantings this year for the first time.

Annual Sources of Pulp Fibers

Nearly 600 samples have been analyzed for potential sources of pulp. Joint evaluations by botanists and chemists indicate that about 10% of those screened merit additional testing - requiring small plantings to provide sufficient material for actual small-scale pulping studies. This increase work has been largely accomplished at cooperating state experiment stations

(Nebraska, North Carolina, Texas). Species such as kenaf, sun hemp, sesbania, and okra, which are considered as having outstanding potential as pulp sources, are in more advanced stages of evaluation. The Cotton and Cordage Fibers Research, CR, has had the responsibility for crop development work on these potential pulp crops because early in the program interest was centered on kenaf, sun hemp, and hemp - all species of interest as sources of cordage fibers and being worked on by CCFRB. Now developmental work on new pulp crops is being placed with the New Crops Research Branch.

We can report the successful negotiation of a P. L. 480 grant with Turkey to provide for collecting by the University of Ankara to feed into these several screening programs. In addition, this 5-year intensive effort will permit us to obtain wild stocks in Turkey needed in crop breeding programs. Because of the interest in the Southern Region in forage crop breeding, this will offer an opportunity to obtain collections of wild species as additional sources of genetic variability.

New Crop Investigations

Fruits and Nuts (CR i2-1)

In response to recommendations of the National Coordinating Committee on New Crops to ARS, the New Crops Research Branch assumed leadership in developing documented inventories of asexually propagated germ plasm collections. Initially this is to include fruits and tree nuts. Forms for the documentation of clonal collections were processed and sent to the 4 Regional Coordinators in October 1959, who were to handle the program for their respective regions.

The New Crops Research Branch has set up the mechanics for assembling and compiling the data when it is received. It is our opinion that the availability of this information will constitute a valuable working tool for fruit research workers all over the United States and the completion of an extensive collection. Fruit breeding is a long-term process and the knowledge of available breeding stocks should be basic to these undertakings.

We can report that 21 locations in the United States have provided partial or complete inventories, mainly Federal stations and State stations in the Western, North Central, and Southern Regions.

Indexing of stone fruit introductions at Glenn Dale has been speeded up by the use of budded virus-free indicator stocks. There are more than 500 accessions to be indexed and it is estimated that this number will be reduced by 50 accessions per year beginning in the fall of 1961. It is planned to restrict introductions to about the number of accessions that are released each year.

Approximately 490 peach introductions are being maintained and evaluated at Chico, California, as well as 257 plum introductions and 237 introductions of cherries. These are of value for direct utilization, for breeding programs, and as rootstocks.

An evaluation has been made of our collection of about 74 walnut introductions. This work has been completed and will appear in print during the coming year.

Among the minor fruits of promise, the Actinidia or Chinese gooseberry is receiving attention. Clonal introductions are under test at our Chico station and seedling progenies of early introductions are being evaluated.

Fruit and Nut Evaluations:

Flowering, pollination, and seed development studies of the Chinese jujube, Zizyphus jujuba, carried out at the U. S. Plant Introduction Station, Chico, California, were completed in 1959. These studies have shown that although the blossoming season of the jujube is very long, the life of individual flowers is quite short and many flowers apparently are not pollinated during their receptive period. Cross-fertilization appears to be necessary for the development of viable seed kernels and many of the aborted kernels observed among jujube seed apparently are the result of self-fertilization. As a result, we now know that where either fruit or viable seed is desired, it is advisable that more than one clone be planted of any of the jujube varieties. (CR i2-4)

Vegetable Evaluations:

Cantaloupe breeders in Texas and California have found a new source of resistance to powdery and downy mildew in a South African cantaloupe introduction of Cucumis melo, P.I. 234607. This melon is of value for immediate use in cantaloupe breeding programs. It is also a valuable addition to the small germ plasm collection held in reserve to test for resistance to new races of the two mildews as they appear. (CRi2-5) (with S-9 and W-6)

A strain of the cultivated Spanish peanut was introduced into the United States from Argentina in 1937, P.I. 121070. During extensive tests in Georgia it came to be known as 'Argentine' because of its origin. The U.S. Department of Agriculture and the Georgia Agricultural Experiment Stations report that after 15 years of carefully conducted tests under a wide variety of soil and seasonal conditions 'Argentine' has exhibited an overall average yield increase of 10.3 percent over 'Dixie Spanish.' It compares equally well with 'Dixie Spanish' in other qualities.

The dwarf okra variety, 'Gold Coast,' was released in 1959 by the Louisiana Agricultural Experiment Station. The new variety combines uniform dwarfness with completely round pods free from spines and is drought resistant. These characteristics were derived from P. I. 186972which was introduced from the African Gold Coast in 1950. (CR i2-5) (with S-9)

Six hundred pepper introductions, Capsicum frutescens, were screened for resistance to bacterial leaf spot at the Southern Regional Plant Introduction Station, Experiment, Georgia. Five of these, P.I.'s 163184, 163189, 163193, 164471, and 164677, were found to be resistant. These five accessions are now a part of a pepper-breeding program at the Georgia Agricultural Experiment Station which has as its objective the development of good, leaf spot resistant, commercial pepper varieties. (CR i2-5) (with S-9)

A new multiple disease resistant tomato variety, 'Indian River,' has been

released by the Florida Agricultural Experiment Station. 'Indian River' is highly resistant to graywall, Fusarium wilt, and grayleaf spot. It also has shown resistance to leaf mold, early blight, blossom-end rot, crease stem, and bunching. The new variety is a cross between 'Manalucie' and 'Manalee.' It owes its disease resistance to P.I. 79532, Lycopersicon pimpinellifolium, and P.I. 126445, L. hirsutum. (CRi2-5)

Ornamental Plant Evaluations:

Abelia 'Dwarf Purple,' a second selection from the cross A. grandiflora x A. schumanni, made at the U.S. Plant Introduction Station, Glenn Dale, Maryland, in 1931, has a compact form reaching to a height of 30 inches.

Outstanding ornamental features are its rose-purple flowers, reddish-green foliage and the red color of its new shoots. Southern nurserymen who have grown the semi-hardy, heat-loving 'Dwarf Purple' like it and are propagating it for distribution. (CR i2-15) (with S-9)

Four of ninety-one Japanese chrysanthemum varieties widely tested in the United States have shown commercial promise. The Montana, Oklahoma, and Minnesota Agricultural Experiment Stations have found the 'Kinkazan,' P.I. 231099, worthy of release for use in northern United States gardens. This variety produces a vigorous, sturdy stemmed, attractive, green-leaved plant which reaches a height of two and a width of three feet and bears a profusion of large golden-yellow flowers in the garden before frost. Montana and Texas Agricultural Experiment Stations recommend the Japanese chrysanthemum varieties 'Meikyo,' P.I. 236059, and 'Hagoromo,' P.I. 236043, as suitable for pot culture in their states and the Georgia and Oklahoma Agricultural Experiment Stations consider the early flowering, yellow 'Kinkazan,' P.I. 231099, worthy of wide commercial trial. (CR i2-15) (with NC-7, S-9, and W-6)

The 'Bradford' pear, P.I. 209840, a seedling selection of the wild Chinese pear, Pyrus calleryana, has been under evaluation in the permanent test planting of the U.S. Plant Introduction Station, Glenn Dale, Maryland, for the past 15 years. This vigorous, densely headed, medium-sized tree, attractive in the early spring when its myriad of spur-borne, small, white flowers are in full bloom, is easily trained for use as street or lawn tree. Good foliage characteristics in the summer and autumn are additional attributes. The 'Bradford' pear is recommended as an ornamental shade tree throughout the southern and eastern United States. (CR i2-15)

New Crop Development (not directly associated with the Regional Program):

The long term 100 acre bamboo experiment for cultural and harvesting research at Camden, Alabama, described in last year's Annual Report was planted. This experiment includes 14 acres designed to compare yields of pine, poplar, and bamboo. (CR i2-16)

Studies in progress at the U.S. Plant Introduction Station, Savannah, Georgia, designed to develop optimal nursery conditions for large scale multiplication of bamboo have established relative production rates of several types of starting stock. Several nutrient requirements for bamboo nurseries have been determined for the Savannah, Georgia, location. A total of 57 shipments of

bamboo material or planting stocks for test planting or other experimental uses were made from the U.S. Plant Introduction Stations. These shipments involved 24,360 plants or rhizomes. (CRi2-16)

Dioscorea species represent the best source to date for the precursors of steroidal drugs, including cortisone. Current commercial usage of steroids in ethical drugs is fourth in significance in the United States exceeded only by antibiotics, vitamins, and tranquilizers. As yet this plant is not cultivated commercially in the United States. Research conducted in conjunction with the vegetative multiplication of 27 clones containing 10 percent or more sapogenin and 72 clones with 8 to 10 percent sapogenin selected from the Mexican accessions mentioned in last year's report, revealed a photoperiodic response that will be valuable in future propagation. Under natural conditions partial or complete dormancy of vines limits vegetative multiplication during an extended period. It was found that an interrupted night providing light from 12 a.m. to 2 a.m. induced plants to produce new vegetative growth rather than flowers and/or a dormant condition. Another partial solution to the major problem of vegetative propagation was discovered in the use of "rosette" growth which rooted much more rapidly than the typical leaf-bud cuttings. Significant results were obtained on field spacing of plants, comparison of selected collections in field plots, and growth response to several soils. (CR i2-11)

Certain effects of plant age and harvest time on yield and sapogenin content of Dioscorea roots have been determined. Additional work has corroborated previous findings on variation in sapogenin content resulting from grinding or maceration of roots. (CR i2-11)

The Federal Experiment Station, Mayaguez, Puerto Rico, continued research on the characterization of differences in Tephrosia vogelii collections as a basis for further breeding work to develop higher rotenone yielding lines for test in the southern part of the United States. Three strains of seed differing in rotenoid content under Puerto Rican conditions were grown at four locations in the United States to compare the effects of soil, site, and other environmental conditions on growth and rotenoid content. Final evaluation of the data is now in progress. In greenhouse nutrition experiments at Clemson College, Clemson, South Carolina, nutrient deficiencies were produced and described for the macronutrients. (CR i2-10)(with S-9) (with PR i-a)

Extensive individual plant selections with desirable growth characteristics were made at the U.S. Plant Introduction Station, Chico, California, from test plantings of four species of Dimorphotheca under development as a source of dimorphecolic acid. These selections will be used in further selection and breeding, and in other crop development experiments at the U.S. Plant Introduction Stations at Savannah, Georgia; and Chico, California. (CR i2-10)

Publications Reported - Fiscal Year 1959-60
New Crops Research Branch

A. World Plant Resources Investigations

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"Plant Exploration Report for Safflower and Miscellaneous Oilseeds - Near East and Mediterranean Countries," P. F. Knowles, Aug. 15, 1959 (Processed).

"Plant Explorations - Ornamentals in Italy, Southern France, Spain, Portugal, England, and Scotland," F. G. Meyer, ARS 34-9, Oct. 1959.

"Seed Protein Sources - Amino Acid Composition and Total Protein Content of Various Plant Seeds," C. R. Smith, M. C. Shekleton, I. A. Wolff, and Quentin Jones, Economic Botany. Apr. - June 1959.

"Progress in New Crops Research," I. A. Wolff and Quentin Jones, Chemurgic Digest. July 1959.

"Search for New Industrial Oils. I. Selected Oils from 24 Plant Families," F. R. Earle, E. H. Melvin, L. H. Mason, C. H. Van Etten, I. A. Wolff, and Quentin Jones, Jour. Amer. Oil Chem. Soc. July 1959.

"Steroidal Sapogenins LV. Survey of Plants for Steroidal Sapogenins and Other Constituents," Monroe E. Wall, C. S. Fenske, J. W. Garvin, J. J. Willaman, Quentin Jones, Bernice G. Schubert, and H. S. Gentry, Jour. Amer. Pharm. Assoc. Vol. XLVIII, No. 12. Dec. 1959.

"Report on New Crops Research," Quentin Jones (Contr. by R. E. Perdue, Jr., and L. O. Williams), Nov. 9, 1959 (Processed).

"Using Germ Plasm for New Products," Quentin Jones and I. A. Wolff, Presentation at A.A.A.S. Symposium on Germ Plasm, Chicago. Dec. 1959.

"Search for New Industrial Oils. II. Oils with High Iodine Values," F. R. Earle, T. A. McGuire, Jean Mallan, M. O. Bagby, I. A. Wolff, and Quentin Jones, Jour. Amer. Oil Chem. Soc. Jan. 1960.

"A New Crop in the Making?" Quentin Jones and I. A. Wolff, Chemurgic Digest, Jan. 1960.

"Amino Acid Composition of 27 Selected Meals," C. H. Van Etten, R. W. Miller, I. A. Wolff, and Quentin Jones, Jour. Amer. Soc. Chem. (Publication pending).

"Alkaloid Bearing Plants and Their Contained Alkaloids," J. J. Willaman and B. G. Schubert, U.S.D.A. Tech. Bull. (Publication pending).

"Handbook of Drug and Condiment Plants," L. O. Williams, U.S.D.A. Agr. Handbook No. 172 (In press).

"The Somatic Chromosomes of Rubeckia and Related Genera of the Compositae," R. E. Perdue, Jr., Contributions from Gray Herbarium. March 1959.

"A Natural Hybrid in the Ditrichaceae," F. J. Hermann and A. L. Andrews, The Bryologist. June 1959.

"Range Extensions of Bryophytes in Eastern United States," F. J. Hermann, The Bryologist. June 1959.

"Some Aspects of the Taxonomy of American Dioscoreas," B. G. Schubert, Paper presented at 9th Inter. Bot. Congress, Montreal, Canada. Aug. 1959.

"The Portuguese Sundew," F. G. Meyer, Nat'l. Hort. Magazine. Oct. 1959.

"Guttiferae from Middle America," L. O. Williams, Tropical Woods. Oct. 1959.

"Arundo donax - Source of Musical Reeds and Industrial Cellulose," R. E. Perdue, Jr., Economic Botany. Oct. - Dec. 1958.

"The Cyperaceae of Wyoming," F. J. Hermann, Contrib. Flora of Wyoming No. 30. Oct. 1959.

"Brazilian Cork," L. O. Williams and C. O. Erlanson, Qualitas Plantarum et Materise Vegetabiles, Vol. VI. Nov. 1959.

"Taxonomic Treatment of the Genus Agoseris, Compositae," Quentin Jones, Illustrated Flora of the Pacific States, Vol. IV. Nov. 1959.

"Contribution Toward a Flora of Nevada, Scrophulariaceae," Gabriel Edwin, CR 54-9. Nov. 1959 (Processed)

"Two New Varieties of Carex from Mexico," F. J. Hermann, Brittonia. Jan. 1960.

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"Vetches of the United States, Naturalized and Cultivated," F. J. Hermann, U.S.D.A. Agr. Handbook No. 168 (In press).

"Contribution Toward a Flora of Nevada, Nyctaginaceae," C. F. Reed, CR-9-60. Jan. 1960(Processed).

B. New Crops Investigations

"Apples, Pears, and Grapes, Introductions Now Available, U. S. Plant Introduction Station, Glenn Dale, Maryland," H. F. Winters. Spring 1960. (Multilith)

"Flowering, Pollination and Seed Development Studies of the Chinese Jujube," William L. Ackerman. (To be published in Proc. Am. Soc. Hort. Sci. 1960).

"Effects of Certain Plant Growth Regulators Upon Cold Hardiness of Lychees," M. H. Gaskins, Proc. Fla. State Hort. Soc. 1959.

"Bacterial Spot Resistance of Introduced Peppers," Grover Sowell, Jr., Phytopathology 50(Abstr.). 1960.

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"Seed Inventory of Available Field Crop Introductions with Notes on the Regional Program for Their Evaluation (Section I, II, III)," Max M. Hoover, Nov. 1959. (Multilith)

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"Cape Marigold: Is It a New Crop in the Making?", Quentin Jones and Ivan A. Wolff, Chemurgic Digest, Jan. 1960.

"A Few Minutes with Longley, Darwin and Camellias," E. C. Tourje, Camellian 11(2): 8-10. 1960.

"White Lantana Introduced for Landscaping," Joseph S. Folkner, Prog. Agric. in Arizona, winter 1960.

"Notice to Nurserymen Relative to the Naming and Release of the Bradford Ornamental Pear," U.S. Dept. Agric., Jan. 1960.

"Magnolia wilsonii," John L. Creech, Nat. Hort. Mag. 39(2). 1960

"The Role of Plant Introductions in the Improvement of Ornamental Plants," John L. Creech, (Paper presented at A.I.B.S. 1959 Meeting). (Multilith).

"Perpetuation and Protection of Germ Plasm as Seeds," Edwin James, (To be published in Proc. of A.A.A.S. 1959).

STATE EXPERIMENT STATIONS DIVISION, ARS - W. C. Kennard

As you know, I have the opportunity to participate in the "new crops" projects in all four of the research regions and I would like to give you a few highlights from the most recent meetings of the other three regional projects.

NE-9 (Meeting held at Geneva, N. Y., August 16-17, 1960)

1. Administrative Adviser A. J. Heinicke retired during the year and has been replaced by Dr. D. W. Barton, new Director of the Geneva Station.

2. There is continued interest in a repository or repositories for asexually propagated plants, but very little progress has been made so far in compiling the needed crop inventories.

3. Domestic explorations were proposed for collection of blueberries, apricots, cherries, elderberries, and old varieties of open pollinated corn.

NC-7 (Meeting held at Ames, Iowa, September 15-16, 1960)

1. The group voted to place increased emphasis on "new crops" as suggested by the Committee of Nine. They plan effort in addition to the allotment of $5,000 for support of utilization research which I reported to you last year.

2. Construction of a greenhouse is planned at the regional station to facilitate disease screening of introductions.

3. The group decided that support of the North Dakota project on the preservation of certain physiologic races of flax rust will terminate June 30, 1961. This will free some regional research funds which can be used to support other NC-7 activities.

4. Slow progress has been made on the inventory of fruits and nuts for possible inclusion in a repository for asexually propagated plants. The regional coordinator plans to make a special effort to complete this inventory.

W-6 (Meeting held at Davis, California, October 26-27, 1960)

1. Co-administrative Adviser R. W. Hodgson retired during the year and was replaced by Dean F. N. Briggs of Davis.

2. Many of the state representatives were not present due tp a lack of travel funds but interest continues in the project.

3. Research underway at the Western Utilization Research and Development Division, Albany, concerned with new crops was discussed. One of the most promising is Dimorphotheca, the Cape Marigold of South Africa. If the crop can be produced economically, the oil would sell readily because of its unusual chemical configuration.

4. The regional project outline will be revised.

One recommendation stated by the Committee of Nine at the April 4-5, 1960 meeting is pertinent to the suggested revision of the S-9 project outline:

> "When regional project outlines are revised, the technical committee should review the continuing contributing project outlines as well as the new or revised contributing projects for conformance to the revised regional project. The new or revised contributing project outlines and a list of the continuing contributing projects accepted by the technical committee should be attached to the revised regional project outline. The Manual of Procedures for Cooperative Regional Research should be amended to include these recommendations."

PLANS AND SUGGESTIONS FOR THE FUTURE OF REGIONAL PROJECT S-9 -
Director R. D. Lewis, Administrative Adviser

Dr. Lewis stated that he is now Administrative Adviser to seven regional research projects. The Southern Directors have agreed to relieve him of this responsibility to certain projects, but he will continue as Administrative Adviser to S-9 "New Plants" project.

Dr. Lewis commended the S-9 committee members for the fine reports presented at this meeting and for the apparent interest in the new plants project that many committee members have developed among plant scientists in their states. However, he indicated that committee members in some states may not be fully aware of their responsibilities. In reviewing the duties of an S-9 technical committee member Dr. Lewis cited a memorandum that he wrote to the Southern Directors calling their attention to the S-9 committee meeting and urging that each state be represented at the meeting. Following is the text of Dr. Lewis' memorandum:

> "As indicated to you on November 14, during our meeting in Washington, I have authorized a meeting of the Technical Committee for the S-9, 'New Plants' to be held at Louisiana State University, Baton Rouge, Louisiana, on December 1 and 2.
>
> "As we believe each state has a direct interest in the plant materials made available for evaluation and use through this cooperative regional project, we trust each state station and federal agency concerned will be represented.
>
> "The S-9 project is organized to serve the interest of practically all groups of plant scientists in each of the stations. Consequently, we believe that each state should be represented by a committee member, who encouraged by his director, can and does accept the opportunity and responsibility of keeping all interested plant scientists in his station informed of the availability and methods of evaluation and utilization and plant materials which are being introduced through the Southern Regional Plant Introduction Station at Experiment, Georgia. This station in turn has access to all plant materials introduced into the other regions through the New Crops Research Division programs of ARS.
>
> "The Committee member from each station can serve effectively as a liaison and local coordinator of new plants activities. We feel that the S-9 project is not as fully effective as it should be where the state representative is concerned only with his personal needs and use of the available plant materials.
>
> "At the December meeting emphasis will again be directed toward location and evaluation (chemical, physical as well as agronomic and horticultural) of crops for possible industrial use. Some significant advances can be reported as a result of the cooperative screening programs of New Crops Research and Utilization Division of ARS in cooperation with the State Stations.

"May I urge again that your representative in the S-9 Committee work closely with all the other interested plant scientists at your station."

Dr. Lewis suggested, as a helpful device in creating interest in new plants, that all plant scientists concerned at each station attend an annual review of S-9 activities in the state.

In summarizing a survey resulting from a request that the Southern Directors review Regional Research Projects, Dr. Lewis reported that S-9 is one of the few regional projects with a central headquarters. He stated that the present central facilities are adequate, but that $10,000 or more additional funds are needed to expand its services. He suggested a trend toward greater emphasis on the evaluation of new crops for industrial uses. Greater concentration of projects at fewer locations was suggested. It is not necessary for every state to work with all crops.

The Committee of Nine at the April 4-5, 1960, meeting made the following recommendation:

"It is recommended that the NC-7, NE-9, S-9, and W-6 technical committees review the purpose, function, and work programs of the four regional new crops projects in view of the expanded facilities for national seed storage and to increase emphasis on the search for entirely new crops to replace present crops advantageously and for crops for industrial use."

According to Dr. Lewis, this means that we need to revise the S-9 project statement. Objectives should be changed to put more effort on new crops for industrial uses. This will involve considerable revision of the procedure. He suggested this be on the schedule of activity of the Executive Committee during 1961. He urged that consideration be given to methods of financing the development of new crops through the "awkward" stage, including pilot plant evaluation.

Dr. Lewis suggested that a representative from the Utilization Research and Development Divisions of ARS be added to the S-9 technical committee.

Dr. Lewis stated that the July or August issue of Chemurgic Digest has a good article on problems in development of crops for industrial utilization. He also commented on a discussion of opportunities for "Research on Industrial Utilization of Agricultural Products" by Dr. Paul F. Sharp, Director of the California Agricultural Experiment Station. Dr. Sharp's speech delivered at the meeting of American Association of Land-Grant Colleges and State Universities, November, 1960, follows:

"Agricultural surpluses have resulted from research and development programs designed to reduce costs and increase agricultural production. From the standpoint of national interest, we should be thankful that we have a surplus and not a deficit of food.

"As a background for considering the problem of industrial utilization of excess agricultural products, we should consider the factors

which contributed to the production of this excess. These comprise (1) the release of land formerly used to feed horses, (2) the lowered calorific need of the laboring population of the country due to less physical labor, shorter work hours and days, etc., and substitution of push-button labor jobs, (3) the expansion in the use of fertilizers, (4) increase in irrigated land, and (5) the use of pesticides. Most of the gains in production from these categories have now been made although additional gains can be made, particularly by the increase in irrigated land and the use of fertilizers.

"Forces are at work which are rapidly decreasing land available to agriculture. These are the expansion of urban areas, construction of broad highways, the submergence of good agricultural land as a result of dam construction forcing agriculture from good to poor land, the expansion of recreational facilities in the form of golf courses, parks, picnic grounds, and the like, to say nothing of the phenomenal increase in the number of mouths to feed from this shrinking agricultural land. These two opposing forces are converging, and at some time they may meet. These points should be kept in mind because at some time in the future major surpluses may be unavailable for industrial use because our agricultural land will be needed for food production unless we import from such areas as South America. Industry would not want to build a long term industrial use program on raw material which in the future would be unavailable at a price which industry could afford to pay.

"We in research feel a little perturbed at a statement that is often made that we have always been able to feed our people and, therefore, we always will. Such statements disregard the factors which have enabled us to accomplish this almost unprecedented feat, but since the factors which enabled us to increase production are currently in operation, the only solution for the distant future, it seems to me, is to come up with something new and unknown at present which would enable an appreciable increase in agricultural production on our shrinking farm acres.

"One of the principal economic factors often disregarded is that rarely can industrial uses of agricultural products afford to pay human food prices for the raw material. This creates an economic force which completely eliminates many of the proposals that are made for new ways of utilizing agricultural products.

"In order to make the gains anticipated in some proposals, we must for the time being at least relegate to second place new uses of agricultural by-products unless the new uses serve to greatly increase the income to the farmer. And since the size of the human stomach is limited, the development of a new food product merely results in the substitution of one food for another with no significant gain unless the new use for domestic food brings about an upgrading of the diet, such as feeding the wheat to the livestock and then eating the livestock in place of eating the wheat more directly in the form of cereal products.

"One of the main considerations in establishing an industrial plant is the availability of large volumes of raw material at a given point, available to that plant cheaply and in sufficient quantities to keep the plant in operation most of the year. Many suggestions do not meet this criteria.

"It seems to me that, basically, the industrial use of a crop would develop around its chemical constituents, the main ones being, of course, proteins, fats, and carbohydrates (cellulose, starch, and sugar). An industrial operation would select the cheapest and best source of these basic materials which would meet the needs for industrial use.

"The research programs of most of the Agricultural Experiment Stations in the country have been built around production problems and the staff is production trained and orientated and does not have the background or facilities for an all out attack on developing new industrial uses for agricultural products. In certain instances, however, Agricultural Experiment Stations could develop basic information relative to the main components of some of the agricultural crops, which information might form the basis for the development of an industrial use. The main contribution which the Agricultural Experiment Stations could make to this effort would be the breeding and selection of plants to increase yields and the proportion of some desirable component which has or could have industrial use. The Agricultural Experiment Stations could make a contribution by solving production problems of substitute crops which in themselves would have industrial uses.

"The regional laboratories of the Agricultural Research Service and commercial companies through staff, facilities, and background offer a good chance of finding and developing new industrial uses, with the Agricultural Experiment Stations backing up their effort by solving production problems to increase yields to meet the needs of the industrial uses developed.

"Extensive and varied chemical industries have been built on rather simple abundant raw materials such as salt, oil, and natural gas. Our most abundant raw agricultural material is cellulose. Advantage has been taken of its physical properties for such industries as paper, cotton products, sacks, rope, etc., but little effort has been made to make use of cellulose, starch, and sugar as a starting raw material for chemical transformation into other needed products.

"In the area of annual crop research, with the exception of cotton, cellulose is usually considered an incidental plant component, and cultural efforts, such as breeding, fertilization, irrigation, etc., have been directed toward an increase in such components as protein, fats and sugars. No one really knows what plant breeders could do in developing a cellulose crop plant. Trees and bamboo are apparently about the best available at the present time.

"Perhaps one of the most highly developed, varied uses of an agricultural raw product is the corn products industry build around its gluten

and starch components. Many of these products find a human food market such as starch itself, glucose syrup, food grade lactic acid. In addition, starch finds industrial use as a paste, glue, and for paper coating.

"A group of some thirty interested people in the twelve western states met at Berkeley about a year ago to explore the possibilities of contributions which the Agricultural Experiment Stations of the western states could make to the industrial utilization of agricultural products.

"The following general possibilities were considered:

1. Developing more knowledge of the various constituents of farm crops.

    a. By taking the principal crops and identifying the various constituents which may be present. This might best be done by Agricultural Research Service and its regional laboratories.

    b. Searching through an array of plants to find high contents of specific constituents known to have or expected to provide specific industrial uses. This could be done by Agricultural Research Service, industry, or the Agricultural Experiment Stations.

2. Separation of farm products by mechanical or chemical means to skim off a valuable industrial component or constituent without seriously lessening the value of the remainder for its present use. This could be done by the Agricultural Experiment Stations and the Agricultural Research Service.

3. Selection or breeding of crops for components potentially suitable for known industrial uses or projected uses. The Agricultural Experiment Stations could be particularly helpful here.

4. Finding and improving new crops which might be grown as alternatives to crops in surplus with emphasis on non-food use. Safflower and castor beans are examples. The Agricultural Experiment Stations could be helpful here.

5. Utilization of land now producing surplus crops for economical production of livestock. The Agricultural Experiment Stations helpful here.

6. Using protein, fats, carbohydrates (cellulose, starch, sugar) as a raw material for a chemical industry based on chemical transformations or by industrial fermentations. Industry, Agricultural Research Service, and Agricultural Experiment Stations.

7. Save for the seven lean years which we would face if atomic war should be thrust upon us by storing a reserve at strategic locations of highly nutritious foods of good keeping quality.

This could be done by private individuals and the federal government.

8. Improvement in present industrial products made from agricultural products to counteract efforts to develop substitutes from non-agricultural sources. The Agricultural Research Service and the Agricultural Experiment Stations helpful here.

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"In more detail the following suggestions were made:

Cellulose

1. Developing annual crops for production of cellulose -- use of trees primarily for production of structural materials. It is recognized that not all of this material available from forest production is presently harvested and used and that comparative costs are vital in governing the source of the raw material.

2. Agricultural products as a source of raw material for a complete line of construction materials.

3. Means of making plant fiber impervious to moisture.

4. Means of handling and transporting farm crops in bulk at low cost as a factor in assembling large quantities of material for industrial use.

5. Controlled decomposition of cellulose by breaking down through irradiation.

6. Conversion of low-grade cellulose to other materials by micro-biological organisms.

7. Harvesting crops from acreage by micro-biological animals to convert cellulose to other compounds.

8. Development of cushioning material from vegetable matter - substitute for rubber.

9. Use of vegetable fiber embedded in plastic or other material to provide strength.

10. Consideration of plants heretofore considered as weeds, as possible sources of large quantities of cellulose (high yield).

11. Cellulose from farm crops for paper and packaging material.

12. Additional products from fermentation processes.

13. Development of markets for full use of potential production from forest lands held in small tracts usually related to ranching or farming operations.

14. Use of lignin as structural material.

15. As inexpensive chemical for waterproofing adobe bricks.

16. Insulation material from farm crops - need to get lower density without reducing strength and fire-proofness.

17. Conversion of cellulose to other carbon compounds through heat and high pressure.

18. Disposable blankets and clothing for special uses such as survival kits and camping.

19. Disposable single-use cooking utensils.

Protein

1. Paper coating from gluten or other protein.

2. Improve quality and processing of proteins for use in paints and lacquer.

3. Animal protein as a source of strength in construction materials.

4. Legumes and particularly grasses with high protein for animal feed adapted to lands now used for growing crops in surplus.

5. Elimination of toxicity of cottonseed meal through breeding or processing.

6. Use of leather in wall covering and rugs.

7. Improved quality of proteins.

8. Protein compounds used for adding to wine and medicines, as material for fighting oil fires, and as a foaming material for oil processing.

9. Improved film for microfilming purposes.

10. Forage which retains protein when weathered and rained upon after drying.

Fats and Oils

1. Breeding new types of oil plants especially promising - isolate genetic characteristics of safflower and castor oil plants for possible improvement.

2. Improve oils for use in paints aiming at qualities comparable to rubber based paints.

3. Development of foam and structural materials from agricultural oils (castor bean oil e.g.).

4. Testing oil content of various plants by areas - fast and accurate procedure needed.

5. Development of forms of oil impervious to moisture, tasteless, capable of solidification and non-toxic.

Starch

1. Improved yields of starch from plants, particularly starches with desirable characteristics for industrial use.

2. Plant roots as a source of useful materials.

Antibiotic Agents

1. Search for and isolation of antibiotic agents from higher plants and testing their effectiveness.

2. Adding antibiotic organic material to fertilizer for control of diseases.

3. Development of antibiotic materials for application to forest lands for disease control.

Enzymes

1. Fundamental research on the possibilities of altering characteristics of plant components by biotic means, insects, molds, bacteria, fungi, and enzymes.

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"Due to climatic or other reasons certain segments of our agriculture base their production economy on a single food or fiber crop. When this crop is produced in amounts greater than market requirements, certain alternatives must be faced:

1. A depression in price.

2. Government subsidies.

3. Use of land for alternate crops with less financial return.

4. Development of foreign markets.

5. Development of industrial uses.

Of these various alternatives, the development of new industrial uses appears to have advantages, if research can bring this about."

Dr. Lewis brought to the attention of the committee that cataloguing of plants by numerical code is in progress.

Dr. Lewis stated that seven line projects of the New Crops Research Branch had been approved earlier this year by the Executive Committee as contributing projects to S-9. He also stated that three additional line projects presented by Dr. Creech at this meeting had been approved by the Executive Committee. These were discussed by Dr. Lewis and approved by the Technical Committee. The ten line projects are listed in Dr. Creech's report. (Page 69 of these minutes)

Dr. Whiteley moved that the Executive Committee draft a revision of the S-9 Project Statement and circulate the revision among Technical Committee members for suggestions and approval. The motion was seconded by Dr. Davis and approved by the Technical Committee.

Dr. Whiteley moved that a representative of the Utilization Research and Development Divisions of ARS be appointed as a member of the S-9 Technical Committee. Dr. Miller seconded the motion and it was approved by the Committee.

PREPARATION OF ANNUAL REPORT

Dr. Lewis stated that the annual report is the responsibility of the committee chairman, and it is due in the office of the State Experiment Stations Division by February 1. The report should summarize the accomplishments of contributing projects and activities of the regional station. He suggested that the summary of accomplishments within the region be arranged by crop groups rather than by states.

ELECTION OF EXECUTIVE COMMITTEE

Dr. Killinger called for a report from the Nominating Committee. Dr. Dempsey nominated Dr. Matlock for chairman and Dr. Roever as secretary. The nominations were seconded by Dr. Miller and unanimously passed.

NEXT MEETING

Dr. Killinger read a letter from Director Arturo Roque, University of Puerto Rico Agricultural Experiment Station, inviting the S-9 Technical Committee to hold its 1961 annual meeting at that station. In the discussion which followed the reading of Director Roque's letter, it was apparent that the S-9 Technical Committee members and the "new crops" program in the southern states would benefit immensely by meeting in Puerto Rico. Many of the new crops which are considered to have potential for the South now are being tested or being grown on a limited scale in Puerto Rico. Among these are bamboo, Dioscorea, Tephrosia, forage crops, acerola, and other agronomic and horticultural crops. The opportunity for first hand observation of these crops would be invaluable to the S-9 Committee members in relation to their responsibility to coordinate and further the new crops programs in their respective states. In addition to the main Experiment Station at Rio Piedras the substations at Isabella and Ponce, and the Federal Experiment Station at Mayaguez, are growing crops of interest to the southern states. Director

Roque offered to provide transportation to visit these various research installations. In view of the many potential benefits to the S-9 project, the Technical Committee members voted unanimously to accept Director Roque's gracious offer. The meeting will be held December 13-15, 1961.

RESOLUTION

Dr. Roever moved that the following resolution be adopted:

"The S-9 Technical Committee expresses its deep appreciation to Dr. Miller and his co-workers for the excellent arrangements made for this annual meeting, and in particular thanks the members of the Horticultural Club for their generous efforts in producing an excellent repast with a horticultural accent and in true Louisiana tradition."

The motion was seconded by Dr. Davis and unanimously passed.