Plant Production and Protection

Plant Production and Protection

V(A). Planned Program (Summary)

1. Name of the Planned Program

Plant Production and Protection

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	6%	6%	6%	6%
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	2%	2%	2%	2%
204	Plant Product Quality and Utility (Preharvest)	6%	6%	6%	6%
205	Plant Management Systems	14%	14%	14%	14%
206	Basic Plant Biology	8%	8%	8%	8%
211	Insects, Mites, and Other Arthropods Affecting Plants	7%	7%	7%	7%
212	Pathogens and Nematodes Affecting Plants	27%	27%	27%	27%
213	Weeds Affecting Plants	8%	8%	8%	8%
215	Biological Control of Pests Affecting Plants	8%	8%	8%	8%
216	Integrated Pest Management Systems	14%	14%	14%	14%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2008	Extension		Research	
	1862	1890	1862	1890
Plan	8.0	0.5	12.0	2.0
Actual	11.0	0.0	16.4	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
946117	0	1648893	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
946117	0	1648893	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

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Field testing and collaboration with Gowen Chemical company is on going to try and get registration of halosulfuron on blueberries and several other small fruits.

Test and evaluated a number of fungicides and nematicides and evaluated and compared them to methyl bromide.

Applied and basic research resulted in several articles and other papers and patents. Further, this information was extended to the target audiences via educational trainings, workshops, conferences, and other media outlets. Cotton management systems were developed to improve fiber quality and increasing cotton production efficiency.

Isolates of the pecan scab pathogen, Fusicladium effusum, were collected from three orchards in Georgia with no known fungicide history. These sensitivity profiles will serve as baselines for future fungicide sensitivity monitoring in commercial pecan orchards.

Research reports were published as popular articles and in Proceeding of the Southern Nursery Research Conference. Several talks have been given to grower groups and at regional meetings. Numerous one on one discussions with growers have been initiated.

Research was conducted to quantify water needs of various greenhouse crops. Presentations were made at scientific and grower meetings about more efficient way to irrigate greenhouse crops.

One research paper was published in 2007 and two papers were presented at scientific meetings.
Transgenic plants are being produced and screened in the green house.

Demonstration workshops were held in three counties to introduce growers to the practice of fruit thinning. The workshops were well attended (300 people total for all 3 workshops). Subsequent communication with pecan producers indicates that many growers implemented fruit thinning as a practice for the first time in their pecan farming operations. A new Southeastern Pecan Growers Handbook was produced with fruit thinning highlighted and described as a recommended practice for pecan producers. The handbook has been distributed to over 300 producers since its release in May 2007.

Field experiments were conducted to evaluate response of new cultivars and breeding lines to use of phorate insecticide and twin row patterns, two practices that have provided suppression of spotted wilt. Several new cultivars have field resistance to TSWV much greater than in moderately resistant cultivar, Georgia Green. Although most of these cultivars still respond to some degree to phorate insecticide or twin row pattern, use of such practices are much less critical than with moderately resistant cultivars

Onion Production Guide was updated and is available on the Extension Publication webpage. Several refereed publications have been published or accepted for publication. The annual Onion Res-Ext Report was published with this year's findings. The production meeting and field day were held as planned. Articles and interviews for local media were done and close collaboration with the Vidalia Onion Committee continues.

Plants have been supplied to private entities (e.g., Macon Museum of Science), state agencies (e.g., Georgia DNR, UGA Physical Plant), and federal agencies (e.g., US Forest Service) for reintroduction projects. Activities have been reported in the newsletter of the State Botanical Garden of Georgia. Classes have been offered through the Plant Certificate Program of the State Botanical Garden of Georgia.

Cable-ties were applied to peach trees either in the fall or winter prior to fruit development, or ties were not applied at all (control). We found that fall application gave the best fruit size and quality.

Plant selections or plants derived from breeding programs were evaluated in the laboratory for their cold hardiness potential. Specific data was collected on the timing and rate of cold acclimation, the timing and extent of the maximum mid winter cold hardiness attained, and the timing and rate of cold deacclimation.

Field and laboratory research as well as publications and outreach conducted according to plan.

Physically map chromosomal regions inherited with apomixis Regions have been physically mapped Generate DNA sequence from chromosomal regions inherited with apomixis DNA sequence has been generated from bacterial artifical chromosome clones that map to the apomixis-linked region Identify genes in chromosomal regions inherited with apomixis Some of the sequenced DNA was genetic in nature Test function of genes in chromosomal regions inherited with apomixis One gene that is expressed late in the process of apomixis is being tested for function using knockdown and overexpression strategies Train a graduate student in technologies associated with apomixis research One graduate student has completed training with a Ph.D. and a second still is in training In addition to genomic sequence, transcriptome sequence from young ovules has been generated from two apomicts.

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Conducted research, attend meetings and present talks and posters: Attend Georgia Association of Plant Pathologists annual meeting and the American Phytopathological Society National meeting. Student training -- Undergraduate training: Mentor two undergraduate students during semester-long directed research for class credit. Graduate student training: Major advisor for one MS student; served on the committees for two other students. Scholarly service: Current committee membership and other special assignments. Editorial Advisory Board member for the Encyclopedia of Plant and Crop Science. Member (one of nine) of the International Society for Plant Pathology Committee on Taxonomy of Plant Pathogenic Bacteria. B. External reviewer of grants, manuscripts, panels, and programs. Participated as an invited member in a two-day Meeting of Experts entitled Identifying Priorities for Research on Citrus Greening Disease organized by the National Academy of Sciences to advise the Florida Citrus Board on establishing a grant program specific to this disease. Manuscript reviews: 8 manuscripts for four different journals.

The immunomagnetic separation and polymerase chain reaction (IMS-PCR) seed health assay for A. avenae subsp. citrulli was optimized and evaluated for its ability to efficiently detect the pathogen in watermelon seeds. IMS-PCR was compared to different standard seed health assays for the detection of Aac in 9 independent laboratories. To improve the specificity of the PCR assay, genomic data were used to generate three subspecies-specific oligonuleotide primers for Aac. To elucidate the role of blossoms in watermelon seed infection by Aac, experiments were conducted to determine the role of bacterial motility, pollination and pollinating insects in seed infection. To further improve the efficiency of seed health testing a magnetic capture hybridization and real time-PCR assay was designed and evaluated. Workshops were conducted to train seed pathologists to develop and implement this assay at Iowa State University, Ames, IA and the American Phytopathological Society national meetings in Minneapolis MN.

In peaches, DMI resistance to Monilinia fructicola (brown rot) can be overcome by simply increasing the rates of DMI fungicides to a level which will control the pathogen. Rate increases are not generally possible, since tolerances are based on environmental and human health concerns, and the field rate is often established at the tolerance level. However, based on interaction with industry contacts, it was determined that fenbuconazole (Indar) tolerances were actually much higher than current established rates, allowing for a possible rate increase. Testing was conducted to determine whether a cost-effective, efficacious rate of fenbuconazole could be achieved with increased rates.

Lab tests determined the level of sensitivity to copper across many new isolates collected. This included several races of the pathogen. Information was delivered at agent trainings and in the form of a poster at a regional commodity meeting and trade show.

As of this date, activities 1-5 and activity 8 have been conducted and will continue into the future. Non-refereed papers have been developed for cotton in regards to activity 6; more publications are anticipated. Information developed in these studies has been incorporated into crop production guides for peanut, cotton, soybean, and corn. Graduate student efforts with cotton fiber/nematode studies are progressing.

Presentations have been given to educate extension personnel, green industry professionals, and Master Gardeners about SOD; however, since the discovery of infected plants within retail ornamental nurseries is no longer publicized, interest and knowledge of the disease has lessened since its' initial discovery in 2004-2005. Over 1,000 sites (nurseries, landscapes, and forest and suburban streams) have been surveyed for P. ramorum since 2004. Additionally, the total number of plant, soil, and water samples processed by the UGA Extension Plant Pathology Laboratory to detect P. ramorum is over 9,000 since 2004.

Collectively among collaborators many county educational meetings were conducted, at least three regional educational programs were conducted. There were numerous applied research projects completed and several extension publications, mass media releases and a host of individual farm visits completed.

Applied research was conducted. Workshops and county level production meetings were conducted. Extension publications were published. Newsletter articles, e-mail communications, and popular articles were written.

Research projects were conducted resulting in scientific publications, presentations at scientific meetings and research conferences. Meetings were held and results reported to growers.

Four cultivars have been released.

Findings have resulted in more effective biological toxins and patents for compounds to enhance Bt toxin efficacy. Disease transmission studies in both animals and plants are on-going with emphasis on pest and disease control.

Salvia was planted in soil amended with mycorrhizal products. No colonization was observed.

Research focused on peach and blueberries, where tree- and bush-attacking pests are shortening orchard longevity and

profitability. Grower education and management programs were informed by research findings.

Nematicidal compounds were tested in lab, greenhouse, and field studies as planned.

Experiments have been conducted to evaluate biological and chemical fungicides and cultural practices for developing integrated disease management approaches. Chemical fungicides with new active ingredients and promising disease suppression were evaluated in repeated experiments under field conditions. Disease control efficacy of new biological products was evaluated in greenhouse and field studies.

Twenty-nine research/demonstration projects were conducted in vegetable IPM in 2008. These included tests in sweet corn, onions, cucurbit crops, cole crops, and beans. Results were discussed at multiple vegetable production meetings throughout the year (5 State/Regional level meetings, 8 County level meetings). Selected projects were also presented at professional meetings. The commercial vegetable pest control handbook was updated and published.

A total of 18 pecan production meetings and 3 pest management workshops were conducted. A quarterly newsletter is published and distributed electronically and posted on the CAES website. Pest management recommendations were published and distributed in the 2008 Georgia Pest Management Handbook and the Pecan Pest Management Handbook.

Research was conducted on powdery mildew of cucurbits, downy mildew of cucurbits, bacterial leaf spot of tomato and pepper, Botrytis neck rot of onion, and fusarium wilt of watermelon. Information was presented at 2 field days, 2 commodity meetings, 1 extension training and other outlets. Research was published in Fungicide and Nematicide reports and extension reports.

2. Brief description of the target audience

Greenhouse operators, farmers, county extension agents, seed companies, chemical companies, industry representatives, turfgrass professionals, general public.

V(E). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons (contacts) reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	**Target**	**Target**	**Target**	**Target**
Plan	19750	50000	0	0
2008	18511	130594	595	2000

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year	Target
Plan:	5
2008:	3

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan	0	0	
2008	0	0	98

V(F). State Defined Outputs

Output Target
Output #1

Output Measure

Number of significant publications including referred journals articles, bulletins and extension publications.

Year	Target	Actual
2008	225	391

Output #2

Output Measure

Number of educational contact hours generated from formal educational programs presented to county extension agents by state faculty directly associated with this planned program.

Year	Target	Actual
2008	1140	1113

Output #3

Output Measure

Number of educational contact hours generated from formal educational programs presented directly to clientele by state faculty directly associated with this planned program.

Year	Target	Actual
2008	2200	2408

Output #4

Output Measure

Number of disease samples processed by diagnostic laboratory.

Year	Target	Actual
2008	6000	1200

V(G). State Defined Outcomes

O No.	Outcome Name
1	Number of additional direct extension contacts made by volunteers, staff, or county agents not receiving federal funds as a direct outcome of the work of federally funded faculty associated with this planned program.
2	Number of invited presentations by faculty as a direct result of the success of this program.
3	Number of Master Gardener certifications granted through this program.
4	Increase in farm gate value of row and forage crops in Georgia. Reported annually in millions of dollars.
5	Increase in farm gate value of fruit and nut crops in Georgia. Reported annually in millions of dollars.
6	Increase in farm gate value of vegetable crops in Georgia. Reported annually in millions of dollars.
7	Increase in farm gate value of ornamental horticulture crops in Georgia. Reported annually in millions of dollars.
8	Percentage of program participants reporting increased knowledge after program participation.
9	Percentage of program participants who indicated a plan to adopt one or more of the practices recommended in this program.

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Outcome #1

1. Outcome Measures

Not reporting on this Outcome for this Annual Report

2. Associated Institution Types

3a. Outcome Type:

3b. Quantitative Outcome

Year	Quantitative Target	Actual

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area

V(H). Planned Program (External Factors)

External factors which affected outcomes

Natural Disasters (drought,weather extremes,etc.)
Economy
Public Policy changes
Government Regulations
Competing Public priorities
Competing Programmatic Challenges
Populations changes (immigration,new cultural groupings,etc.)

Brief Explanation

Biggest external factors are when and if Gowen submits a registration package for halosulfuron to the EPA, and whether the EPA approves the registration.

Methyl Bromide has been eliminated, so there is no recourse. Something must be done. The drought, the economy downturn, public policy changes and funding all affected as expected.

A historic drought afflicted all of Georgia in 2007. Further, economic pressures as the result of changes in the corn-for-ethanol program had a domino effect on costs and price risks. Meanwhile, the drought's severity had a devastating effect on the green industry, as watering restrictions and eventual elimination prevented proper care of turf and horticultural products. Further, immigration policy changes have affected the development of the grazing dairy industry in Georgia.

2007 was a very hot, dry growing season that may have influenced results.

Drought events may increase the need for more efficient irrigation, and thus make funding more readily available. Funding opportunities always depend on the health of the economy. Government regulation concerning water use may also increase funding opportunities, while competing public priorities may decrease it. Competing programmatic challenges always need to be weighed, and if other programmatic areas become more or less important, that will affect progress of this program.

Government regulations on germplasm release policies required that were unexpected.

Weather conditions leading to a light 2006 pecan crop led to a very heavy pecan crop across the state in 2007. This led many pecan producers to see the value of fruit thinning.

During the early part of the 2008 growing season, drought affected plant growth, and yield potential in some tests. However, a late season tropical storm helped leaf spot epidemics and greatly aided plant growth and yield.

Drought conditions in Georgia during the last year and watering restrictions put some limits on our outdoor plant propagation activities.

We had a frost in April of 2007 that reduced the state's overall crop by 55%.

The change in the economy affected the program as operating funds were taken back.

Economic recession during most of 2008 affected fruit producers' economic outlook and changed cost-benefit ratios in pest management.

Lack of suitable programs for federal funding of research topic.

Extramural funds were available to support research activities. Naturally infested seeds were available through solicitation from seed companies as well as by the ability of collaborators to generate naturally infested seedlots.

Extreme drought reduced disease in some experiments. The April freeze of 2007 decimated peach and blueberry commodities, but most research was salvaged.

Drought affected the outcome by lessening the severity of disease in 2007. This in turn inhibited our ability to collect isolates and obtain data from field plots.

Severe drought across much of Georgia in 2007 affected the spread of the soybean rust epidemic, thus making this disease less severe last season. Severe drought however likely made damage from nematodes on all crops more significant. In 2007, I worked with the EPA and the USDA to ensure continued availability of adlicarb to peanut growers in Georgia and also worked to renew a Section 18 label for tebuconazole.

Phytophthora ramorum remains a federally regulated pathogen. However, federal funds to study, survey, and ultimately manage P. ramorum are being significantly reduced compared to past funding years. A reduction in funding has resulted in a reduction in sample numbers collected and processed by the GDA, GFC, and UGA Extension Plant Pathology laboratory. Funding and support for the P. ramorum certification program also has decreased due to economic hardships (economy, drastic increase in transportation costs, and drought) to the green industry in Georgia, as well as lack of publicity following P. ramorum recovery.

Drought and cold weather conditions were encountered. Plant disease affected some study plants.

Drought required digging of a new well at great expense. There is interest among Hispanics in our yellow, non-melting flesh selections. These are similar to Latin American landraces.

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Departmental space and fiscal resources were limiting factors in basic insect sciences. Also, drought impacted plant disease transmission studies in vegetables. State budget cuts during FY09 have also impacted the outcomes of this work.

The viability of the inoculants could have been affected by storage.

Peach insecticide efficacy trials were conducted, but fruit loss associated with cold injury, destroyed the crop in our research orchard.

EPA modified its position on use of adjuvant with pesticides, requiring use of adjuvants for establishment of tolerances if adjuvants are recommended on the label. This prevented adjuvant recommendations on the label of two insecticides for which adjuvants have clearly shown benefits in efficacy.

Much higher prices for fuel, fertilizer and pesticides put tremendous pressure on the bottom line for most growers. Removal of pecan from the label of aldicarb reduced the choices for aphid and mite control.

The 10 inches of rain dropped by tropical storm Fay effected our fall vegetable production by increasing the level of disease. Currently the EPA is planning the use of fumigation buffers that may reduce the acreage in southwest Georgia that can effectively used to produce vegetables.

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

After Only (post program)
Retrospective (post program)
Before-After (before and after program)
During (during program)
Time series (multiple points before and after program)
Case Study
Comparisons between program participants (individuals,group,organizations) and non-participants
Comparison between locales where the program operates and sites without program intervention

Evaluation Results

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In all field trials conducted, injury to over 10 blueberry varieties did not exceed 20% with labeled rates, and tended to be transient. Postemergent control of sedges with halosulfuron exceeded 80% during the first 8 weeks after application. With an extensive underground tuber rhizome system, a second cleanup application will be necessary.

evaluation undergoing

Faculty evaluated their program's success by conducting pre and post meeting evaluations/observations of participants before and after the planned program was conducted. Multiple producers were used as case studies to understand the impact of this program. Survey comparisons of participants and non-participants of the program was used to elucidate effectiveness of implemented programs. On-site surveys and observations were made to account for the immediate or near term impact of new information delivered in a program. On-farm research and demonstrations were used on over 35 locations in 2007, serving as case studies to show effectiveness of new technology. Data was collected, analyzed, and shared through direct and indirect contact.

Replicated trials were conducted that evaluated double-cropping scenarios with Vidalia onions to reduce sour skin, a disease caused by a soilborne bacterium. Evaluations of onions harvested in the field plots and evaluations of numbers of colony forming units of bacteria per gram of soil were evaluated in the laboratory. Also data were collected from a survey of the distribution of Iris yellow spot virus in spiny sowthistle (an indicator host) in over 50 counties was conducted that demonstrated the widespread dissemination of the virus outside of the onion-growing region. Also, a survey of viruses in peanuts were conducted in over 50 counties in Georgia to determine what viruses were present in the peanut crop.

Evalualtions were performed following presentations at grower meetings.

Population studies have continued as planned using dilution plating and incubations.

Continue to have results submitted to journals for evaluation and review.

Transgenic plants continued to be developed in the laboratory with screening for the selectable marker. Positives are allowed to mature to determine if they are fertile. If fertile the mature plants were allowed to seed. Seed was collected for further studies. and eventual release. Wiil be initiating the possibility of field testing transgenic peanut in Uganda.

We conducted field trials in Tifton, Ga., intended to determine the effect of colored plastic film mulches on growth and yield of broccoli. The results of this trial have been presented in professional meetings and growers meetings and will be published as a journal article.

A survey conducted prior to the 2007 season indicated that fruit thinning was not practiced by many pecan growers. Attendance by over 300 people at the demonstration clinics and subsequent implementation by a number of growers indicates that the efforts were successful.

Incidence of tomato spotted wilt in peanut was determined by counting the number of 1 ft portions of row severely affected by tomato spotted wilt, and calculating a percentage of the plot affected based on total row length within the plot. Also, yield (pod yield as pounds/Acre) was estimated for each plot for yield comparisons and initial economic analysis.

Evaluations were conducted after food safety workshops.

Weekly meetings of the Plant Conservation Program staff of the State Botanical Garden have provided the venue for evaluating the program and making changes as required.

Evaluation studies were conducted by comparing the laboratory estimates of the cold hardiness of woody ornamentals to their actual performance in the field.

None of the alternative treatments against bacterial spot of peach have been as effective as the antibiotic standard. Protocols for fungicide application against brown rot of peach in the packinghouse have been optimized, allowing efficacious and cost-effective postharvest treatment. Mummy berry and foliar diseases of blueberry are suppressed with biofungicides, although not as effectively as in conventional systems.

Two workshops were conducted where seed pathologists were trained how to conduct MCH-real time PCR for the detection of multiple pathogens in seeds. In total approximately 75 individuals participated in the workshops. A paper describing the technique was recently accepted for publication in Phytopathology.

Formal questionnaires were not developed for the education programs. However, numerous individual interviews were conducted either at education programs or on-site at retail and production ornamental nurseries and landscapes to obtain personal opinions and perceptions on what has been done in the program previously, as well as where changes and additional efforts are needed in the future. Physical plant, soil, and water samples continue to be collected and/or

solicited from concerned Georgia citizens and green industry personnel to detect pathogen survival and potential spread.

Over 20% of growers have adopted the alternative methyl bromide application procedures. This is based on surveys of growers in the state.

Plant development research was conducted including studies on tissue culture and plant conservation of Elliottia racemosa, reproductive biology (flowering and fruit development)of horticultural crops, studies on herbal and medicial plants, and ozone and its effects on commercial greenhouse crops.

An increasing number of trees of the Gulf series are being propagated, except for 2007. (Nursery disaster in Tenn.)

Research is evaluated annually and on longer term through graduate program assessment. Continued long term funding of these programs by sponsoring agencies is another important factor

Conducted on-farm and experiment station research in-orchard and packing house. Focused on borer species in peach,and leaf hopper survey in blueberries. Also worked with USDA-APHIS, Clemson University, SC Peach Council and GA Peach Council conducting peach IPM efficacy evaluations to support re-acquisition of Mexican export markets for un-fumigated peaches from SC & GA. Hosted a GA Pesticide Resistance Management Tour for U.S. EPA. Led dialogue urging modification of pesticide label language which would discourage pesticide use pattern which promote resistance.

Twelve field experiments were conducted on bell pepper, squash, and tomato in 2008 in Tifton, GA. The results indicated that some newly available chemical fungicides, such as fluopicolide, provided greater suppression of Phytophthora blight compared with the traditional chemical fungicide standard mefenoxam. Considerable numbers of P. capsici strains isolated from vegetable fields in GA have developed resistance to mefenoxam, however, strains resistant to these new chemical fungicides have not been identified. Some biological control products, such as Bioten (Trichoderma asperellum and T. gamsii) showed to be promising in disease suppression.

Key Items of Evaluation