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ANNUAL REPORT OF COOPERATIVE REGIONAL PROJECTS
Supported by Allotments of the Regional Research Fund
Hatch Act, as Amended August 11, 1955
January 1 to December 31, 1971

1. PROJECT: SOUTHERN REGIONAL PROJECT S-9, "NEW PLANTS"
The Introduction, Multiplication, Evaluation and Preservation of New
Plants for Agricultural, Industrial and Urban-Rural Uses.

2. COOPERATING AGENCIES AND PRINCIPAL LEADERS:

State Experiment Stations and Representatives

| | | | |
|-------|----------------------|-------|-------------------|
| Ala. | C. S. Hoveland* | N.C. | W. T. Fike, Sec.* |
| Ark. | J. L. Bowers* | Okla. | R. S. Matlock* |
| Fla. | G. B. Killinger* | P.R. | J. Velez Fortuno* |
| Ga. | W. R. Langford* | S.C. | J. A. Martin* |
| Ky. | R. E. Sigafus, Chm.* | Tenn. | M. J. Constantin* |
| La. | R. J. Stadtherr* | Tex. | E. L. Whiteley* |
| Miss. | H. W. Bennett* | Va. | T. J. Smith* |

Administrative Advisor

C. R. Jackson

U.S. Department of Agriculture

| | |
|---|----------------|
| New Crops Research Branch | J. L. Creech* |
| Plant Introduction Investigations | Quentin Jones |
| Plant Materials Investigations | H. L. Hyland |
| Agronomic Crops | A. J. Oakes |
| Horticultural Crops | H. F. Winters |
| Chemurgic Crop Investigations | G. A. White |
| Cooperative State Experiment Stas. Ser. | C. I. Harris |
| NMN Research Division | W. H. Tallent* |
| Soil Conservation Service | W. C. Young* |

Southern Regional Plant Introduction Station, Experiment, Ga.

| | |
|--------------------------|--------------------|
| Regional Coordinator | W. R. Langford |
| Plant Pathologist | Grover Sowell, Jr. |
| Assistant Agronomist | J. H. Massey |
| Assistant Horticulturist | W. L. Corley |

3. PROGRESS OF WORK AND PRINCIPAL ACCOMPLISHMENTS:

Through international exchange of seed and from plant explorations conducted by the New Crops Research Branch, ARS, 2014 new introductions were added to the regional germ plasm collection in 1971, increasing the S-9 inventory of seedstocks to 25,600 accessions. Mungbeans from India and forage grasses and legumes from South Africa constitute about 80 percent of the new material. The other new introductions represent numerous species including peanuts, peppers, cantaloupe and other southern crops.

The regional station grew 3300 accessions for seed increase and preliminary evaluation. In addition to these cooperators in Alabama, Puerto Rico, Georgia and Oklahoma supplied the regional station with new seed of 1500 introductions of

cowpeas, peanuts, and mungbeans. Catalogues of all peanuts, grasses, and pepper introductions held at the regional station were prepared and distributed to plant scientists. S-9 cooperators were supplied with 11,644 packets of seeds and plants, and through international exchange of plant materials foreign scientists were supplied with 5462 accessions.

All states in the region participated in the evaluation of agronomic and horticultural plant introductions. Tall fescue and Harding grass introductions were evaluated in Alabama for cold tolerant types that remain productive during mid-winter. 1200 grain sorghum accessions were evaluated in Alabama for nutritive quality. Digestible dry matter in this material was found to range from 31% to 60%, indicating that the nutritive quality of grain sorghum can be improved through breeding. In Texas 7 sorghum introductions (PI's 226096, 229828, 264453, 302231, 302236, 302178 and 308976) were found to be resistant to the aphid Schizaphis graminum. 519 cowpea introductions were screened in Arkansas for tolerance to viruses and resistance to Cercospora leafspot, and for plant and fruit characteristics that aid in mechanical harvesting. Numerous grass introductions were screened for nematode resistance in Florida. Resistance to sting nematode was found in Digitaria decumbens PI 299601. Many peanut accessions were screened in Georgia for nematode and insect resistance. Results indicate that useful resistance to fall army worm is present among the 2186 lines. To date no resistance to nematodes has been found. High resistance to powdery mildew was found in cantaloupe PI 164320. In Louisiana 3 okra introductions (PI's 311106, 310477, and 310474) were found to be resistant to Meloidogyne incognita. In an effort to determine the host range of maize dwarf mosaic virus many introduced grass species were tested in Mississippi for reaction to MDMV. Six species not reported before as being susceptible were found to be susceptible to MDMV. All mungbean introductions were screened in Oklahoma for large seeded types that mature uniformly and for resistance to rootknot nematode. Evaluation of tropical fruit and nut crop introductions was continued in Puerto Rico. Macadamia nuts appeared well adapted to the highlands of Puerto Rico. Pigeon peas were screened for high protein content and for large seeded types. Results from cytological studies of clover spp. at Clemson University indicate a close relationship among Trifolium repens, T. occidentale, T. nigrescens, T. petrisavii, and T. uniflorum, making interspecific hybridization of these spp. possible. 130 forage type bermudagrasses were selected in Tennessee from the collection of 600 introductions for further evaluation for winterhardiness and forage yield. Numerous introductions were placed under evaluation for erosion control, wildlife feed, and other conservation uses.

Cultural studies of kenaf were conducted in North Carolina, South Carolina, Georgia, Florida and Texas. Adaptation or cultural studies of Briza spicata, Brassica spp., Crambe, Tephrosia, Crepis alpina, Chamaepeuce afra and Stokesia laevis were conducted in five states. Six new cultivars developed in part from introduced germ plasm were released in 1971. They are: (1) 'Morpa' lovegrass, selected for palatability and winterhardiness from PI 208994; (2) 'Greenleaf' pepper whose parentage includes tobacco-etch virus resistant PI's 152225 and 159236; (3) 'Venus' and (4) 'Saturn' tomatoes with resistance to Southern bacterial wilt from PI 129080; (5) 'Millex 23' pearl millet, a single cross hybrid containing PI's 286834 and 185642; and (6) 'Roma' sorgo.

The S-9 Technical Committee met at the Plant Industry Station, Beltsville, Md. July 26-28. Detail progress reports of new crops research presented by each participant are recorded in the Minutes of the meeting.

4. USEFULNESS OF FINDINGS:

Results obtained through this project at the regional station, at state experiment stations, by federal agencies, and by private enterprise are mutually beneficial to plant breeders and other plant scientists, and through them ultimately to the public. Desirable traits found in plant introductions can be used to develop superior varieties thereby increasing efficiency of production and reducing the need for pesticides. Through work at the regional station seed of world collections of economic crops is maintained for future use. New information gained from cultural studies of potential

chemurgic crops will aid in the development of new crops and diversification of agriculture.

5. WORK PLANNED FOR NEXT YEAR:

The work outline for this project will be revised. The regional station will continue to receive, propagate, and catalogue plants for distribution to plant breeders and other cooperators. Screening studies will be continued to locate new sources of disease and insect resistance. Evaluation of introductions will be continued at state stations and SCS plant material centers.

6. PUBLICATIONS ISSUED OR MANUSCRIPTS APPROVED DURING THE YEAR:

Georgia

Regional publications

Langford, W. R. and others. 1971. The National Program for Conservation of Crop Germ Plasm (Progress Report of Federal/State Cooperation) 73 pp.

Journal Series Papers

- Corley, W. L. and A. H. Dempsey. 1971. Evaluation of New Ornamental Peppers. HortScience Vol. 6. p 491-492.
- Massey, J. H. 1971. Effects of Nitrogen Rates and Plant Spacing on Sunflower Seed Yields and Other Characteristics. Agron. J. 63:137-138.
- Massey, J. H. 1971. Harvesting Vernonia anthelmintica L. Willd. to Reduce Seed Shattering Losses. Agron. J. 63:812.

Mississippi

Journal Series Papers

- Bennett, H, W. and Byron L. Burson. 1971. Effect of Culm Breakage on Seed Set in Seven Paspalum Species and an Intraspecific Hybrid. Crop. Sci. 11:229-231.
- Burson, B. L. and H. W. Bennett. 1971. Chromosome Numbers, Microsporogenesis, and Mode Reproduction of Seven Paspalum Species. Crop. Sci. 11:292-294.

South Carolina

Station publications

- Schoenike, R. E. 1971. Sawtooth Oak - Promising Exotic Tree Species for the Piedmont. Forestry Bul. No. 6. Dept. of Forestry, Clemson Univ.

Texas

Journal Series Papers

- White, G. A., W. C. Adamson, E. L. Whiteley and J. H. Massey. 1971. Emergence of Kenaf Seedlings as Affected by Seed Fungicides. Agron. J. 63:484-486.
- Whiteley, E. L. 1971. Influence of Date of Harvest on the Yield of Kenaf (Hibiscus cannabinus L.). Agron. J. 63:509-510.
- Whiteley, E. L. 1971. The Influence of Date of Planting on the Yield of Kanaf (Hibiscus cannabinus L.). Agron. J. 63:135-136.

7. APPROVED:

18 Jan. 1972
Date

1/14/72
Date

Roy E. Digges
Chairman, Technical Committee

Burtis R. Jackson
Regional Administrative Advisor

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SOUTHERN REGIONAL PLANT INTRODUCTION STATION

Report of Plant Pathology Research, 1971

A. Screening Plant Introductions for Disease Resistance

Peanut Stunt Virus: In cooperation with Dr's. Demski and Kuhn 1450 peanut introductions have been screened for resistance to peanut stunt virus. PI 259610 which showed apparent resistance in an earlier test proved to be susceptible. All of the introductions screened thus far are susceptible to the virus when inoculated mechanically.

Rhizoctonia on Peanut: Five introductions that appeared to be resistant in petri dish tests were tested in soil infested with R. solani. Pre-emergence damping off was severe and only 18% emergence was obtained with the best introduction as compared to 2% emergence for Argentine. An unidentified phycomycete of the Mucoraceae present in the seed of certain groups of introductions made it necessary to discontinue preliminary screening tests. Attempts to inhibit the phycomycete with fungicides without interfering with Rhizoctonia were unsuccessful.

Leafspot of Peanut: In cooperation with Dr. D. H. Smith 1404 introductions have been tested for resistance to leafspot caused by Cercospora arachidicola. Introductions that had an average of three or less leafspots per leaflet and an average of 4 leaflets or less defoliated in preliminary greenhouse tests were placed in replicated field tests. PI 109839 and PI 269685 retained their leaves better than Argentine in the 1971 field tests. The percent leaf area intercepting light on these two introductions was approximately 50% as compared to 0% for Argentine late in the season. This difference was significant at the 1% level of statistical significance.

WMV-2 on Squash: Further tests with introductions showing delayed symptom expression failed to confirm a useful source of resistance to this disease.

Gummy-stem-blight on Watermelon and Cantaloupe: PI 271778 is already in use as a source of resistance by at least one plant breeder. The larger fruit size (up to 30 cm.) of this introduction and the possibility that this source of resistance can be transferred to commercial types easier than the resistance from PI 189225, may make PI 271778 useful as a source of resistance.

Twelve single-spore isolates were made from a single leafspot on a breeding line which has PI 140471 in its pedigree. Results from preliminary tests did not indicate a difference in pathogenicity between the single-spore isolates from resistant material and a single colony isolate obtained from susceptible watermelon. Significant differences were observed in the stem resistance of PI 140471 (mean length of stem canker 2.2 mm.) and the new resistant cultivar Gulfcoast (mean length of stem canker 110.9 mm.) in a

replicated greenhouse test. Field observations indicate that Gulfcoast and breeding lines containing resistance from PI 140471 are consistently resistant in Alabama. Reports from Hughes and Hamilton in South Carolina, however, indicate that both PI 140471 and breeding lines developed from it are susceptible.

The disease resistance of a new introduction of cantaloupe, PI 321005 from Taiwan, was noted in the field and confirmed in greenhouse tests in cooperation with Mr. Corley. The mean length of gummy-stem-blight stem canker was 37 mm. as compared to 2.2 mm. for PI 140471 and 113 mm. for the susceptible check. The mean index for powdery mildew was 1.2 as compared to 4.8 for Hales Best Jumbo (0-5 scale). This is a high quality melon grown in Taiwan as Tainan #2.

Under conditions of moderate disease development PI 271778 produced 13 times as many mature fruits as did Charleston Gray in unsprayed field plots. In the same field Gulfcoast did not appear to have significant resistance while PI 140471 remained free of the disease. PI 321005 did not show resistance to gummy-stem-blight in this test but it was equal to Georgia 47 in resistance to powdery mildew.

Preliminary tests with diseased PI 140471 and PI 189225 from South Carolina and pure cultures of Mycosphaerella citrullina from this material indicate that a new race is not present.

Bacterial Spot of Tomato: In further tests with resistant introductions, none of the introductions including PI 124235 were resistant to all Florida isolates of the bacterium.

B. Diseases Associated with Plant Introductions

One hundred original seed of each of five peanut introductions from Senegal were surface sterilized and plated on V-8 agar. A fungus of the Aspergillus niger group grew from 13-94% of the seed. Yellow-green Aspergillus spp. grew from 19% of the seed of one introduction. Some of these may be in the A. flavus group. The other fungi that grew from these peanuts were miscellaneous saprophytes. Fifty seed of each introduction were planted in flats of fumigated soil. The emergence of one introduction was very poor and a number of the emerged seedlings were affected by a disease. The fungus of the A. niger group was isolated from necrotic cotyledons on the diseased plants. The plants did not show virus symptoms and attempts to detect viruses in 15 symptomless plants by rubbing sap on Topcrop bean and Early Ramshorn southern pea were unsuccessful. Neither fungi nor viruses could be detected in original seed of Phaseolus aureus.

Kahn^{a/} has called attention to the increased risk of introducing viruses with vegetative propagations as compared to seed. This is due, he states,

^{a/} Kahn, R. P. and R. L. Monroe. Virus infection in plant introductions collected as vegetative propagations. I. Wild vs cultivated Solanum species. FAO Plant Protection Bul. 18:97-101. 1970.

to the relatively small percentage of viruses known to be seed transmitted and the fact that propagules derived from virus-infected mother plants are almost always virus-infected themselves. As previously reported, symptoms on tester plants rubbed at Experiment indicated the presence of two viruses or two strains of the same virus in vegetative propagations of Arachis spp.^{b/}. The symptoms on peanut and Chenopodium quinoa rubbed at Glenn Dale, Md. by Dr. Kahn indicated the presence of a distinct virus in certain other introductions. The importance of variations in technique and growing conditions in detecting viruses in plant tissue was well illustrated by the fact that duplicate results were not obtained with any introductions. The technique used at Glenn Dale or the one used at Experiment did not detect all viruses detected by both techniques.

C. Diseases of Industrial Crops

A fungus which appeared to be identical to the one consistently isolated from leafspots on kenaf was isolated from small (1-4 mm.) leafspots on 4 weed species growing in and near a kenaf planting. Isolates from weeds and from kenaf remained vegetative on V-8 agar, kenaf leaf extract agar sterilized by filtration, and sterilized green beans. Mycelial suspensions of these cultures did not cause symptoms. The preliminary work indicates that considerable research will be necessary to determine a means of producing infective units of Cristulariella pyramidalis for use in screening for resistance.

Research Planned for 1972

WMV-2 on Squash: All introductions of Cucurbita pepo will be planted in the field, inoculated with WMV-2 and observed for fruit symptoms.

Leafspot of Peanut: The most promising introductions will be tested for resistance and yield in an isolated field planting.

Rhizoctonia solani on Peanut: The most promising introductions will be tested in fumigated and non-fumigated plots in a field heavily infested with Rhizoctonia solani.

Gummy Stem Blight of Cucurbits: Four introductions of Cucumis melo with moderate to high resistance to gummy stem blight will be subjected to strong selection pressure by Mycosphaerella citrullina and crossed in the greenhouse.

Bacterial Spot of Pepper and Tomato: Additional experiments on the resistance of introductions to specific isolates will be completed.

^{b/} Kahn, R. P. and Grover Sowell, Jr. 1970. Incidence of virus infection in plant introductions collected as vegetative propagations. II. Wild vs cultivated Arachis species. FAO Plant Protection Bul. 18:142-144.

Rough Spot of Sorghum: Research on methods of producing inoculum of Ascochyta sorghi will be conducted. If an accurate screening technique can be developed introductions will be screened.