Project Number: S-009

Project Title: Plant Genetic Resources Conservation and Utilization

Period Covered: 08/2002 through 8/2003

Date of This Report: March 4, 2004

Annual Meeting Dates: August 6, 2003

Participants: http://www.ars-grin.gov/ars/SoAtlantic/Griffin/pgrcu/s9report.html

Minutes: http://www.ars-grin.gov/ars/SoAtlantic/Griffin/pgrcu/s9report.html

Accomplishments and Impacts:

USDA - Plant Genetic Resources Conservation Unit

Plant genetic resources collected from throughout the world are a valuable source of genetic diversity for the improvement of agricultural and horticultural crops grown in the U.S. This germplasm will be used now and in the future to develop improved plant materials with resistance to diseases or insects, improved crop quality, greater yields, alternate uses, and new chemical traits. The germplasm collection at the Plant Genetic Resources Conservation Unit contains 82,584 accessions representing 1,427 species and 246 genera. This collection is one of the largest working collections of seed and clonal accessions in the entire U.S. National Plant Germplasm System.

Vigna: Research was conducted to test the use of SSR markers for determining resistance to cucumber mosaic virus in cowpea. The markers tested were determined not to be linked to resistance, but in the process of field testing additional lines with CMV resistance were found. This could have a significant impact of the control of this pathogen.

Cowpea regeneration was carried out as planned with above 50 lines increased in the winter grow out, about 130 out of 200 lines producing seed in the field in Griffin and another 50 lines increased in Puerto Rico. The digital images of flowers and seeds of the regeneration lines for the last two years were prepared for the web and sent to Beltsville for inclusion on GRIN.

Peanut: Using information in GRIN, approximately 775 cultivated accessions were selected for increase at the Bledsoe Research Farm, Georgia. Seed was collected from a total of 765 accessions with the majority of the accessions having good germination. Yield per plot was increased by moving regeneration plots from Byron, GA to the Bledsoe Research Farm because the level of tomato spotted wilt virus was greatly reduced.

A joint SSR discovery project was continued with Dr. Guohao He at Tuskegee University (HBLC). This cooperative effort has resulted in the development of additional SSR markers for peanuts, some of which are related to botanical variety identification of cultivated peanuts.

Continued the National Peanut Check-off Board on Tomato Spotted Wilt Virus Resistance research project and research funded by the GACC for Peanuts for mid generation

selection of breeding of cultivated material for disease and pest resistance.

Active member of team which collected 28 accessions of peanut germplasm (mainly wild germplasm for forage use) in Paraguay.

Cooperative research was performed on a grid method of RT-PCR for screening peanut germplasm for the presence of peanut stripe and mottle viruses. This method is sensitive and can save time and money in screening for these viruses.

Clovers, Grasses, New Crops, Misc. Legumes and Misc. Crops: Several gaps were corrected in GRIN including reduction of seed distributed for winged bean due to low seed production. Regenerated 213 accessions of castor, misc. legumes, kenaf, miscellaneous crops, and sesame at the Westbrook farm. Several other accessions were attempted, but have photoperiod sensitivity or low viability/vigor. Planting one month earlier than normal in the greenhouse, resulted in seed regeneration of 38 accessions including *Leucaena leucocephala* which had not flowered last year.

Acquisitions of various accessions were received including one *Calopogonium mucunoides*, collected from Vietnam and two *Neonotonia wightii* accessions collected from Taiwan.

Collaborated with University of Georgia researchers on genetic variation among Mucuna accessions for nematode and fungus knat reduction and field evaluations for development of nutraceutical crops.

Reviewed and distributed 2,818 legumes, miscellaneous crops, grasses, and new crops to researchers throughout the world for numerous research studies with a wide range of objectives.

Conducted successful seed increases in the field of 12 cross-pollinated and 29 self-pollinated clover accessions in cages with bees. Conducted successful seed increases of 27 self-pollinated clover accessions in the greenhouse. Short-day African clovers are currently being grown in the greenhouse and seed is being harvested.

Seed increases were successfully conducted for 43 grass accessions in the field. Modifications in the germination and transplanting process were identified and will be used next year to increase the number of successful regenerations. Digital images were taken of the grass accessions grown for regeneration and of the entire bamboo collection (96 accessions) maintained at Byron, GA. The total (377 accession) clonal grass collection was repotted and maintained in the greenhouse.

Sorghum

Coordinated plan for regeneration of sorghum accessions with John Erpelding, sorghum curator. Seed was received from 2003 growout and germinations were conducted on all accessions received. Samples with poor germination (<50%) were identified and selected for planting in 2004. Selected over 2,100 sorghum accessions that were sent to St. Croix this fall/winter to be planted for seed regeneration in 2004. Presently, all sorghum accessions with known germinations between 20-50% have been sent to St. Croix for regeneration. A total of 200 accessions with very low germination have been sent to Puerto Rico for emergency regeneration.

Updated a timeline for improvement in maintenance of the sorghum germplasm collection and presented this timeline to the Sorghum CGC at the 2003 meetings. The plan documented in the timeline was accepted by the committee with no changes.

Vegetable Crops: All sweetpotato germplasm was maintained in vitro, propagules were distributed on request, and new material was added to the collection. Almost 600 of the 700 sweetpotato cultures have been sent to Ft. Collins, CO as a backup. Prior to 2002 there was no off site backup of the sweetpotato collection. This backup ensures the security of the collection and the continued availability of these materials to the user community.

One-hundred-twenty accessions of *Citrullus lanatus*, 50 accessions of various *Capsicum* spp., 25 accessions of *Cucurbita moschata*, 30 accessions of various *Ipomoea* spp., and 5 *Solanum* spp. were increased in the field and greenhouse. Digital images were recorded on all accessions regenerated. Digital images were captured on seed of all *Citrullus lanatus* accessions to help curators and genebank personnel confirm purity of the seed in subsequent regenerations.

A total of 350 accessions of *Capsicum baccatum* were grown in Griffin, GA and characterized for 26 morphological descriptors. Digital images were taken of all accessions and uploaded into the GRIN database.

A plant exploration trip was conducted in Arizona for native *Ipomoea* spp. Seed was collected from a number of *Ipomoea* spp. and several collections were also made of native cucurbits.

A total of 120 accessions of *Capsicum* spp. were evaluated for capsaicin content and reducing sugars. Ranges for capsaicin and individual reducing sugars varied greatly. These data were placed in GRIN and have been used by researchers as a basis for selecting germplasm for research.

The identification of genotypes with the ability to germinate at reduced temperatures has permitted an extension of the growing range of crop plants and has enabled growers to plant earlier to take advantage of an earlier harvest with higher profits. About 1,000 accessions of *Citrullus* spp. were screened for low temperature germinability. Two accessions were identified that germinated at temperatures that totally inhibit germination of all cultivated watermelons tested. This trait is heritable and can be incorporated into commercial watermelon cultivars.

Molecular Evaluations

During 2003, a number of positions in the molecular program were filled. Ming Li Wang was hired as the research geneticist and Noelle Barkley as the molecular biologist/support scientist. A number of studies have been initiated with initial results coming in. Equipment additions continued with the purchase of an HPLC to enable Unit scientists to characterize genetic variation for phytochemicals among genetic resources within the collection.

A new system of DNA marker development has been evaluated. Markers from model legumes (*Medicao trucatula* and soybean) were transferred to other legumes (peanut, cowpea, lablab, and guar) in the collection at Griffin. Transferring DNA markers from one species to another is much more cost effective than generating and screening SSRs from a genomic DNA library. This system will also be evaluated for use with grass species for marker development.

Experiments are underway to develop a highly sensitive and high throughput system with a 96-well plate format to detect viruses in peanut germplasm using RT-PCR. This system can be used to screen germplasm using multiplex detection.

Germplasm Maintenance

Continued to build the germination program as a high priority in the Unit. Germinations were completed for over 7,990 accessions of crops maintained at Griffin.

Continued program to split samples of all 82,000 accessions maintained at Griffin. An additional technician was hired and a total of 8,134 accessions were split this year (compared with 2,137 accessions last year). Small distribution sample will be maintained in 5 C and bulk of sample will be maintained at -18 C to maximize longevity of viable seed and minimize need for regeneration.

Renovation of the seed processing facility was completed with six new work stations, new external dust collection/air handling system, six air hoses, and new lighting installed. New garage door was installed to facilitate movement of large seed orders.

Upgraded seed storage facilities by purchasing and installing moveable storage shelves in the -18 C cold room. Samples were placed into smaller plastic trays, instead of metal trays, to improve ease of handling heavy trays by employees. Moveable storage shelves have maximized possible seed storage space within the -18 C freezer making efficient use of the energy utilized to maintain this temperature.

Alabama

Legumes, Forage and Cover Crops

AU Merit hairy vetch (PI 619630) was developed and released because it has a consistently high forage yield and is early flowering. AU Merit was derived from accession PI 206493 obtained from the Plant Genetic Resources Conservation Unit (S-9), NPGS.

Watermelon

Phylogenetic relationships of *Citrullus* were studied using DNA sequences from several chloroplast regions. PCR-RFLP analysis of chloroplast DNA of a wide collection of *Citrullus lanatus*, *C. colocynthis*, *C. ecirrhosus* and *C. rehmii* accessions (>150) from all over the world identified a total of 8 different variety and/or species diagnostic haplotypes. To infer phylogenetic relationships, variable regions were sequenced and patterns of nucleotide substitutions were studied in 17 different *Citrullus* accessions. *Praecitrullus fistulosus* was used as outgroup. The cultivated watermelon, *C. lanatus* var. *lanatus*, *C. ecirrhosus* and *C. rehmii* lacked intraspecific sequence divergence at the studied regions, while sequence divergence was very low in wild citron (*C. lanatus* var. *citroides*) and low in *C. colocynthis*. *C. ecrirrhosus*, a desert perennial from Namibia is closely related and ancestral to *C. lanatus*. Additional studies will be done to study phylogeographic routes.

Florida

Department of Horticultural Sciences, Gainesville FL

Dr. Mark Bassett reports on studies of the Am gene for scarlet flowers in bean. The gene originated in a line of H. Lamprecht (M0169, a "multigaris" line; a hybrid derivative of a cross between P. coccineus (formerly "multiflorus") and P. vulgaris). M0169 has now been assigned as PI 527868 and is considered a member of the common bean "genetic stocks" collection.

North Florida AREC, Marianna, FL

Dr. Ann Blount reports on the evaluation of bahiagrass and other *Paspalum* spp. using plant introductions obtained from NPGS and other scientists working with *Paspalum* species in Uruguay and Argentina. Concurrent evaluations of this material are on-going at Ona,

Brooksville, Gainesville, Live Oak, Marianna, and Tifton. Several new species have shown superior winter growth and better seasonal forage distribution compared to bahiagrass. Selection criteria being considered at the various test locations are winter survival, frost tolerance, forage yield, forage quality, seasonal forage distribution, turf characteristics, seed production, and persistence under grazing. Approximately 72 new accessions are under evaluation including accessions of *P. notatum, P. nicorae, P. quadrifarium* and *P. guaraniticum*. Accessions currently being evaluated that are not bahiagrass include: *P. nicorae* - PIs 202044, 209983, 276248, 276249, 283020, 284171, 304004, 310131, 404469, 404471, 404859, 462273, 477103, 490363, 490364, 508818, 508819, 508820, 508821; *P. quadrifarium* - 404880, 404881, 404882, 462302, 462295, 462298, 508942, 508947; *P. guaraniticum* - 404449.

Agronomy Department, Gainesville, FL

For several years Dr. Gordon Prine researched tall naturally established Florida stands of castor bean (Ricinus communis). The best areas in a natural castor bean stand at Lakeland, Florida produced 30 tons/A of oven dry stems in a single year. We collected seed from 20 tall castor bean locations over Pennisular, Florida and planted in a replicated intercrossing nursery near Citra, Florida in 2002. We collected seed from the best plants and planted in replicated intercross nursery in 2003. We expect to harvest enough seed to put in Plant Introduction Seed Bank to conserve this Florida castor bean germplasm for future use.

Dr. Ken Quesenberry continued plant breeding and selection research with buffalo clover (*Trifolium reflexum*), primarily focused on germplasm collections from Georgia and Florida crossed with other accessions from around the SE USA. F_3 selections were made in the greenhouse for early flowering, pink and red flowered plants. Seed production of buffalo clover as a wildflower alternative for Florida is being evaluated in the 2002-03 growing season at two farmer locations.

FLMR7 was approved for release as a cultivar by the Florida Agricultural Experiment Station (FAES) in 2002 and foundation seed increase is in progress. Four elite selections of rhizoma perennial peanut (*A. glabrata*) were established in replicated forage yield trials at the Plant Science Research Unit (PSRU) at Citra, FL. Field evaluation of 30 plant introductions of pintoi perennial peanut (*Arachis pintoi*) was initiated in 2001 and continued into 2002-03. Primary criteria of evaluation include spread and weed competitiveness, disease susceptibility, frost and freeze tolerance and seed production.

Tissue cultures of ›Tifton 9' bahiagrass were initiated on modified MS media. Embryogenic calli were transferred to media containing three concentrations each of three mitotic spindle poison agents (colchicine, trifluralin, and oryzalin). Regenerated plants were transplanted to the field and evaluated for ploidy level using a combination of leaf stomatal measurements, flow cytometry, and chromosome counts. All treatments yielded tetraploid clones. Almost 300 individuals have been tentatively identified as tetraploid based on one of the above methods of determination.

Gulf Coast AREC, Bradenton, FL

Dr. Jay Scott reports on PI 114490 that has been used as a source of bacterial spot resistance in tomato breeding. He also reports that PI 270248 is being used as a source of high fruit sugars for developing tomato varieties with improved flavor.

LA 1777 is a *L. hirsutum* accession for which a population of introgression lines with overlapping small segments of the *L. hirsutum* genome have been generated. This population is

being used to find genes with resistance to the silverleaf whitefly (*Bemisia argentifolii*). This population will also be assayed for resistance to geminiviruses that have been reported by others to locate the resistance genes. None of the lines had Type IV trichomes but some had greater concentrations of type VI-s. LA 1932, LA 2779, and LA 1938 continue to be used as sources of geminivirus resistance, this work has been ongoing since 1990.

Guam

The project was initiated in Jan. 2001 to collect local and international plant germplasm and to propagate selected cultivars by seed and tissue culture. The project will improve plant acquisition and management system for germplasm and plant propagation program by advancing technology of the Guam AES Horticulture Laboratory.

Activities included (1) to collect local and international plant germplasm and propagate selected cultivars by seed production and in-vitro propagation for conservation of germlines and distribution, (2) to evaluate field performance of collected germplasm for tropical climate adaptation, pest resistance, and other desirable characters for consumers in Guam, and (3) to improve a plant acquisition and management system for germplasm collection and plant propagation program by advancing technology.

Crops tested in 2002 included sweetpotato (Ipomoea batatas (L.) Lam.), vegetable soybean (Glycine max (L.) Merr.), and tomato (Lycopersicon esculenta Mill.). Two new sweet potato accessions with purple flesh color were obtained from Saipan.

Two sets of soybean accessions originated from the AVRDC breeding program and a Japanese company were evaluated in Guam cobbly clay soil. AVRDC lines were adapted to Guam's climate, while Japanese commercial cultivars matured too early resulting in their poor yields.

Open-pollinated cherry tomato accessions from AVRDC were evaluated twice for local fresh market, however both experiments were terminated before the harvest stage due to typhoon damage (the first trial) and outbreak of bacterial leaf spot (Xanthomonas campestirs pv. vesicatoria) (the second trial). The result of data of plant tolerance to the disease in the second trial was summarized and presented to Dr. P. Hanson, a tomato breeder of AVRDC as a report. Two sweetpotato accessions were shipped to the Tuskegee University, Alabama through USDA-ARS, PSI-FL Plant Germplasm Quarantine in Beltsville, MD on April 30, 2002. They were Ipomoea batatas cv. 'Terlaje' originated from Guam, and cv. 'Kuri' of Saipan origin. Two accessions are currently being screened in Quarantine Lab will be released in May 2005. Expansion of our existing wet lab increased an area for sorting and cleaning harvested plant materials and seeds for distribution. Plant acquisition and plant propagation activities will continue at a plant nursery and a shade house in House 1, Horticulture Laboratory at the University of Guam.

Impact was that tissue cultured bananas became very popular to local community on Guam. Plant acquisition and plant propagation activities in this project contribute improvement of local supply of planting materials. Indigenous germplasm collection maintains a variety of genetic materials of important crops.

Hawaii

Performance data for HAES selections 294 ('Purvis'), 344 ('Kau'), 741 ('Mauka'), 788

'Pahala'), 800 ('Makai'), 816, 835, 849, 856, and 863 at the University of Hawaii Kona Experiment Station (elevation 390m) showed that yields from 10-14 year-old 856 trees were comparable to the highest yielding 344 trees, while performance of 835 and 863 was similar to 800 and 294. Selection 816 exhibited a higher incidence of "stick tights" while 849 possessed thin shells, good kernel recovery, but lower yields. Selections 835 and 856 are currently undergoing further testing at the University of Hawaii Waiakea Experiment Station (elevation 180m) in Hilo.

Results for the 2002 harvest season from a trial to evaluate selections at the Captain Cook Experiment Station (elevation 2000 ft) in Kona have been summarized. Trees were planted in a 15x30 feet spacing and were top-worked in May 1988. The test plot consisted of 6 trees of each selection (294, 344, 741, 788, 816, 835, 856 and 857) planted in 2 replicates. Nut and kernel quality obtained for the 2002 harvest season showed that kernel recovery for all of the selections was very similar and ranged from 37.1 to 43.8%. The recovery of No. 1 kernel, however, showed that selections 788 (Pahala), 835 and 856 tended to perform better at this location. Although 816 had high kernel recovery (43.8%), the low percentage of No. 1 kernel (67%) led to low recovery of No.1 kernel (30%). The 816 selection possessed large kernels but tended to suffer from stinkbug damage, and had discolored and shriveled kernels. Although 741 (Mauka) has produced well in other trials at upper elevations, results from this Captain Cook trial showed that 741 did not appear to perform well at this site.

Yield data from the Captain Cook trial for the 2002 harvest season (14th year after planting) showed that higher average wet-in-shell yields were obtained with 816, 856 and 857. However, when the percent No. 1 kernels is considered, the average net wet-in-shell yields showed that 788, 856 and 857 tended to perform better. The estimated yield of No. 1 kernel which was calculated from the percentage recovery of No. 1 kernel also showed that 788 and 856 were better performing selections. This trial will be continued to determine whether similar trends persist in future harvests.

Evaluation of the newest HAES selections (862, 879, 887, 896, 900, 932) is ongoing at the Waiakea Station. Selections 879 and 932 have an upright growth habit, and 900 has a fairly thick shell which may provide some protection against stinkbugs and tropical nut borers. Preliminary evaluations show that selections 879, 887, 900 and 932 have a high percentage of No. 1 kernels and are comparable to 344 and 800.

USDA/ARS, Pacific Basin Agricultural Research Center, Tropical Plant Genetic Resource Management Unit, Hilo, Hawaii.

The mission of the unit is to provide long-term maintenance, collection, distribution, characterization and documentation and enhancement to 14 designated tropical fruit and nut crops for the USDA/ARS, National Plant Germplasm System. We managed the 924 accessions of germplasm as living collections in 32 acres of field plantings at three locations; we distributed 95 germplasm and17 information orders; we generated and input 84 germplasm descriptors with 98 vouchers and 1950 observations into the Germplasm Resource Information Network (GRIN). The impact of these activities is to proving a unique and need services of germplasm and information resources to scientist and stakeholders.

Two new scientists, Dr. Lisa Keith (plant pathology) and Dr. Tracie Matsumoto (plant physiology) are responsible for developing research programs in the unit to better the documentation and preservation of tropical fruit and nut germplasm.

Ralstonia solanacearum remains a serious disease for ginger production in Hawaii and

wilt free ginger seed pieces is difficult to obtain. The unit along with cooperators at the University of Hawaii, College of Tropical Agriculture and Human Resources developed and demonstrated a sustainable system utilizing tissue culture and a clean greenhouse production system. Impact is to provide producers a way to produce Ralstonia free ginger seed rhizome in significant quantities, and as a potential alternative to field production.
New crops are needed for diversification in Hawaii after sugar failed, and the high cost of production prohibits Hawaii agricultural products from competing in the commodity markets worldwide. Working with the University of Hawaii, Cooperative Extension Services in Hilo, Hawaii, we identified four tea varieties, *Camellia sinensis*, and selected seedlings for further testing at two high elevation stations for production of high quality tea. Impact of the project is identified a potential economic crop for further research.

The mechanism of off-season flower induction using potassium chlorate is not known. Working with cooperators from the University of Hawaii, College of Tropical Agriculture and Human Resources and a local orchard, preliminary evidence indicated that longan trees treated with potassium chlorate have lowers levels of nitrate reductase activity. Impact of the research is to identify mechanism in the mode of action of potassium chlorate on longan flowering, and to derive management techniques and alternative chemical for controlled flowering of other recalcitrant tropical fruit and nut germplasm.

Lychee flowering is sporadic and highly variable in the tropics. Research involved isolating and cloning genes involved in flowering of Arabidopsis, which will be used to screen for homologs in lychee by DNA hybridization. Impact of a successful program will further the unit=s ability in the evaluation, characterization and documentation of crops in the collection that do not normally set fruit in the tropical environment.

Papaya seeds difficult to store for a long period and retain quality under normal refrigeration. The plant physiologist at the unit is research into developing protocols for better initial seed quality, and proper drying and storing seeds to improve storage. The impact of this project is to improve the storage period and the viability of the stored seeds.
One of the most important problems in tropical germplasm preservation and production is the diversity and high incidence of disease in the tropical environment. The unit plant pathologist is conducting a disease survey of guava, rambutan, and macadamia nut, and the fungi. *Colletotrichum*, *Pestalotia*, and *Guignardia spp* were constantly been isolated from leaves and fruits of guava; *Lasmenia* sp. from fruit spots of rambutan, and a collection of bacterial from macadamia. Impact of this research is to collect and generate information on host-pathogen relationships to be input into the Germplasm Resources Information Network, and to develop potential integrated disease control in crop production systems.

North Carolina

Plant breeding and genetics faculty at NC State University are conducting research on maize, soybean, peanut, cotton, tobacco, small grains, turfgrass, kenaf, sweet potato, cucurbits, blueberry, brambles, tree crops, ornamentals, and a miscellaneous collection of other crops. Most projects involve interdisciplinary teams who are attempting to incorporate disease resistance, quality factors, or abiotic stress resistance from introduced plant accessions into their improved breeding materials. Many of these projects include plant introductions in their cultivar development programs. Germplasm collections include cultivated and/or wild species

accessions of *Nicotiana* and *Arachis* species, South American maize germplasm, and many cultivated and related species introductions of soybean, blueberries and sweet potato.

Germplasm work in the legumes includes peanut research, which is concentrating on evaluating plant introductions for flavor, an array of disease resistances, and aflatoxin resistance. Attempts to incorporate wild species genes into the cultivated peanut is concentrating on tomato spotted wilt virus, leaf spots, Sclerotinia blight, Cylindrocladium black rot, and nematodes. Wild species of peanut are being characterized with AFLP markers and genomic relationships are being determined cytogenetically. Plant introductions in soybean are being used to identify aluminum tolerant genotypes and for drought stress resistance. Cooperative programs with researchers in China and Mexico are attempting to identify genetic diversity for soybean rooting traits. Through conventional breeding, new advanced breeding lines were developed from exotic Asian cultivars and these lines consistently out-perform popular U.S. cultivars. Research has now shown that Asian germplasm has utility in breeding for yield improvement. Crosses between northern and southern cultivars were being tested to determine yield potentials and adaptation to southern climates and varieties are being bred for resistance to cyst nematode races 2 and 4.

For grasses, maize research is testing diallel crosses using tropical germplasm that has gone through a conversion program for adaptation to temperate climates. From this program, alleles from tropical corn landraces are being recovered to produce superior semi-exotic inbreds. Mapping populations are being evaluated for resistance to Fusarium ear rot and fumonisin. The maize geneticists have demonstrated the ability of tropical germplasm to increase U.S. corn yields and they have uncovered a third heterotic group for commercial U.S. varietal development. Interspecific crossing and embryo rescue have been performed to transfer resistance to Fusarium head blight from diploid *Tricicum monococcum* into cultivated hexaploid wheat. Advanced generation lines with powdery mildew resistance also resulted from tetraploid *T. araraticum* introgression to helxaploid wheat. High protein oat cultivars are being developed and evolutionary studies with *Avena* are being conduced. An oat project is identifying pathways to domestication from the wild progenitors to modern commercial germplasm; and interspecific crosses have been made to incorporate anti-oxidant compounds into the cultivated oat. Turfgrass geneticists are attempting to improve drought and disease resistances. Transformation projects to improve bermudagrass for sting nematode resistance have yielded promising results, and parallel projects with tall fescue and perennial ryegrass for other traits are leading to commercialization of new varieties. Lastly, sea oat (*Uniola paniculata*) accessions of diverse geographical origin are being tested in beach areas to stabilize coastal dunes.

Gene clusters for disease resistance in a chromosomal segment from *Nicotiana plumabinifolia* are being used for improvement of black shank disease resistance in tobacco. Other projects are using wild tobacco species to incorporate tomato spotted wilt virus and root knot nematode resistance into tobacco. Experimental burley hybrids NC 2001 and NC 2002 were approved for release and flue-cured hybrids NC 299 and NC 102 were released. The blueberry project is evaluating plant introductions for quality factors and making crosses between plant introductions and improved cultivars. Wild sweet potato species with high starch content are being investigated for bio-fuels. In addition, new collections are being made of bloodroot, goldenseal, black cohosh, and mayapple as potential medicinal herbs.

Puerto Rico

A replicated guava planting consisting of 14 accessions was established at Juana Díaz in 1998, and data are being collected on fruit production, tree height and canopy volume. Seventeen plantain and 26 banana cultivars were maintained in a field germplasm collection at Corozal. Six banana cultivars (›Yamgambi=, ›Grand Nain=, ›Johnson=, ›Ziv=, ›Niño Alto=, and ›Hybrid 2390=) are being evaluated for resístance to yellow sigatoka at Corozal. Field germplasm collections of yam (30 accessions), cassava (22 accessions) and sweet potato (18 accessions) were maintained at Corozal. Seventy-five tanier accessions were maintained in the field at Isabela. Citrus rootstock-scion trials are being evaluated at Corozal, Adjuntas, and Isabela. A collection of 34 Spanish lime accessions at Juana Díaz continues to be evaluated. A collection of 180 sugarcane clones is being maintained and evaluated at Gurabo. Three local maize varieties (›Mayorbela=, ›Diente de Caballo= and ›Chulo=) are being maintained at Isabela, and selection is being practiced to improve seed yield, adaptation, and disease and insect resistance. The open pollinated sweet corn cultivar ›Hawaiian Supersweet #9= is under evaluation at Isabela. Twelve clones of AMayaguezano@ mango are being evaluated in a replicated field planting at Lajas. Twelve sweet cherry pepper varieties are being evaluated in the field at Lajas. A tomato cultivar evaluation trial was conducted at Lajas.

USDA-ARS, Tropical Agriculture Research Station
Research Accomplishments:

A subset of 300 Sudanese sorghum accession was evaluated for anthracnose in collaboration with Dr. L. K. Prom (USDA-ARS, College Station, TX). The evaluation was conducted in Puerto Rico and Texas resulting in the identification of 97 accessions resistant to pathotypes present at the locations.

In their fourth year after planting nine carambola clones tested at four locations had yields which ranged from 10,169 kg/ha to 42,081 kg/ha and brix values ranging from 8.2 to 10.2

Experiments to evaluate 8 rambutan cultivars for yield and fruit quality traits at two locations in Puerto Rico were established in 1999. In the first year of production (2003), cultivar R-162 was the highest yielder at Corozal and Isabela with a yield of 2892 kg/ha/year and 544 kg/ha/year, respectively. This cultivar also showed the highest average brix (sweetness) value (20.33).

The banana collection has been indexed for banana streak virus, cucumber mosaic virus, banana bract mosaic, banana bunchy top virus using DAS-ELISA. The *in-vitro* collection is now free of these viruses.

Two lures (pelletized torula yeast and a two component lure of ammonium acetate and putrescine) used to attract fruit flies (*Anestrepha* spp.) to traps were evaluated within sapodilla, mamey sapote, and carambola orchards. Significantly more flies were collected in traps containing torula yeast in sapodilla and mamey sapote. Fruit fly pressure within sapodilla was extremely high with approximately 30 Caribbean fruit flies (*A. suspensa*) collected per trap per day; in contrast, only 0.12 flies per trap per day (approximately 1:1 ratio of the two fruit fly species) were found in mamey sapote. Within carambola, more flies were captured with the two component synthetic lure and the predominant species was West Indian fruit fly (*A. obliqua*).

Fourteen weed species have been identified for the first time in Puerto Rico as alternate hosts of papaya ringspot virus (PRSV) in studies to determine distribution of viruses that affect papaya in weeds surrounding papaya fields.

Service Accomplishments:

The regeneration of 2100 sorghum accessions with low seed viability was conducted at GIRU, US Virgin Islands. A total of 200 accessions with germination rates below 15% were germinated in the laboratory and transplanted to pots in the greenhouse with healthy seedlings planted in the TARS research farm at Isabela. Also, 50 accessions of cowpea, 29 of maize, (707 rows) and five cucurbits were seed-regenerated at St. Croix and Mayaguez.

The sorghum germplasm collections from Algeria, Chad, Gambia, Oman, and Rwanda were artificially inoculated with anthracnose to evaluate disease response. Most of the accessions from Algeria and Oman were highly susceptible. In contrast, most of the accessions from Gambia and Rwanda were highly resistant.

Phenotypic selection was conducted for nine sorghum conversion populations to identify lines for release in collaboration with Dr. D. Rosenow (Texas A&M University, Lubbock, TX). Seven tropical bulks were also increased and 40 backcrosses conducted to advance lines in the sorghum conversion program.

A total of 1,478 distributions of tropical germplasm in the form of budwood, cuttings, rhizomes, corms, and fruits were made available to cooperators, and local, national and international requesters. Additionally, program personnel answered many technical questions concerning the agronomy and cultivation of crops that are the responsibility of this repository.

South Carolina

Germplasm was distributed from the USDA Plant Genetic Resources Conservation Unit at Griffin, GA to the following individuals in South Carolina in 2002: Mr. Michael Watkins, S.C. Foundation Seed Association, Clemson, SC, Vigna unguiculata, PI 612607; Dr. Judy Thies, USDA Vegetable Laboratory, Charleston, SC, 613 Capsicum spp. Accessions; Dr. Howard Harrison, USDA Vegetable Laboratory , Charleston, SC, 19 Macuna spp. accessions.

Germplasm provided by the PGRC Unit at Griffin, GA will be screened for economically important traits and subsequently utilized in breeding programs at the USDA Vegetable Laboratory, Charleston, SC, for improvement of vegetable crops in the southern U.S.

Tennessee

The following projects are being conducted at the University of Tennessee in which exotic or novel germplasm lines are being utilized as parental material for the projects.

CORN
Project Title: Breeding maize lines with exotic germplasm
Personnel: Dennis West, Professor, Dept. of Plant Sciences, Univ. of Tennessee
Collaborators: Major Goodman, NCSU
Objective: Incorporate genes from exotic maize germplasm into adapted U.S. maize germplasm.
Approach: Early generation lines from the Germplasm Enhancement of Maize (GEM) project, coordinated through the USDA Maize project at Iowa State University, are crossed with elite adapted lines. The resulting hybrids are grown regionally in the Southern U.S. to evaluate field performance. The best lines from these hybrid trials are entered in breeding programs, using traditional breeding methods, to develop new maize parental lines. In 2003 we have 933 experimental hybrids from the GEM project in yield trials in Tennessee. In addition to the yield trials we have 400 nursery rows of GEM material for inbreeding and selection.

SOYBEAN

Project Title: Effects of Root/Leaflet Orientation Trait Combinations on Water-Use Efficiency in Soybean

Personnel: Fred Allen, Professor; Richard Johnson, Res. Associate, Dept. of Plant Sciences, Univ. of Tennessee

Objective: Determine the effects of combinations of fibrous root and leaflet orientation on water-use efficiency in soybeans.

Approach: Recombinant inbred lines (RIL) are being developed from crosses between a fibrous root line, PI416.937, and cultivars with differing leaflet orientation capabilities. The plan is develop isolines that have lo-orientation/normal root; lo-orientation/fibrous root; hi-orientation/normal root; and hi-orientation/fibrous root trait combinations and compare their water-use in comparison to seed yield. Crosses have been made and F2 populations are being evaluated in the field during the 2003 growing season.

Crosses have also been made with a line that exhibits slow-wilting during severe water stress, PI471.938, in order to develop isolines that will be evaluated for their water-use relative to yield.

Project Title: Expanding the Genetic Diversity of Elite Soybean Germplasm

Personnel: Vincent Pantalone, Associate Professor, Dept. of Plant Sciences, Univ. of TN

Randy Nelson, USDA-ARS Germplasm Currator, Univ. of Illinois, Urbana-Champaign.

Objective: Conduct visual selection of lines for adaptation and desirable agronomic traits from among the genetically diverse populations.

Approach: The populations are being grown by soybean breeders in different parts of the U.S. with the goal of selecting adapted lines for local conditions that can be used directly as potential new cultivars, or use the lines as parents in crosses in order to introgress new germplasm into breeding programs.

strain	pedigree
HS89-3261	LG82-8379 x A2943
LG82-3002	F5 PI253665D x PI283331
LG82-8224	F4 PI68658 x Lawrence
LG82-8379	F4 PI68508 x FC04007B
LG84-1096	F5 PI297515 x PI290126B
LG85-3343	F5 PI361064 x PI407710
LG86-7382	F9 PI68508 x FC04007B
LG87-1811	F6 PI407720 x PI384474
LG87-1991	F6 PI189930 x PI68600
LG87-496	F6 PI189930 x PI68600
LG88-2227	F6 A78-123018 x PI438205B
LG88-2248	F6 PI438151 x A78-123018
LG88-2696	F6 Ripley x PI370059
LG88-3146	F6 PI427099 x PI445830
LG88-8958	F6 PI253665D x PI283331
LG89-1501	F6 PI68508 x PI384471
LG89-1525	F8 PI90566-1 x L74-3897

LG89-1910 F6 PI437614A x A3127
LG89-6607 F5 LG82-8224 x Hobbit
LG89-6661 F5 Sherman x LG84-1096
LG89-6959 F5 PI358314 x Harper
LG89-7629 F5 Ripley x PI445837
LG89-7657 F5 Ripley x PI438206
LG89-7793 F5 PI391594 x Century
LG89-8286 F5 LG82-3002 x Elgin
LG89-8323 F5 LG82-3002 x Harper
LG89-8665 F5 PI436682 x Ripley
LG89-8810 F5 PI437578 x PI445837
LG9013144 F6 LG82-8224 x Hobbit
LG90-2179 F6 PI437851A x Ripley
LG90-4181 F6 PI436682 x Lawrence
LG94-1129 F6 LG85-3343 x LG87-1991
LG94-4662 F6 PI458511 x Flyer
LG95-5874 F6 LG87-1811 x (LG85-3343 x LG86-7382)
LG95-7682 F6 LG85-3343 x (LG87-1991 x LG87-496)
LG96-1488 F6 LG89-8665 x LG88-2696
LG96-1546 F6 LG89-8810 x LG88-3146
LG96-1713 F6 LG88-3146 x LG88-2248
LG96-1789 F6 LG89-8665 x LG89-7657
LG97-5474 F6 P6906-16 x P5096-03D
LG97-6859 F6 PI503338 x P5096-03D
LG97-6861 F6 PI503338 x P5096-03D
LG97-7022 F6 LG89-1525 x A3322
LG97-7034 F6 LG89-6607 x LG89-1910
LG97-7132 F6 LG89-6959 x LG89-8323
LG97-7363 F6 LG90-2179 x LG88-3146
LG97-7376 F6 LG90-2179 x LG88-3146
LG97-8655 F6 LG88-2227 x A3322
LG97-8764 F6 LG88-3146 x HS89-3261
LG97-8789 F6 LG88-3146 x P5096-03D
LG97-8856 F6 LG90-13144 x LG88-3146
LG97-8905 F6 LG89-6607 x LG88-2227
LG97-9015 F6 LG89-8286 x LG89-6661
LG97-9226 F6 LG89-7629 x 9303
LG97-9239 F6 LG89-7629 x 9303
LG97-9301 F6 LG89-7793 x LG88-8958
LG97-9340 F6 LG89-8286 x LG89-1501
LG97-9384 F6 LG90-2179 x A3322
LG97-9486 F6 LG88-3146 x HS89-3261
LG97-9685 F6 LG89-1525 x A3322

LG97-9692 F6 LG89-1525 x A3322
LG97-9912 F6 LG90-4181 x A3322
P5096-03D A3127 x PI273483
P6906-16 [PI80471 x PI86050] x [Wms 79 (2) x A3127]

Regeneration Plans

USDA - Plant Genetic Resources Conservation Unit

Plans this year will emphasize an increase in the number of regenerations being conducted by the Unit. Funding increases in FY01 and FY02 have resulted in additional labor support for the seed regeneration program of each curator, which will enable a greater number of regenerations to be attempted this year. Each curator will submit a plan to increase the total number of regenerations being conducted in the field and/or greenhouse for their crops. The numbers to be regenerated will not be presented in the report this year, as final determinations have not yet been completed.

The regeneration plan will also include plans to adapt our current field operations to reduce the amount of erosion. Heavy rains last year resulted in soil erosion in some fields where the entire plot area was rototilled. This year curators will develop plans to reduce soil erosion by maintaining a grass or other crop cover on most of the land area or by maintaining plant strips to reduce soil movement from plot areas. These plans will also be highlighted in future reports as they are developed and refined.

Publications:

Alabama

Ball, D.M., and J.A. Mosjidis. 2002. You-ll like this lespedeza. Hay and Forage 17(2):12.

Ball, D.M., J.A. Mosjidis, S. Nightengale, R. Rawls and C. Norris. 2002. AU Grazer - A new sericea lespedeza that tolerates heavy grazing. Timely Information Sheet. 3 p. Alabama Cooperative Extension Service.

Ball, D.M., and J.A. Mosjidis. 2002. Cahaba White vetch. Timely Information Sheet. 5 p. Alabama Cooperative Extension Service.

Dane, F. 2002. Chloroplast DNA investigations in *Citrullus* using PCR-RFLP analysis. ASHS. Cucurbitaceae 2002: 100-108.

Dane, F., and R. Bakhtiyarova. 2003. Diagnostic chloroplast DNA haplotypes to distinguish cultivated from citron type watermelon. Cucurbit Genetics Cooperative (in press).

Mosjidis, J. A., and C. M. Owsley. 2002. Legume cover crop development by NRCS and Auburn University.p.305-309. *In*: van Santen, E. (ed.) Proceedings of the 25th Annual Southern Conservation Tillage Conference for Sustainable Agriculture. Auburn, AL, USA, 24-26 June 2002.

Mosjidis, J. A. 2002. Breeding sericea lespedeza for grazing tolerance. p.28. *In*: Smith, G.R. and G. Evers (ed.) Proceedings of the Seventeenth *Trifolium* Conference, Overton, Texas, April 10-12, 2002.

Mosjidis, J. A. 2002. Registration of 'AU Merit' hairy vetch. Crop Sci. 42:1751.

Voigt, P.W.and J.A. Mosjidis. 2002. Acid-soil resistance of forage legumes as assessed by a soil-on-agar method. Crop Sci. 42:1631-1639.

Arkansas

No publications submitted.

Florida

Bassett, Mark J.. 2003. Inheritance of scarlet color and vein pattern in flowers and oxblood red seedcoat color derived from the interspecific cross of common bean with scarlet runner bean (Phaseolus coccineus L.). J. Amer. Soc. Hort. Sci. 128:559-563.

Georgelis, N. 2002. High fruit sugar characterization, inheritance, and linkage of molecular markers in tomato. Masters Thesis. University of Florida.

Jank, L., K.H. Quesenberry, A.R.S. Blount, and P. Mislevy. 2002. Selection in Setaria sphacelata for winter survival. N.Z. J. Agric. Res. 45:273-281.

Mullaney, J.M., K.H. Quesenberry, and S.T. Talcott. 2002. A breeding perspective on isoflavones in red clover. P. 14. *In* Proceedings of the 17th Trifolium Conference, Overton, TX 10-12 April 2002.

Quesenberry, K.H., A.R. Blount, L.S. Dunavin, and P. Mislevy. 2002. Development of an improved non-dormant red clover for the southeastern USA. *In* Proceedings of the 17th Trifolium Conference, Overton, TX 10-12 April 2002.

Scott, J.W. 2002. A new allele at the potato leaf locus derived from *L. chilense* accession LA 1932 is discovered in a geminivirus resistance project. Report. Tomato Genetics Cooperative 52:31-33.

Scott, J.W., D.M. Francis, S.A. Miller, G.C. Somodi, and J.B. Jones. 2003. Tomato bacterial spot resistance derived from PI 114490; Inheritance of resistance to race T2 and relationship across three pathogen races. J. Amer. Soc. Hort. Sci. 128(4): in press.

Georgia

No publications submitted.

Guam

Marutani, M. 2002. Report: Cultivar evaluation of tomato 2002: Disease tolerance of small sized tomato to bacterial leaf spot (Xanthonomas campestris pv. vesicatoria). This report was submitted to Asian Vegetable Research Development Center in Taiwan.

Hawaii

Nagao, M.A., Ito, P.J., Tsumura, T. and Kawabata, A.M. 2003. Selection for new macadamia varieties. Hawaii Macadamia Nut Assoc. 43 Annual Proc. In press.

Kentucky

No publications submitted.

Louisiana

D.R. La Bonte, J.M. Cannon, C.A. Clark, A.Q. Villordon, P.W. Wilson, A.H. Hammond, and R.N. Story. 2003. 'Bienville' sweetpotato. HortScience 38:473-474.

Buteler, M.I., D.R. La Bonte, R.L. Jarret, and R.E. Macchiavelli. 2002. Microsatellite-based paternity analysis in polyploidy sweetpotato. J. Am. Soc. Hort. Sci. 127:392-396.

Fajardo, D.S., D.R. La Bonte, and R.L. Jarret. 2002. Identifying and selecting for genetic diversity in Papua New Guinea sweetpotato, Ipomoea batatas (L.) Lam. Germplasm collected as botanical seed. Genet. Resour. Crop Evol. 49:463-470.

Mao, L, R.N. Story, A.M. Hammond, J.K. Peterson, and D.R. La Bonte. 2002. Effects of previous insect feeding injury to sweet potato on resistance to sweet potato weevil (Coleoptera: Curculionidae) and storage root chemistry. J. Entom. Sci. 38:72-83.

Mississippi

Coker, Christine, and Mike Ely. 2002. Yardlong bean: a new crop for Mississippi growers and consumers. Journal of the Mississippi Academy of Sciences 47(1):15.

Macoon, B., B. Boyd, and F.T. Withers, Jr. 2002. Perennial peanut adaptability to central and south Mississippi. MAFES Information Bull. 387:30.

Macoon, B., B. Boyd, and F.T. Withers, Jr. 2002. Eastern gamagrass variety trial. MAFES Information Bull. 387:27.

Zhang, Xiang-Dong, Callahan, F. E., Jenkins, J. N., Ma, D. P., Karach, M. Saha, S., Creech, R. G. 2002. A novel root-specific gene, MIC-3 with increased expression in nematode-resistant cotton (*Gossypium hirsutum* L.) after root-knot nematode infection. Biochim. Biophys. Acta 1576:214B218.

Krans, J.V., H.W. Philley, M. Tomaso-Peterson, J.M. Goatley, Jr., B.A. Stewart, D.W. Wells, and V.L. Maddox. 2002. Registration of MSRS-328 and MSRS-330 creeping bentgrass germplasms. Crop Sci. 42:319.

Carvajal-Rebanales, Carmen R. 2002. Effect of cultivar and temperature on germination, lipid and carbohydrate content, and peroxidase activity of cowpea seed. Ph.D. Diss., Mississippi State Univ. 99p.

Chozin, Mohammad. 2002. Inheritance of drought resistance in cowpea [*Vigna unguiculata* (L.) Walp.]. Ph.D. Diss., Mississippi State Univ. 78p.

Carvajal, R., C. E. Watson, K. Connor, and J. O. Garner. 2002. Effect of carbohydrate composition and temperature on seed germination of cowpea cultivars. J. Miss. Acad. Sci. 47:17.

Carvajal, R., J. O. Garner, and C. E. Watson. 2002. Effect of fatty acid composition and temperature on seed germination of cowpea cultivars. J. Miss. Acad. Sci. 47:18.

Cheatham, C.L. Genetic and combining ability of yield and fiber properties associated with selected American and Australian cotton genotypes. Ph.D. Dissertation. 2001. Mississippi State University. 118 p.

Williams, W.P., and F.M. Davis. 2002. Registration of maize germplasm line Mp716. Crop Sci. 42:671-672.

Gutiérrez, O.A., S. Basu, S. Saha, J. N. Jenkins, D. B. Shoemaker, C. L. Cheatham, and J. C. McCarty, Jr. 2002. Genetic distance among selected cotton genotypes and its relationship with F2 performance. Crop Sci. 2002 42: 1841-1847

McCarty, Jack. C., Jr., and Johnie N. Jenkins. 2002. Registration of 16 day length-neutral flowering primitive cotton germplasm lines. Crop Sci. 42:1755-1756.

North Carolina

Barrientos-Priego, L., T.G. Isleib, and H.E. Pattee. 2002. Variation in oil content among Mexican and Peruvian *hirsuta* peanut landraces and virginia-type *hypogaea* lines. Peanut Sci. 29: 72-77.

Beam, J.B., D.L. Jordan, A.C. York, J.E. Bailey, T.G. Isleib, and T.E. Mackenzie. 2002. Interaction of prohexadione calcium with agrichemicals applied to peanut (*Arachis hypogaea* L.). Peanut Sci. 29: 29-34.

Bowman, D. T. 2002. North Carolina Measured Crop Performance-Small Grain. N. C. Agri. Res. Serv. Rept. No. 200, 45p.

Bowman, D. T. 2002. North Carolina Measured Crop Performance-Corn and Corn Silage. N.C. Agri Res. Serv. Rept. No. 201, 36p.

Bowman, D. T. 2002. North Carolina Measured Crop Performance-Soybean and Cotton. N. C. Agric. Res. Serv. Rept. No. 204. 51p.

Castillo, F., E. Herrera, V. Moreno, J. Romero, I. Nunez, V. Ballesteros, J. Sanchez, R. Ortega, P. Ramirez, A. Kato, M. M. Goodman, M. E. Smith, A. Ramirez, C O. Qualset, and F. Espejel. 2002. Potential of local diversity for the improvement of maize production in Mexico. pp. 55-56 in Chavez-Servia, J L., L. M. Arias-Reyes, D. I. Jarvis, j. Tuxill, D. Lope-Alzina, and C. Eyzaguirre (eds.) Proc. Symp.: Managing Crop Diversity in Traditional Ecosystems. Feb. 13 - 16, 2002. Merida, Mexico. IPGRI, Rome.

Cervantes-Martinez, C.T., K.J. Frey, P.J. White, D.M. Wesenberg, and J.B. Holland. 2002. Correlated responses to selection for greater beta-glucan content in two oat populations. Crop Sci. 32:730-738.

Cox, T.S., M. Bender, C. Picone, D. L. Van Tassel, J.B. Holland, E.C. Brummer, B.E. Zoeller, A.H. Paterson, and W. Jackson. 2002. Breeding perennial grain crops. Critical Reviews in Plant Sci. 21:59-91.

Goodman, Major M. 2002. New sources of germplasm: Lines, transgenes, and breeders. Pp. 28 - 41 in J.M. Martinez R., F. Rincon S, and G. Martinez G. (eds.), Mem. Congresso Nacional de Fitogenetica, Univ. Autonimo Agr. Antonio Narro, Saltillo, Coah., Mexico.

Holbrook, C.C., and T.G. Isleib. 2001. Geographical distribution of genetic diversity in *Arachis hypogaea*. Peanut Sci. 28: 80-83.

Holland, J.B., Å. Bjørnstad, K.J. Frey, M. Gullord, and D.M. Wesenberg. 2002. Recurrent selection for broad adaptation affects stability of oat. Euphytica 126: 265-274.

Holland, J.B., W.E. Nyquist, and C.T. Cervantes-Martinez. 2003. Estimating and interpreting heritability for plant breeding: An Update. Plant Breeding Reviews. 22:9-112.

Holland, J.B., V.A. Portyanko, D.A. Hoffman, and M. Lee. 2002. Genomic regions controlling vernalization and photoperiod responses in oat. Theoretical and Applied Genetics 105:113-126.

Isleib, T.G., C.C. Holbrook, and D.W. Gorbet. 2001. Use of plant introductions in peanut cultivar development. Peanut Sci. 28: 96-113.

Johnson, E. S., M. F. Wolff, and E. A. Wernsman, W. R. Atchley and H. D. Shew. 2002. Origin of the black shank resistance gene, *Ph*, in tobacco cultivar Coker 371-Gold. Plant Dis. 10:1080-1084.

Johnson, E. S., M. F. Wolff, E. A. Wernsman, and R. C. Rufty. 2002. Marker-assisted selection for resistance to black shank disease in tobacco. Plant Dis. 10:1303-1309.

Li, H. and Burton, J.W. 2002. Selection for increased seed density: Method for indirectly increasing soybean seed protein. Crop Science 42:393-398.

Li, L., and R. Qu. 2002. *In vitro* somatic embryogenesis in turf-type bermudagrass -- Roles of ABA and GA, and occurrence of repetitive somatic embryogenesis. *Plant Breeding* 121: 155-158.

Matsuoka, Y., Y. Vigouroux, M. M. Goodman, J. Sanchez G., E. Buckler, and J. Doebley. 2002. A single domestication for maize shown by multilocus microsatellite genotyping. PNAS 99:6080-6084.

Murphy, J.P., R.A. Navarro, S. Leath, and D.T. Bowman. 2002. Registration of 'NC Hulless' oat. Crop Sci. 42:311.

Murphy, J.P., R.A. Navarro and S. Leath. 2002. Registration of NC99BGTAG11 wheat germplasm resistant to powdery mildew. Crop Sci. 42:1382.

Murphy, J.P., R.A. Navarro, S. Leath and D. Bowman. 2002. Registration of 'NC Hulless' oat. Crop Sci. 42:311.

Pattee, H. E., T.G. Isleib, F.G. Giesbrecht, and Z. Cui. 2002. Prediction of parental genetic compatibility to enhance flavor attributes of peanuts. Chapter 17, pp. 217-230. *In* Rajasekaran, K., T.J. Jacks, and J.W. Finley (eds.), Crop Biotechnology, ACS Symposium Series 829; American Chemical Society: Washington, DC, 2002.

Pattee, H.E., T.G. Isleib, D.W. Gorbet, and F.G. Giesbrecht. 2002. Selection of alternative genetic sources of large seed size in virginia-type peanut - Evaluation of sensory, composition and agronomic characteristics. J. Agric. Food Chem. 50: 4885-4889.

Pattee, H.E., T.G. Isleib, D.W. Gorbet, F.G. Giesbrecht, and Z. Cui. 2001. Parent selection for breeding for roasted peanut flavor quality. Peanut Sci. 28: 51-58.

Pattee, H.E., T.G. Isleib, D.W. Gorbet, K. Moore, Y. Lopez, M.R. Baring, and C.E. Simpson. 2002. Effect of the high oleic trait on roasted peanut flavor in backcross-derived breeding lines. J. Agric. Food Chem. 50:7362-7365.

Pattee, H.E., T.G. Isleib, K. Moore, D.W. Gorbet, and F.G. Giesbrecht. 2002. Effect of the high-oleic trait and paste storage variables on sensory attribute stability of roasted peanuts. J. Agric. Food Chem. 50:7366-7370.

Sharp, G. L., J. M. Martin, S. P. Lanning, N. K. Blake, C. W. Brey, Sivamani, E., Qu, R. and L. E. Talbert. 2002. Field evaluation of transgenic and classical sources of wheat streak mosaic virus resistance. *Crop Sci.* 42: 105-110

Silva I.R., T.J. Smyth, C.D. Raper, T.E. Carter, T.W. Rufty. 2001. Differential aluminum tolerance in soybean: an evaluation of the role of organic acids. Physiol Plant 112: 200-210.

Sivamani E., C. W. Brey, L. E. Talbert, W. E. Dyer, W. K. Kaniewski, M. Young, and R. Qu. 2002. Resistance to wheat streak mosaic virus in transgenic wheat engineered with the viral coat protein gene. *Transgenic Res.* 11: 31-41.

Stalker, H. T. and L. G. Mozingo. 2001. Molecular markers of *Arachis* and marker-assisted selection. Peanut Sci. 28:117-123.

Stalker, H. T., T. Halward, and G. Kochert. 2001, pp. 285-299. RFLP map of peanut. *In*: R. L. Phillips and I. K. Vasil (eds.) DNA-Based Markers in Plants. Kluwer Academic Publishers, The Netherlands.

Stalker, H. T., M. E. Ferguson, J. F. M. Valls, R. N. Pittman, C. E. Simpson, P. Bramel-Cox. 2002. Catalog of *Arachis* Germplasm Collection. Web version. http://www.icrisat.org/text/research/grep/homepage/groundnut/arachis/start.htm.

Stalker, H. T. M. K. Beute, B. B. Shew, and K. R. Barker. 2002. Registration of two root-knot nematode-resistant peanut germplasm lines. Crop Sci. 42: 312-313.

Stalker, H. T., M. K. Beute, B. B. Shew, and T. G. Isleib. 2002. Registration of Five Leaf Spot-Resistant Peanut Germplasm Lines. Crop Sci. 42: 314-316.

Stalker, H. T. and R. E. Lynch. 2002. Registration of four insect-resistant peanut germplasm lines. Crop Sci. 42:313-314.

Zhou, X., T. E. Carter, Jr., Z. Cui, S. Mayazaki, and J. W. Burton. 2002. Genetic diversity patterns in Japanese soybean cultivars based on coefficient of parentage. Crop Sci. 42:1331-1442.

Oklahoma

No publications submitted.

Puerto Rico

González Vélez, A. and C.E. Ortiz. 2002. Potencial de *Colocasia esculenta* var. a*ntiquorum* como cultivo en Puerto Rico. J. Agric. Univ. PR 86:77-80.

Vélez Colón, R., S.A. Henríquez and R. Machiavelli. 2003. Preliminary results of a guava (*Psidium guajava*) trial at the Juana Díaz Substation of the University of Puerto Rico. Submitted for publication J. Agric. Univ. PR.

Saunders, J., Bailey, B., Howers, J., Goenaga, R., Hebbar, P., Mischke, S., Sanogo, S. and Schnell, R. 2002. The USDA Program for *Theobroma cacao* - Molecular Genomics, Disease Resistance and IPM Strategies. The Manufacturing Confectioner 82(9):109-119.

Goenaga, R. 2002. Puerto Rico-s Tropical Agriculture Research Station: 100 Years of Tropical Research. Fruit Gardener 34:14-2.

Ferwerda-Licha, M. and Pingel, R.L. 2003. Ongoing survey on the incidence of papaya ringspot virus in weeds found in a papaya field in northern Puerto Rico. Phytopathology 93:525 (Abstract).

Pingel, R.L. and Epsky, D. 2002. Field trials of lures to attract fruit flies (Diptera: Tephritidae) in commercial sapodilla, mamey sapote, and carambola orchards in Puerto Rico. Poster presentation at the National Meetings of the Entomological Society of America, Ft. Lauderdale, FL.

Goenaga, R. and Smith, J.R. 2002. Dry matter production and leaf elemental concentrations of common bean grown on an scid Ultisol. J. Plant Nutr. 25:103-112.

Irizarry, H. and Goenaga, R. 2003. Release of Cacao Clonal Selections. Germplasm Release.

South Carolina

No publications submitted.

Tennessee

No publications submitted.

Texas

No publications submitted.

Virgin Islands (U.S.)
No publications submitted.

Virginia

Bhardwaj, H.L., A.A. Hamama, 2003. Accumulation of glucosinolate, oil, and erucic acid in developing Brassica seeds. Ind. Crop. Prod. 17:47-51.

Borsch, T., K.W. Hilu, D. Quandt, V. Wilde, C. Neinhuis, W. Barthlott, 2003. Noncoding plastid trnT-trnF sequences reveal a well resolved phylogeny of basal angiosperms. J. Evol. Biol. 16:558-576.

Nikus, J., A. Esen, L.M.V. Jonsson, 2003. Cloning of a plastidic rye (Secale cereale) beta-glucosidase cDNA and its expression in Escherichia coli. Physiol. Plant. 118:337-345.

Sauquet, H., J.A. Doyle, T. Scharaschkin, T. Borsch, K.W. Hilu, L.W. Chatrou, A. Le Thomas, 2003. Phylogenetic analysis of Magnoliales and Myristicaceae based on multiple data sets:

implications for character evolution. Bot. J. Linnean Soc. 142:125-186.

Verdoucq, L., M. Czjzek, J. Moriniere, D.R. Bevan, A. Esen, 2003. Mutational and structural analysis of aglycone specificity in maize and sorghum beta-glucosidases. J. Biol. Chem. 278:25055-25062.

USDA - Plant Genetic Resources Conservation Unit

Duke, S.O., S.R. Baerson, F.E. Dayan, A.M. Rimando, B.E. Scheffler, M.R. Tellez, D.E. Wedge, K.K. Schrader, D.H. Akey, F.H. Arthur, A.J. De Lucca, D.M. Gibson, H.H. Harrison Jr, J.K. Peterson, D.R. Gealy, T. Tworkoski, C.L. Wilson, and J.B. Morris. 2003. United States Department of Agriculture-Agricultural Research Service research on natural products for pest management. Pest Management Science 59:708-717.

He, G., R. Meng, M. Newman, G. Gao, R.N. Pittman, C.S. Prakash. 2003. Microsatellites as DNA markers in cultivated peanut (Arachis hypogaea L.). BMC Plant Biology 2003 3:3.

Jarret, R.L., B. Perkins, T. Fan, A. Prince, K. Guthrie, and B. Skoczenski. 2003. Using EIA to screen *Capsicum* spp. germplasm for capsaicinoid content. Journal of Food Composition and Analysis (accepted).

Morris, J.B. 2003. Legumes. p. 365-372. *In* S.H. Katz and W.W. Weaver (eds.) Encyclopedia of Food and Culture. Vol. 2. Charles Scribner-s and Sons, New York.

Morris, J.B. 2003. Bio-functional legumes with nutraceutical, pharmaceutical, and industrial uses. Economic Botany 57:254-261.

Morris, J.B. 2003. Guar: A potential new crop in Georgia, USA. Assoc. for the Advancement of Industrial Crops Meeting. Abstract p. 48.
Morris, J.B., K.M. Moore, and J.B. Eitzen. 2003. Velvetbean: A special-purpose legume for important agricultural and medicinal applications. Agronomy Abstracts (CD-ROM).

Pederson, G.A. 2003. Data submission by users of plant genetic resources. Agronomy Abstracts (CD-ROM).