Project Number: S-009

Project Title: Plant Genetic Resources Conservation and Utilization

Period Covered: 01/2001 through 8/2001

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Annual Meeting Dates: August 7-8, 2001

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 more than 82,000 accessions representing more than 1470 species and 265 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: A cowpea breeding line (GC-86L-98) was released with resistance to Cucumber mosaic virus (CMV) and Blackeye cowpea mosaic virus. This is the first reported cowpea germplasm line with CMV resistance. These two viruses produce cowpea stunt, which is the most important disease of cowpeas in the southeastern U.S. This line produces nice pods with large, round, white seeds and matures about 105 days after planting under Georgia growing conditions. GC-86L-98 offers an option for direct use as a late garden variety and should be useful in breeding for the control of cowpea stunt disease in commercial cultivars.

Vigna germplasm winter greenhouse regeneration involved 45 lines of *V. unguiculata* subspecies received from the International Institute for Tropical Agriculture. Seed was obtained from 43 lines after many months involving picking mature pods almost every day after flowering. In addition, 200 Vigna lines were grown in the field and greenhouse during the summer with seed being obtained from only 120 lines due to poor flowering because of photoperiod problems. An additional 50 lines were grown at Isabela, Puerto Rico, with all lines producing at least some seed. Virus spread was of some concern in Puerto Rico in this field because of viruses introduced in the seed. Virus spread is more of a problem in Georgia because of the endemic viruses. In both locations, virus-free seed reduces the infections in the regeneration field.

Research has continued to identify the virus(es) causing mosaic symptoms in *Crotalaria* species in germplasm regeneration plots. Serology has identified viruses related to alfalfa mosaic

virus (AlMV) ,cucumber mosaic virus, blackeye cowpea mosaic virus, and peanut stunt virus (PSV) present in the plants in the field. Host range studies show a mild mosaic with severe necrosis or death on *Nicotiana benthamiana* as well as usual mosaic or local lesions on other hosts. After infected Crotalaria taken from the field was in the greenhouse for a number of months, extracts produced only AlMV in serological tests, but these extracts still produced the same symptoms on *N. benthamiana*. RT-PCR tests with primers for AlMV, CMV, and PSV did not produce diagnostic fragments with extracts from these plants. The search for the causal agent is still in progress.

Work is in progress to evaluate the relationships of the subspecies of *Vigna unguiculata* using AFLP and SSR markers. The AFLP portion of the study has been completed. The SSR work is in the early stages using primers published by workers at IITA in Nigeria in cooperation with others to evaluate relationships of cowpea cultivars and breeding lines.

Peanut: Six hundred eighty peanut accessions were increased at Byron, GA. This included several new entries to the collection. A new disease control spray program was used this year starting 30 days after planting with two different fungicides used every two weeks. In addition, a new irrigation system was used this year. The new spray program and irrigation system resulted in increased yields of the accessions. Herbicides were applied during the growing season but control was difficult due to regrowth after rainfall during the middle of the season.

The screenhouse refurbishing was finished in March of 2001. This included all new screens, new doors, a new overhead watering system and leveling of the soil. Twenty-seven PI's from 16 species from seven sections of *Arachis* were put into 11 gal. pots in the screenhouse for seed increase. Several accessions produced several thousand seeds while others produced very few seeds. The screenhouse has become an incredible tool for increasing wild Arachis species.

A set of 22 *Arachi*s DNA samples, including 18 cultivated and 4 wild accessions, were screened against 55 AFLP primer sets to identify polymorphic markers. No polymorphisms were found in the cultivated material. DNA was extracted from 135 wild accessions, and AFLP profiles were generated for each sample using three optimal primer sets identified in the previous screen. Data has been compiled and analyzed for this material. A manuscript is in process, but we are still waiting for the inclusion of several additional wild species that should arrive early 2002.

Scanned images, from cultivated and wild peanuts, are now being taken from pods and seeds. These images will eventually be put into GRIN in order to allow anyone to see what the seeds and pods look like. This will also allow scientists to see actual examples of pod and seed characteristics.

In the summer of 2001, we implemented a bar code system in the greenhouse and field increases and research plots. The bar code system has allowed us to keep an inventory of the greenhouse that be updated in as little as 15 minutes and has allowed us to take notes in the field, greenhouse, or screenhouse with more accuracy and speed. With the bar code system, the information is inputted once thus reducing human error and making the collection information more reliable to the end user.

After harvest this year, 250 selections were made from F2 and F3 material from crosses of Southeastern adapted varieties with Bayo Grande. After evaluation of the seed, 217 selections were kept for further evaluation. A total of 36 and 22 advanced lines were kept for further evaluation based on taste, yield, and disease resistance. This multidisciplinary breeding project

involves a plant pathologist, entomologist, agronomist, and peanut geneticist making evaluations and selections together.

A survey of New Mexico sites found Blackhull and Southern Blight to be the major problems to peanuts there. Few diseases were found in southwest Texas.

Clovers, Grasses, New Crops, Misc. Legumes and Misc. Crops: During this year we regenerated 23 annual clovers, 51 legumes, 57 guar, 4 winged bean, 2 sesame, 8 kenaf, 1 castor, 20 miscellaneous crops, and 75 grass accessions resulting in a total of 241 accessions regenerated out of a possible 388 attempted. All regenerations were based on importance, low viability, seed age, low seed numbers, and original seed only. Some species are perennial and require a second year for seed production. Losses occurred because of extremely low viability and low vigor. Additional losses occurred because a period of rainfall delayed planting until June 20. This late planting resulted in a growing season too short for some accessions.

Eight kenaf were successfully regenerated in the field at Byron. Two velvetbean accessions which did not produce seed last year were grown for one year in the greenhouse and transplanted this year with successful seed regeneration. This confirms our hypothesis that velvetbean requires an additional year as well as short photoperiods to flower.

Numerous accessions (1,984) of annual clovers, special-purpose legumes, new crops, miscellaneous crops and grasses were sent to researchers throughout the world for research use regarding phyllogeny, plant identification, sustainable agriculture, pasture evaluation, ozone, AFLP molecular markers, pharmacetical crop evaluation, forage screening, genes coding for enzymes, crop adaptation studies, molecular evolution of mitochondrial genes, education, magnesium and calcium content, exhibit, market development, gene banks, ornamental evaluation, molecular taxonomy, pest research, germplasm exchange, cover cropping, game management, botanical garden, clinical nutrition studies, enzyme and production research, pharmaceutical and nutraceutical research, weed research, salt tolerance, variety testing, seed identification, plant survival studies, stomatal response to light and CO2 concentration, cytogenetic studies, host range studies, fodder, class demonstration, drought tolerance, dryland production, oil composition, new crop development, commercial trials, animal feed supplements, biological control, archaeobotany, gene evolution, browse research with African hoofstock, biointensive gardening, protein sources, and food self sufficiency.

Through collaborative efforts, we have discovered that variability does exist among *Canavalia ensiformis* accessions for reducing root-knot nematode galls when added as a soil amendment. Furthermore, legume and new crop species including *Cyamopsis tetragonoloba* have been identified as having useful and value-added therapeutically-effective phytopharmaceutical characteristics including use as a laxative in addition to its current food additive and dietary fiber uses.

Study of AFLP banding patterns in subterranean clover showed similarities and differences among 255 subclover accessions. A manuscript is in preparation detailing relationships among these accessions.

Vegetable Crops: A total of 150 accessions of watermelon (*Citrullus* sp.) were regenerated in the field in Byron, GA. As in previous years, pollination cages with honeybees were utilized. Seed yields per cage were good to excellent. Minimal problems were encountered with diseases or insect pests during the growing season. Complete characterization data were recorded on all

accessions and these data were tabulated and forwarded to the GRIN database operator. The seed extraction facilities in Byron used for watermelon were improved via the addition of a new (unit-made) table, and the installation of an awning above the seed cleaning area. In addition to the accessions that were increased in the field, 10 additional accessions of *Citrullus* sp. were pre-increased in the greenhouse using hand pollinations (sib-matings). The original seed of these accessions had low (<5%) germination. They will be scheduled for a normal regeneration in 2002.

Fifty-two accessions of chiles (*Capsicum* spp.) were increased in the field this year. This was the first year that controlled pollination of *Capsicum* spp. was attempted at Griffin. The cage covers and galvanized frames worked well, although removal of the hold-downs from the clay soil in Griffin was difficult. Minimal disease or pest problems were encountered. Although many of the accessions flowered late in the year (September) high seed yields were obtained from most (>90%) accessions. A modified seed extraction technique utilizing a commercial blender was also developed. Characterization data were collected on all accessions, and all accessions were checked for their correct taxonomic identification. Characterization data and taxonomic classification data were tabulated and forwarded to the GRIN database operator. In addition to the accessions increased in the field, five additional Capsicum accessions were pre-increased simultaneously in the greenhouse. These materials had less than 5% germination when initially planted for increase. Seed was collected from these for a normal regeneration in FY2002. A proposal requesting funds for characterization of the Capsicum core collection was submitted to the Capsicum CGC.

Twenty accessions of squash (*Cucurbita moschata*) were increased in the field in Byron, GA. Based on previous regenerations, increased spacing between plants and between rows was utilized. This facilitated the identification and isolation of flowers for controlled (hand) pollination. Above-average seed yields were obtained from 12 (60%) of the accessions, with the remainder (9) producing average seed yields. Only a single accession did not flower. Photographs were taken of the fruit of each accession, and characterization data were collected on these. The many unique morphological characteristics associated with this species prompted a revision of the existing S-9 squash descriptors, and the development of a descriptor list specific to this crop. All characterization data and descriptors were forwarded for entry into GRIN.

One of the most challenging groups included in the vegetable crops program is the misc. cucurbits. Members of this group are taxonomically diverse. In many instances, no or only minimal information is available in the scientific literature regarding the flowering or cultural requirements of individual species. Seed inventory levels of many accessions are low, and/or the seed is old with low vigor or viability. This year we continued our efforts to empirically determine which species in this group could be regenerated under the environmental conditions in Griffin (in the field or greenhouse). Ten accessions of various species (one per genera) were evaluated in 2001. The seed of five of these (Grif 14032, PI596673, PI179663, PI319698 and PI532432) did not germinate. The remainder were grown on or near a trellis in the field at Griffin. *Sicana oderifera* is marginal in that although the plants do begin to flower in late September, no mature fruit were recovered before the first frost. In contrast, abundant mature fruit and seed of *Diplocyclos palmatus* were readily obtained. *Polyclathra cucumerina* (PI 438922) did not flower in the field. This species was found to be photoperiod (short-day) sensitive. Fruit and seed were recovered (from plants maintained in the greenhouse) from sib-mated individuals. This species was found to be night flowering. *Dieterlea fusiformis*

produced a small number of fruit and approximately 50 seed were recovered. Mature fruit and seed of *Apodanthera undulata* (PI 512089) were recovered from field grown plants. Photographs were taken of fruit, flowers, and vegetative parts of the plants from which seed were harvested. A germplasm evaluation proposal was submitted to solicit funding to evaluate inter- and intra-population diversity of *Cucurbita okeechobeensis* var. *okeechobeensis*.

In addition to the previous, two accessions of *Lagenaria siceraria* were grown in response to a request from Dr. S. Bozarth in support of his anthropological studies. At maturity, fruit were harvested and sent to Dr. Bozarth.

Fifty accessions of okra (*Abelmoschus* spp.) were grown in the field in Byron, GA. Germination of seed of most (>90%) accessions was high after direct seeding into the field. However, as in previous years (FY1999 and 2000, but not 1998), plants emerged slowly and subsequent growth was slow. Eight weeks after emergence, all accessions exhibited stunting. As in previous years, stunted plants with attached soil were examined for the presence of nematodes. However, no nematodes were observed. Few plants ultimately flowered. Few seed were collected. No characterization data were recorded.

Nine accessions of morning glory (*Ipomoea* spp.) were increased in the greenhouse. Species increased included *Ipomoea trifida, I. triloba, I. ternifolia, I. tiliacea*, and *I. grandifolia*. These are predominantly short-day self-incompatible species. More than 4,000 hand pollinations were made with these materials over a period of 8 weeks. Adequate numbers of seed (>1,000) were obtained from 7 of these accessions. No seed were obtained from the accession of *I. tiliacea*. The taxonomic identification of all accessions was confirmed or corrected as required. Photographs were taken of flowers and vegetative parts of a representative example of each species.

Approximately 700 accessions of sweetpotato (*Ipomoea batatas* (L.) Lam.) were regenerated in vitro. The unit operations manual was updated to include minor modifications to the in vitro maintenance procedures. Eleven new accessions were released from Plant Quarantine in Beltsville and received for maintenance. These were propagated via subculture of nodal segments, and added to the existing inventory. The maintenance temperature of the in vitro collection was adjusted to 19°C (from 20°C) in order to slow growth.

Guam

Plant germplasm was collected and evaluated in the Vegetable Research Unit of the Guam Agricultural Experimental Station. Crops tested in 2001 included sweetpotato (*Ipomoea batatas* (L.) Lam.), vegetable soybean (*Glycine max* (L.) Merr.), and tomato (*Lycopersicon esculenta* Mill.). Sweet potato accessions were originally obtained from the Asian Vegetable Research Development Center (AVRDC) in Taiwan as seeds and in-vitro plantlets from USDA/ARS in Georgia. Additionally several local cultivars including two germlines from the neighbor island of Rota were evaluated for their adaptability to Guam cobbly clay soil.. Occurrence of slug (*Veronicella cubensis* Pfelffer), sweetpotato weevil (*Cylas formicarius* F.) and sting bug (*Brachyplatys insularis* Ruckes) were major pests in the field trials. Plant characteristics tested included growth habit, skin and fresh color, shape of tuberous roots, and leaf shape. A cultivar from Rota has appealing purple fresh color.

Soybean accessions originated from the AVRDC breeding program were also evaluated in Guam cobbly clay soil. Cultivars with two or more seeded pods were selected for advance

testing. Five medium to large sized tomato cultivars were evaluated for local fresh market. They were evaluated for their yield and fruit quality. All cultivars were bred for heat tolerance and were available from U.S. commercial seed companies. A small sample set of seeds of five tomato cultivars were also distributed to eight local growers. Three growers planted them on their farms and recognized that cultivar 'Solar Set' was superior.

In the Horticultural Laboratory of the University of Guam, tissue-cultured banana (*Musa* spp.) cv. Macao was produced and distributed to local community. Two factsheets were produced to promote growing healthy disease free garden/yard plants.

To increase plant acquisition and plant propagation activity, a plant nursery and a shadehouse are being improved as part of the horticultural program at the University of Guam. Expansion of our existing wet lab will add an area for sorting and cleaning harvested plant materials.

Hawaii

Vegetative flushing in late autumn and early winter is associated with irregular spring flowering of lychee (*Litchi chinenesis* Sonn) trees and can result in inconsistent yields. A study was conducted to determine if tip pruning of vegetative flushes emerging on 'Kaimana' lychee trees in early winter could enhance spring flowering. Results from this study confirmed that a resting period during early winter was conducive to floral initiation in lychee. Results also showed that vegetative flushing occurring during early winter reduced flowering of Kaimana trees and that pruning of young flushes, which emerged during early December, stimulated flowering. Increased flowering may not necessarily result in greater yields, as low soil moisture and low humidity during blooming and fruit set can cause abscission of flowers and fruitlets and reduce yields. Thus it is imperative that sufficient irrigation is available to trees during flowering and fruit set to obtain maximum yield.

Flowering of longan (*Dimocarpus longan* (Lour.) Steud.) in Hawaii is often inconsistent which leads to erratic production and poor yields. A study was conducted to determine if soil application and foliar sprays of KClO3 were effective for inducing flowering of longan in Hawaii. Treatments consisted of evenly broadcasting KClO3 under the canopy of each tree in an area extending to about 1.5 meters away from the trunk. All leaves and loose organic matter were removed from under the canopy prior to application, and trees were immediately irrigated to deliver the KClO3 to the root zone. Synchronous flowering and uniform fruit set of four longan cultivars ('Kohala', 'Sri Chompoo', 'Biew Kiew', and 'E-Wai') were stimulated 2 months after ground applications of potassium chlorate (KClO3).

In a second study 10 year-old air layered 'Kohala' trees growing under similar conditions were treated in December with a foliar spray of 0 or 2.0 g/l KClO3 applied to run-off. Foliar applications containing of 2.0 g/l KClO3 stimulated flowering within 2 months after application, but flowering was limited to the treated branches. Soil application of KClO3 effectively stimulated flowering of longan trees within 2 months after application and resulted in earlier, more profuse and more synchronous flowering, and in a greater amount of fruit set. The increased fruit set and crop load following treatment with KClO3 indicate that further studies are necessary to investigate effect of KClO3 on fruit size and quality, return bloom and long term tree vigor. Since flowering was more synchronous with potassium chlorate than in untreated trees, fruit maturation was also more uniform. Under these circumstances fruit maturation in

treated trees should be monitored closely so that trees are harvested when fruits attain optimum quality as over maturation can result in less than optimal fruit quality (reduced soluble solids, off-flavor, fruit cracking).

Virgin Islands

New papaya varieties from Brazil, Cuba, and Uganda were grown and evaluated for their production potential, fruit quality and tolerance to local diseases and pests. These new papaya varieties were added to the papaya collection now consisting of 52 varieties that have been evaluated for growth and production in the USVI. The Virgin Islands is semiarid with calcareous soils, pH 8.5, and most commercial varieties are not tolerant to these conditions.

Breeding and selection continues for developing early-bearing papaya. Three lines have been developed that start setting fruit between 50-100 cm from the ground.

A collection of native *Passiflora* species was established consisting of *P. edulis* f. *flavicarpa, P. foetida, P. laurifolia, P. quadranularis*, and *P. suberosa*.

Tissue culture has been successfully used to propagate the Sandy Point Orchid (*Phychilis macconelliae*) from seed. This orchid has been listed as an endangered plant species in the USVI. Plants, from tissue culture, have been established under greenhouse conditions and will be re-released into their native habitat.

Through field days and tours, the local population of the US Virgin Islands were made aware of the native population of Passiflora and orchids and how to identify them if seen in the wild.

Oklahoma

'Ozarka' bermudagrass [*Cynodon dactylon* (L). Pers.] was jointly released in 2001 by the Missouri, Oklahoma, Kansas, and Arkansas Agricultural Experiment Stations, the USDA Agricultural Research Service, and the Samuel Roberts Noble Foundation. Ozarka is a clonally propagated forage type bermudagrass tested under the experimental designation 74X 12-6. Ozarka is an F_1 hybrid resulting from the crossing of *C. dactylon* PI 253302 and 'Coastal' bermudagrasses in 1974. PI 253302 was introduced from Yugoslavia. Coastal is the F_1 hybrid of 'Tift' bermudagrass and a plant introduction from South Africa. By the mid-1980's, initial field screening of several hundred F_1 bermudagrass plants from various crosses identified Ozarka as having desirable performance characteristics and resulted in its advancement to replicated performance testing. Ozarka is relatively upright and tall growing in comparison to more decumbent cultivars such as 'Greenfield'. It's excellent stand persistence in humid environments suggest, as do field observations, that it has good resistance to diseases that may cause stand thinning. Although a tetraploid with 2n=4x=36 chromosomes, Ozarka produces few seeds and must be propagated vegetatively. Available evidence indicates Ozarka to be well adapted to the southern one-half of Missouri and Kansas, and statewide in Oklahoma and Arkansas. The Oklahoma Agricultural Experiment Station will maintain breeder stock. The Missouri and Oklahoma Foundation Seed Stocks will respectively direct foundation sprig production in Missouri and Oklahoma.

'Riviera' seeded turf type bermudagrass, tested as OKS 95-1, was proposed for release. OKS 95-1 is a synthetic variety derived from the intercrossing of three clonal parent plants. The

three parents were selected in spring 1995 from breeding populations grown as individual space-planted plants for purposes of cyclic selection. The parent plants were selected on the bases of visual and/or measured assessments of characters conditioning turf quality, transition zone adaptation, and seed production. The three clonal parent plants were planted in a field polycross nursery on the Agronomy Research Station, Stillwater, Oklahoma in July 1995. Evaluations of OKS 95-1 have been from plantings established using Syn-1 seed produced from this block. Turfgrass quality of OKS 95-1 in 1998 was equal to the industry standard clonal triploid hybrids 'Tifway' and 'Tifgreen'and was greater than that of all seeded cultivars except 'Princess'. OKS 95-1 had slightly coarser leaf texture than Tifway and Tifgreen, and the highest numerical leaf texture rating (finest texture) of all seeded cultivars. OKS 95-1 had greater spring sod density than all seeded varieties except Princess. It had spring density equal to that of Tifway and Tifgreen. OKS 95-1 had the numerically highest mean rating for percent living ground cover in spring and summer. OKS 95-1 had numerically low frost tolerance ratings (more injury) and winter color ratings relative to many of the seeded and vegetatively-propagated cultivars tested.

Plans

USDA - Plant Genetic Resources Conservation Unit

Vigna: Research is continuing on the relationship of *Vigna unguiculata* subspecies via AFLP and SSR markers and investigation into the etiology of the viral disease of *Crotalaria* species. The Crotalaria pathogen will be investigated further to determine the extent of involvement of seed transmission with the occurrence of the disease as well as determining whether there is a new pathogen or new strain. Efforts will also continue to identify new virus problems as they arise in the regeneration plots of the crops at Griffin.

A new area of research will involve greenhouse and field studies to locate additional sources of CMV resistance in the collection. In summary, plants of cowpea accessions belonging to the core collection will be evaluated by mechanical inoculation in the greenhouse under conditions giving no more than 30% infection of GC-86L-98 (as would be observed in the field under intense inoculum pressure). 'Coronet' cowpea will be used as a susceptible control and GC-86L-98 will be the resistant standard. Those lines showing possible resistance in the greenhouse tests will then be tested further in field trials. Results of these tests will be entered into GRIN to increase data available for breeders and researchers.

Regeneration efforts will continue with the Vigna collection to eliminate seedborne viruses and to increase seed of those lines which currently have too few seeds for distribution or have a low germination. Lines which have demonstrated photoperiod problems will be grown in the greenhouse during the winter at Griffin or in the field at Isabela, Puerto Rico in the summer. Evaluation data obtained in these efforts will be entered into GRIN system.

Peanut: Quarantine increase and testing will began for material from India and other locations this winter/spring and continue through late fall. It is expected that 115 accessions at time can be increased and that 2 cycles of increase can be made during the year.

Wild germplasm will be increased again in the screenhouse with about 25 accessions expected to be increased. We plan to used the same type of soil as 2001 as yields were very good. New increases will most likely evolve material that might be somewhat difficult to

increase and thus require more pots. Clonal wild peanuts will continue to be repotted as time and labor permit.

At least 500 accessions will be increased at Byron depending upon the amount of available usable land for production.

Two projects with outside funding are planned for 2002. One project will employ subtractive hybridization to identify potential Tomato Spotted Wilt Virus resistance. The second project will try to develop markers for oleic acid production so that the peanut collection or other breeding material can be easily screened for mid- and high oleic acid production.

Depending upon funding, a survey of the New Mexico / Southwest Texas production areas will again be done to address potential disease and pest problems for clients there as requested by local U.S. Representatives.

A collection to Paraguay is planned for May to collect wild forage type peanuts and any cultivated peanuts that might be in the collection area. All material brought back from the collection will be quarantine tested and/or increased prior to any distribution to scientists.

Clovers, Grasses, New Crops, Misc. Legumes and Misc. Crops: A total of 325 special purpose legumes, new crops, and miscellaneous crops will be regenerated and characterized during FY 02. Species to be regenerated will be based on importance with regard to function such as pharmaceutical/phytochemical, nutraceutical, forage, and cover cropping traits. All accessions will be selected for regeneration due to original seed, R1, low seed numbers, or greater than 10 year old seed. Gaps will be identified and corrected in the GRIN system for these species.

Additional phytopharmaceutical/nutraceutical/biofunctional legume species within the special-purpose legume collection, miscellaneous crops, and new crops will be identified.

We will complete morphological notes to complement current molecular markers (AFLP) discovered for identifying variation/duplication within the *Trifolium subterranean* collection.

A second year collaborative study with Jerry Walker will be conducted to identify useful nematicidal variability effects from several accessions of *Canavalia ensiformis*.

Research will be initiated on velvetbean as a transition rotational crop for sustainable agriculture in collaboration with Clemson University, University of Georgia, and the USDA Vegetable Laboratory, Charleston, SC through a grant from EPA. This will include regenerating fresh velvetbean seed and plant material for use in our work pertaining to sustainable systems.

A total of 50 annual clover accessions representing a wide diversity of *Trifolium* species will be conducted in the greenhouse. Hand pollinations will be used to produce seed. African clover species flower in response to shorter daylength. Accessions of these species will be transplanted into the field at Griffin in summer during long days to flower and produce seed as daylength shortens.

Vegetable Crops: Seed of the majority (95%) of the Citrullus accessions maintained in Griffin are available for distribution. However, the CGC has expressed an interest in adding heirloom cultivars to the active collection. We propose to increase 50 Citrullus accessions from the S-9 collection, and approximately 100 heirloom watermelon cultivars using seed obtained from the NSSL. Characterization data will be collected on all accessions, and photographs will be taken of the fruit of the heirloom cultivars.

We will attempt to germinate seed in vitro of the miscellaneous cucurbits from which

plants could not be obtained in 2001. These were Grif 14032, PI596673, PI179663, PI319698 and PI532432. If successful, plants will be transferred to, and grown to maturity in, large plastic pots with trellises. If mature fruit have not been harvested from these by October, plants and pots will be moved into the greenhouse. One accession each of ten additional genera will be planted for increase. These will include: *Cyclanthera, Cayaponia, Cionosicyos, Peponopsis, Schizocarpum, Echinopepon, Corallocarpus, Bryonia, Coccinia* and *Thladiantha*. If possible, seed of individual accessions will be tested for germination, in advance. Due to its growth and flowering characteristics, attempts will be to arrange for the increase of *Sicana oderifera* in Puerto Rico. One accession of *Dieterlea fusiformis* will be increased in a pollination cage with bees. Data on growth and flowering characteristics will be recorded.

Fifty accessions of Capsicum will be increased using the protocols developed in 2001, with minor modifications. Accessions for increase will be selected based primarily on inventory level. Should funding become available, the Capsicum core collection will be planted in the field (15-20 plants per accession) for characterization and photo-documentation. Characterization data and digital photos will be placed in GRIN.

Twenty-one accessions of *Cucurbita moschata* will be increased as per 2001. Materials for increase will be selected based on data obtained from a previous AFLP-diversity study. Due to its importance in crop improvement efforts, 'Nigerian Local' will be increased (it was increased in 2001 but only 500 seed were recovered) by open-pollination in isolation.

A previous study identified putative duplicate accessions of eggplant (*Solanum melongena*). Putative duplicates will be grown in the field for a side-by-side comparison. Confirmed duplicates will be either removed from the collection, or further maintained only in long-term storage.

Ten *Ipomoea* species will be increased in the greenhouse in fall 2002. Accessions for increase will be selected based on the availability of seed of representative examples of individual taxa, or user demand.

The sweetpotato collection will be maintained in its current state. New accessions will be propagated and added to the inventory as required.

Publications:

Alabama

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Arkansas

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