Mississippi Department of Agriculture and Commerce

Specialty Crop Block Grant Program-Farm Bill
FY2013

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PROGRAM CONTACT

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Introduction

The Mississippi Department of Agriculture and Commerce (MDAC) was awarded $276,351.62 in funding for the Specialty Crop Block Grant Program-FB (SCBGP-FB) in September 2013. MDAC has partnered with four organizations to implement twelve projects to enhance the competitiveness of specialty crops throughout the state.

The final reports for the projects, "Public Relations Campaign to Promote Buying Local Specialty Crops," and "Mississippi Sweet Potato Promotion/Marketing Campaign," were previously approved in the first annual report. The final reports for the projects, "Using Specialty Crops to Develop and Promote Farmer's Markets in Mississippi," and "Tea Evaluation Trail in Mississippi," were previously approved in the second annual report.

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PUBLIC RELATIONS CAMPAIGN TO PROMOTE BUYING LOCAL SPECIALTY CROPS

Approved In First Annual Report

Project Summary

Less than two percent of the public is actively engaged in production agriculture today. Many people are three or four generations removed from the farm and consequently have less of an appreciation for the benefits of a locally-produced food source. A well-designed, professional campaign is needed to educate the public about the benefits of agriculture in general. The Farm Families of Mississippi campaign addresses many of the issues that have been identified through surveys that the public is misinformed about or needs further information. The Specialty Crops Grant Program is a way to educate the public about the benefits of buying locally produced foods, one of the identified messages of the overall campaign.

This specialty crops promotion project was designed to run in concert with another public relations effort being run by the Farm Families of Mississippi (FFM). The larger project is the Ag Image Campaign for all agriculture. The specialty crop promotional effort was specifically directed to promote buying locally produced specialty crops. Many of these small specialty crop growers cannot afford the high cost of a media campaign. With this campaign, however, the specialty crops had their own TV spots, radio spots, and billboards that had the same look and feel of the larger campaign but targeted specialty crops. This specialty crop promotion was the only portion of the overall campaign promoting specialty crops.

This project was previously funded by the 2010, 2011, and 2012 Specialty Crop Block Grant Program. The FY2013 project built on the name recognition that was achieved in the past. Farm Families of Mississippi also pushed the specialty crops in cooking segments that ran on several of the TV stations. These segments highlighted the use of locally grown products and gave interesting facts about the commodities while the dish was being prepared.

Project Approach

The TV spot promoting the availability of specialty crops ran in equal rotation with the rest of the spots in the Farm Families of MS campaign. They ran on WLBT in Jackson, WLOX in Biloxi, WABG in Greenwood/Greenville, WTVA in Tupelo, WCBI in Columbus, WTOK in Meridian, and WDAM in Hattiesburg. This gave statewide coverage. These spots generally ran during morning, noon, and evening news programming but also picked a few TV shows that fit our demographics and ran some spots in them. Approximately 650 TV spots featuring specialty crops ran throughout this project. In addition to the paid TV ads, specialty crops were featured on several cooking segments at no charge.

The radio spots ran on the SuperTalk radio network statewide. This network of nine stations multiplied the coverage tremendously. For every spot ran, it was played on nine stations for a fraction of the cost of doing that individually. The specialty crop ads ran over 750 times.

There were 14 billboards that featured a specialty crop that were displayed in Jackson, on the Gulf Coast, Tupelo, Meridian, Hattiesburg, and in the Greenwood/Greenville area.

Market Research Insight was contracted to do the scientific survey to measure the impact of the campaign. The public was surveyed just prior to the campaign to get a baseline number and then again immediately following the campaign. The survey results show that the ads had the desired effect on consumers. The number of respondents saying they frequently try to find and purchase locally grown specialty crops increased from 68% in February 2014 to 74% in May 2014. Respondents saying they recall the promotional ads increased from 49% in 2012 to 55% in 2013 to 60% in 2014.

Farm Families of Mississippi is a group of approximately 240 organizations, companies, and individuals committed to educate and improve the image of agriculture among the state's consumers and the list is still growing. This is not a short-term project. The partners in this organization, spearheaded by Farm Bureau, have committed to an ongoing, multi-year campaign. To influence public perception, a consistent, sustained communication program is required and should keep in focus the long-term goal of creating positive public perception of agriculture in Mississippi.

Goals and Outcomes Achieved

The goal of the project was to raise the level of awareness among the public about the benefits of buying locally produced specialty crops. By raising awareness, the demand for these specialty crops will potentially enhance the viability and profits for the farmers producing them. TV spots and billboards were used in the Jackson, Meridian, Hattiesburg, Columbus, Tupelo, Greenwood/Greenville, and Gulf Coast media markets and radio spots were used statewide. The survey company stated, "The 2014 media program definitely increased awareness of certain specialty crops. Tomatoes, sweet corn, beans, and peas are the best known local crops. Increases for the pre- and post-surveys in 2014 show the three specialty crop areas were influenced by this year's advertising." Public opinion concerning the importance of buying locally grown specialty agriculture products should be considered at universal levels, well over 90%. Because the numbers are so high already, the focus now should be maintaining that awareness. Some of that awareness can be attributed to the carryover effect from previous years' advertising. The numbers are pretty high already so that shows the ad campaign is having its desired effect. But the Farm Families has seen that when advertising is stopped, public perception of the message goes down.

Beneficiaries

The groups that will benefit from this public relations effort will be the local farmers that raise these specialty crops and market them locally. Mississippi is the number two sweet potato producer in the nation with over 100 farmers growing sweet potatoes on approximately 20,000 acres. There are more than 2,000 acres of sweet corn produced in Mississippi by approximately 40 growers with most of the crop being consumed locally. Mississippi ranks between 23rd and 25th in the nation in honey production and produces about from 1.1 to 1.5 million pounds of honey each year. Mississippi contains between 14,000 and 16,000 acres of pecan orchards and thousands of yard trees. Orchards range in size from 25 to 500 acres. Pecans are sold directly to consumers, accumulators, or by mail-order. While the Farm Families don't have sales figures from all of the local farmers, the increase in the awareness of the benefits of buying locally produced foods should increase local sales especially when you combine that with the responses from the survey showing that the public realizes that buying locally helps the local economy. The benefits of an advertising campaign fade with time if it is not continued. Long term economic impact of a project such as this will be continued as long as the advertising campaign continues. The campaign highlighted the fact that most people try to find and buy fresh produce including specialty crops locally grown rather than a brand that they may be familiar with and accustomed to buying.

Lessons Learned

An interesting insight came as a result of this long-term campaign. The Farm Families has been approached by many organizations about partnering with them including one called Eat Jackson. They are a web-based publication that promotes all things related to food in Mississippi. They have seen the ads over the years and wanted to partner with FFM in promoting locally grown and processed food. Partnerships like this have opened many doors for Farm Families of Mississippi, and by extension, the specialty crops producers in the social media world. The Farm Families Facebook page has more than doubled this year. Conversations about how and where your food is grown are abundant and continue to expand.

FFM feels like this was a very worthwhile campaign because it showed that the public really does want to buy locally produced food and understands the benefits of doing that. The challenge is reminding them of it enough so that they are motivated to take the extra step to find and purchase the locally produced food.

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Additional Information

To see the TV spots, go to the URL listed below.

http://www.growingmississippi.org/newsroom.htm

RENIFORM NEMATODE IMPLICATED IN SWEET POTATO END ROT: THE KEY TO ECONOMIC LOSSES?

Project Summary

According to the USDA, the per capita consumption of sweet potatoes has increased more than 2 pounds over the last 15 years. According to the most recent National Sweet Potato Newsletter, the winter of 2014 was a record year as the United States produced over 26 million pounds of sweet potatoes. Mississippi is the second largest sweet potato producer in the country. Sweet potatoes are grown on about 22,400 acres by 104 commercial sweet potato growers in rural Mississippi (USDA Agricultural Census, 2012). The estimated value of Mississippi's sweet potato production rose sharply higher in 2008, to $73,000,000, continuing a two year trend (Mississippi State University, 2008). Since most sweet potato farmers reside in two rural counties which possess the majority of the state's appropriate soils, Calhoun and Chickasaw, any impact on the sweet potato crop will be felt throughout north central Mississippi.

Macrophomina phaseolina (Mp) is known to infect several hundred crop and non-crop plant species worldwide causing a range of diseases including charcoal rot, root rot, and seedling blight. Mp has been historically present in Mississippi fields and the occurrences of sweet potato tip/end rot have increased annually since 2005. This is important to sweet potato growers since end rot disease of stored sweet potatoes has increased from almost nothing in 2004 to accounting for 3- 30% of storage losses in 2008 (Burdine, unpublished). The statewide consequences of Mp occurrences have been dramatic with yields decreasing from 172 cwt/acre for the 2008 crop to 115 cwt/acre in 2009, while production showed an even more dramatic decline from 3,354 thousand cwt in 2008 to 1,265 thousand cwt in 2009. Furthermore, control of the end rot problem will increase consumer and market confidence with Mississippi grown sweet potatoes.

Extension Service nematode samples drawn by Mississippi State University Extension plant pathologist and horticulturalist have indicated that fewer root-knot nematodes and more reniform nematodes were being recovered from sweet potato fields by 2009. Samples submitted to the Mississippi State University Extension Service Plant Nematology Laboratory, also seem to indicate increases of reniform nematodes in sweet potato soils. During the same time period, a field trial examining the potential of biological fungicides for alleviating end rot disease, showed a very significant and highly-correlated relationship between reniform nematode numbers at harvest and soil counts of Mp (Henn, A. and W. Burdine, MSU, unpublished data) but the results were based on a preliminary study.

An interaction between nematodes and Mp would explain, at least mostly so, the erratic appearances of end rot disease within a field and among years. Plant-parasitic nematodes and soil dwelling fungi are tightly clumped into "pools" within the soil. As their numbers increase,

the size and number of pools in the field also increase. This could explain why some boxes of sweet potatoes from fields yield healthy roots upon removal from storage whereas others produce end rot diseased roots, and explain why some fields are more likely than others to produce the disease. Is there genetic variation or differences in pathogenicity of fungal pathogens (e.g. Mp) or is there a synergism with a combination of organisms (e.g. nematodes) and/or environment and management practices? From the current study we attempted to draw some conclusions evaluating the nematode-fungus interaction on tip/endrot disease levels. From this research we hoped the information could guide growers actual management needs and avoid costly procedures (e.g. nematicide applications) when making decisions.

Therefore the specific goal was to further define the relationship between reniform nematodes and fungi that are associated with tip/end rot disease of sweet potatoes. Mp is present at high levels in many Mississippi fields but reniform was becoming the norm by 2010 rather than the exception. Furthermore, nematode levels were reported by growers with tip/endrot problems to be generally higher in fields when surveyed from a preliminary sampling by MSU Extension personnel, 2009. Based on that information the objective of our study was to verify any fungal/nematode connection in relation to root pre- and post-harvest damage. By doing so, we hoped to clearly define the relationship between the organisms, categorize risks to sweet potato growers, and propose management strategies to minimize disease and assess field risks.

Results from the study in total (FY2012, FY2013) showed no specific trends with increased fungi/nematodes populations. Therefore, informing growers that this disease complex is at best secondary cause of tip/endrot, would enable recommendations for nematicide applications to be primarily accessed for nematode threshold levels and not root disease problems. The research from this funded project was a continuation from FY2012 which included trials at two locations in grower's fields and initial greenhouse test. Results from those first tests were inconclusive, but field collection of dead plant tissues and soil samples throughout the study showed a high level of Mp and reniform nematodes during certain times of the year. Because there was almost no tip/endrot in either of two fields the first year, the additional grant (FY2013) was requested in an attempt to use greenhouse controlled studies and allow for more in-field testing. In addition, soil/plant debris collected during latter stages of the study was attempted to identify disease pathogen population levels over time and determine any Mp genetic variability in-fields from Calhoun, Chickasaw, and surrounding counties to further define the nature or importance of the two organisms in tip/endrot disease cycle. The survey was added later as a second method for determining if a disease complex might be more evident across many fields and not restricted to the study locations. Disease levels appeared to be level in both counties during the study period regardless of nematode and fungal presence.

This reported is for the current project that is a continuation of the previously funded SCBGP grant which began in November FY2012.

Project Approach

Field Trials: Two field studies were established at farmers' fields including Steve Bailey (Bailey Family Farms) and Rob Langston (Penick Produce) in 2013 and Steve Bailey (Bailey Family Farms) and David Duncan (Duncan Farms) in 2014. Another test was planned for 2015 but due to heavy rains, management decisions changed, causing site selection problems and was not possible. To determine initial site selections for the field trials, nematode samples were taken across entire field since reniform nematode levels are known to vary within growers' fields.

Note: study in 2014 trial was established in late August due to changes in management practices that prevented previously committed sites at beginning of the season. Thus, no plant growth data could be assessed during the season.

Regardless of sampling dates, at each study site, soil sampling was systematically collected using a serpentine pattern to determine locations of low and high nematode levels and guided us for establishing 20 replicated plots per treatment. Each plot was three rows by 13-15 ft. long depending upon location. The middle row was used for harvest of the roots. Plant tissue samples were collected at mid-season and harvest to monitor microbial population fluctuations from the two outside rows. Harvested roots were returned to MSU Pontotoc Field Station and rated for quality and disease (supported by Dr. Steve Meyers, MSU), then placed into 3 groups of 10 marketable roots per plot. The roots were returned to MSU laboratory for either temperature control storage or Mp isolation determinations. Isolation studies were conducted with the first group of 10 immediately, second group of 10 at 90 days following storage, and third group of 10 at 120 days. From each root, nine tissue samples (1 cm × 1 cm) selected from proximal and distal root and middle region covering three tissue depths or nine total pieces per root. Results can be found in Tables 1 and 2.

Figure 1. Plots during growing season and harvesting of plots in 2014. Storage roots from each plot were binned separately and returned to the MAFES Field Station at Pontotoc, MS, for grading.

Greenhouse Trials: Three greenhouse tests were established following first study during FY2013. Pots were infested with various rates (amounts) of Mp inoculum with primary goal of determining if Mp infection levels on roots were greater when in the presence of mid-range level of reniform nematodes (2000-3000) per pot. During the first trial, soil was collected from each of the two field trial sites from FY2012 with the intent of pasteurizing soil in a large volume autoclave. However, during setup for this trial, the large volume autoclave stopped working and was unavailable for over 30 days. Because we could not use the field soil as planned, we chose pasteurized Pro Mix BX soil substrate, as it provides a suitable growing substrate with minimal microbial interference. 12" clay pots were set up with 5000 mL of Pro Mix BX, and virus-tested culture grown slips were introduced into each pot. Soil substrate was moistened and three plants were allowed to establish for two weeks. Once plants were established, treatments were applied with three different levels of Mp using a corn-meal sand mixture and the standard level of reniform nematode average mid- range population seen in the fields. Plants were allowed to mature for 90 days, and then were harvested from pots. Harvested roots were examined for visible signs of tip/end rot from tissue sampling. The tissues were processed and removed from distal, middle and postal ends of each root at three depths as in the field trial sampling. The tissue pieces (1 cm × 1 cm) were surface sterilized, placed onto fungal growth media, and isolates of Mp growing from pieces were tallied for population levels and evaluated for cultural morphological types as in field tests (Table 1).

Soil selection for greenhouse studies was an issue. The soil used across tests varied due to problems as per the autoclave issue. In the greenhouse trial 2, field soil was used from Bailey Family Farms. The field soils quickly became compacted and water permeability was poor resulting in poor plant growth and root formation (Figure 2). Also, it was hard keeping the plants sufficiently watered and fertilized or water would pool on the surface. It was unclear what impact soil compaction from field soils had on nematode counts which were extremely low during the tests. Nematode population crashed under these conditions and plant growth was very irregular. In trial 3, we used field soils, Pro Mix BX and 50:50 ratio of both. Even when the Pro Mix BX or field soil and Pro Mix BX combined, nematode and disease levels did not hold well over the 90 day period during each greenhouse study (Figures 4 and 5). The Mp counts were low from the tissue samples even after applying high rates of inoculum to the each pot in the three greenhouse trials.

Figure 2. Images of Beauregard B-14 sweetpotato plants maturing in the greenhouse in three soil substrates. From L to R: ProMix BX; Field Soil; ProMix + Field Soil. Note: apparent healthy growth of plants within each soil type. Note: soil compaction in middle slide using only field soil.

Figure 3. Storage roots (potatoes) from greenhouse trial at maturity. Note: atypical root system, numerous fibrous roots, discolored storage root tissue, and underdeveloped storage roots.

Project to identify field levels of Mp and Reniform Nematode: Because there was no indications that tip/endrot was greater with increased nematode levels; a general survey of surrounding fields was conducted to determine if both pathogens were now generally present in most sweet potato fields since storage rot outbreaks seemed to stabilize during our study period. At each field visited, plant debris was randomly collected from decaying roots and stems, which could harbor Mp, and soil samples from same spots for nematode determination. From those soils, nematode assays were done to identify trends in Mp and nematode occurrences in Calhoun and Chickasaw county fields. Over 30 fields were assayed during FY13 funding period. Plant debris per field involved collecting random selected plant tissue pieces on surface down to 12" with a shovel from 20 random sampling points across each field. Tissues

were removed and returned in plastic bags for processing and 500 ml soil was placed into a separate bag for rough nematode counts. From the collected tissues, 40 subsamples (1 cm x 1 cm) were sterilized and plated onto selective growth media. Mp growing from those pieces were tallied and stored. Results showed that the Mp frequencies were highest ranging (0) 5-30% (40%) in November-December of each year but isolation levels were less at <5% by April the following season. These results were obtained by going back to some of the same fields (Bailey, Duncan, and Langston) each year to monitor Mp and nematode population changes. Nematode levels range from (0) <100 to 5,000 (10,000>) in November-December following harvest but by April they were generally much lower (<300). Isolates of Mp from this survey were stored and saved for future genetic studies and other projects. Isolates did show morphological variations, but it is uncertain if those differences correlate with pathogenicity of the fungus. More greenhouse tests are needed with the isolates to verify any differences. Knowing genetic variability of Mp may provide a plausible reason why certain fields have major root tip/end rots at harvest and in storage but absent or low disease in adjacent fields. The survey clearly shows both organisms are present in many fields in the two sweet potato production counties but low root disease levels the year of the survey could not be correlation with increasing fungal/nematode populations. Management practices, other than nematode control, must be considered or evaluated when trying to understand tip/endrot and storage rot problematic fields.

Contributions from project partners included but were not limited to:

- Drs. Henn and Stokes performed surveying of field locations for reniform nematode population variations in early 2013.
- Drs. Baird, Henn, and Stokes established collaborations with growers in the primary sweet potato growing region of the state
- Drs. Baird and Stokes established field plots, collected and analyzed field samples with student workers, established and maintained greenhouse trials, and collected and analyzed samples from greenhouse studies.
- Drs. Steve Meyers and Mark Shankle supported the study by coordinating growers for establishing field plots during this second granting period. Dr. Meyers helped in harvesting and rating root quality after they were returned from field.

Goals and Outcomes Achieved

	Reniform Nema Levels (Start)	Reniform Nema Levels (Mid)	Disease Rates # roots (Harvest)	Plant Stand Count (Start)	Plant Stand Counts (Mid)	Plant Stand Count (Harvest)	Avg Storage Root Length	Avg Storage Root Width
Bailey 1C	39	1277	0	40	40	39	4.69	2.00
Bailey 1F	24	1547	1	37	32	30	4.25	2.95
Bailey 2C	2814	3765	0	44	41	40	4.40	2.45
Bailey 2E	3122	2659	2	42	40	39	3.67	2.38
Bailey 4A	2042	4126	1	40	40	40	5.10	2.15
Bailey 4C	126	1017	1	40	40	40	3.60	1.50
Penick 1A	1230	6520	1	38	37	35	3.00	0.625
Penick 1C	1261	3700	2	37	37	37	4.05	1.63
Penick 2C	9614	13247	1	42	40	40	2.53	0.83
Penick 3C	1663	3977	0	40	39	39	5.13	2.44
Penick 4B	13023	14980	1	40	40	40	1.50	0.50
Penick 4F	9893	10442	0	42	41	40	4.83	1.42

Table 1. Seasonal data from 2013 field trials. Nematode counts were taken periodically within plots. Storage roots were measured at harvest. Disease rating was based on a modified Horsfall-Barratt Scale (Horsfall and Barratt, 1945).

Plot	Renaform Nema Levels (Harvest)	Root Rots Total # Field	US no 1 #1	US no 1 wt 2	Can # 1	Can wt 2	Cull #1	Cull wt 2	Jumbo #1	Jumbo wt 2
S-9	85	0	1.59	8.19	0.875			0.795	6.865	0.79
S-54	459	0	5.065	7.3	1.05	1.02	0.64	0.555		
S-53	681	1	2.385	1.055		0.18	0.22			
S-31	227	1		7.955		0.3		1.355		2.925
S-45	85	0	9.685	7.81	0.555	0.945		0.34		0.5
S-30	33	0	4.925				0.09			
S-50	705	0	4.515	4.295	0.575	0.64		0.235	0.715	0.71
S-18	511	0	1.05	1.45	0.29	0.54		0.26	1.22	
S-28	80	0	2.695	4.285	0.68	0.415	0.715		0.91	
S-14	66	0	1.275	2.715		0.62		0.095		1.985
S-48	582	0	4.44	6.855	0.1	0.84	0.345	1.39		1.24
S-42	85	2	5.185	6.715	0.27	0.98	0.32	0.15	4.101	0.755
D-16	2885	0	5.94	8.085	1.125	1.26	0.75	0.375	2.37	1.675
D-29	2751	0	6.19	8.975	0.665	1.2	0.22	0.22	1.209	1.6
D-13	3221	1	9.435	11.555	0.965	0.575		0.43	2.56	1.48
D-14	4395	0	9.52	6.255	1.37	1.1	0.43	0.175	0.535	0.495
D-30	2224	1	11.15	8.01	1.03	1.165	0.46		1.05	0.44
D-5	4390	0	8.595	11.27	0.71	2.075		0.225	0.77	
D-7	2177	0	11.26	7.65	0.38	1.755			1.24	2.725
D-28	4663	0	7.19	10.45	0.925	1.235	0.29		4.34	3.905
D-31	62	0	3.68	1	0.98	5.095		0.195	0.695	0.955
D-12	2451	1	9.44	6.43	0.235	0.66			2.795	4.225
D-8	3137	0	9.88	8.62	0.51	0.64			1.855	2.56

Table 2. Grading data from 2014 field trials. Where number is missing, no storage roots were generated within that class from that plot. Almost no tip/end rot was observed at S. Bailey (S) and D. Duncan (D) fields with 5 and 3 total roots with disease respectively and reniform nematode counts ranged from 33-681 at Bailey's field and 2,177-4,663 at Duncan's.

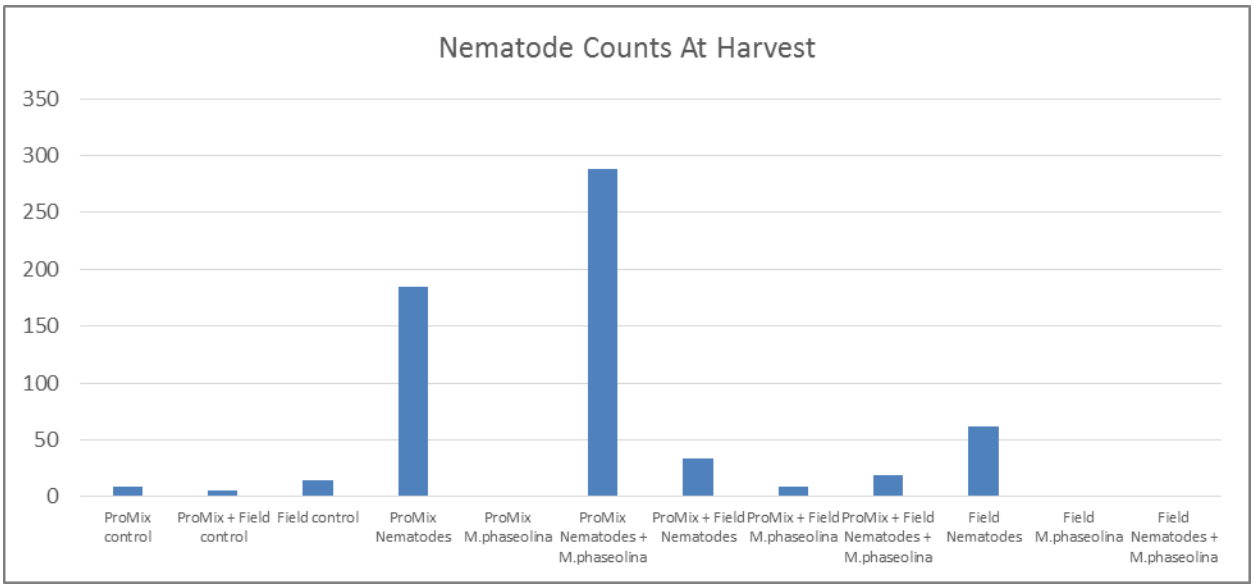

Figure 4. Nematode counts in greenhouse substrate trials at harvest (approximately 90 days of growth).

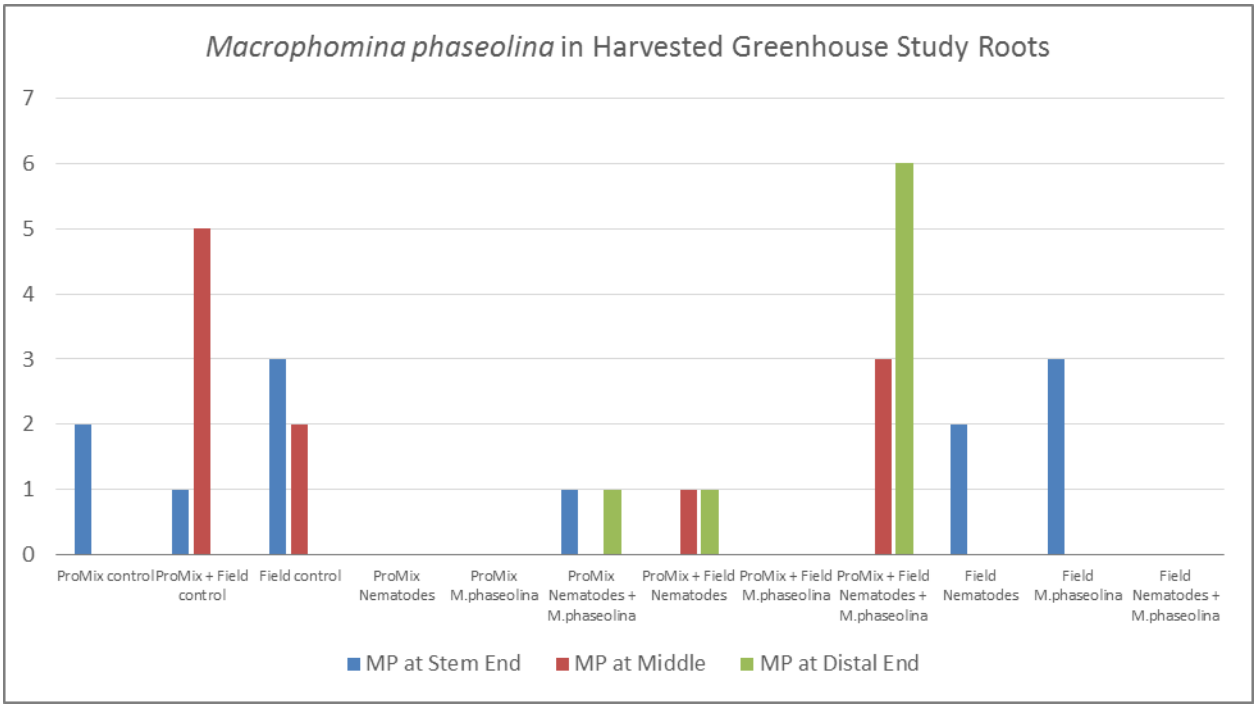

Figure 5. Average number of identified cultures of Mp in roots collected during greenhouse trials. Treatments are from three greenhouse trials established during this period. If a specific treatment was used more than once across trials, then results were averaged for that treatment.

Beneficiaries

The objective of this project was to determine if there was a synergistic effect of ever increasing populations of reniform nematodes and Mp (soil fungi) directly associated with increasing tip/endrot disease in sweet potato production areas of Mississippi. The data from this study can be used by Extension Personnel to guide growers looking at different management options when determining need to treat for nematodes in their fields. These data provides pre-planting information to growers so that nematode and fungi mitigation programs can be better defined and implemented especially since reniform nematode increases were not the primary contributors to increase root rots. Therefore, improving mitigation strategies for the disease from other management sources need to be investigated and reduces the perceived potential need for chemical treatments. Expensive nematicide costs should be primarily directed to nematode threshold levels and not base on root rot considerations.

Beneficiaries are the growers who can potentially rule out nematode involvement in tip/end rot as a primary contributor to tip/endrot. As stated above, the results of this study has provided the first clues that the presence and increase of nematodes (based on field data) populations do not necessary indicate that storage rots will automatically increase. Other parameters must now be considered as contributors to disease problem.

Lessons Learned

Lessons learned is that reniform nematode and Mp examinations must be conducted only in fields that have a history of tip/endrot. Refining of field techniques for determining presence of tip/end rot as opposed to other types of root damage produced in sweet potatoes, and what is feasible for setup of comparative greenhouse trials. Stable greenhouse environments are critical to conducting soil organism studies with plants and maintaining adequate temperature and water control is critical not only to sweet potato plants but tester fungi and nematodes. In addition, greenhouse nutrients, and the types of soils all will impact sizes and growth of the roots in pots. For example, the field soils compacted very quickly and left standing waters possibly reducing survival of the tester organisms. In all cases to use pasteurized soils (one clean of microbes), the only clear and safe method is Pro-Mix BX versus field soils. Using Pro Mix allowed for equal water and nutrient distribution in pots, distribution of Mp and nematodes during initiation of the study. However the mix may not be best for nematode growth and reproduction. Fields often were reported having problems with tip/endrot one year did not have those problems during each year our studies were established regardless of Mp levels and nematode populations in each field (Tables 1 and 2). As stated above the survey of fields in Calhoun and Chickasaw counties often had substantial populations of Mp and reniform nematode but did not show a direct correlation with field and storage disease problem. Lastly, greenhouse data could not be repeated across tests due to additional technical issues with equipment and greenhouse cooling system breakage twice during two of

the trials. It is essential that effective temperature controlled greenhouses facilities must be in place or the results from those studies or results may be compromised.

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Additional Information

References

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Acknowlegement

Special thanks to Dr Stephen Meyers for support during the course of the field trials. His efforts enable us to conduct the research and complete all phases of the field trials.

EXPANDING MISSISSIPPI FARM TO SCHOOL EDUCATIONAL EFFORTS

Project Summary

Since 2002, the Mississippi Department of Agriculture and Commerce has worked with the Mississippi Department of Education to bring locally produced fruits and vegetables to Mississippi schools. In 2012, the two agencies took the initiative to take the Farm to School program one step further, by incorporating a media event with the Governor and Commissioner of Agriculture and Commerce to increase awareness of the program. The response from the program was greatly received. The purpose of this project was to enhance the materials and further the educational components available. The specific objectives of this project included: continuing to develop and gather materials for educators to use in the classroom that incorporate agriculture and making these resources readily available, in addition to offering Mississippi schools the opportunity to participate in "Growing Lunch" a mini-grant for schools to start or expand a school garden.

The need for education of food origin exists amongst school children today as the average American is at least three generations removed from the farm. Everyday food availability is taken for granted; many citizens are able to go to the grocery store and expect fresh quality produce to be there at all times. Many fail to realize that many summer vegetables such as squash, sweet corn, and berries are not available in Mississippi's climate all year long.

Educational materials will only be developed for those specialty crops grown in Mississippi. It is expected that once children are educated on these specialty crops, consumption among the school age children will increase, not only aiding them in a more nutritional diet, but also causing an increase in the demand for Mississippi fruits and vegetables. In addition, the school garden grants available will offer a hands-on learning experience to supplement activities in the classroom. Students that are actively involved with the planting and maintaining of the produce are more likely to be enthusiastic about eating the fruits and vegetables, because they have invested much more time and attention rather than something off the grocery store shelf.

Project Approach

MDAC released the Growing Lunch School Garden Grant in the summer of 2014. Information and application instructions were available on the MDAC website: http://www.mdac.ms.gov/bureaus-departments/market-development/growing-lunch-school-garden-grant/. Additional announcement avenues and locations included: a press release announcing the Growing Lunch School Garden Grant on August 7, 2014, an article in the *Mississippi Market Bulletin* in the September 1 issue (which reached 47,000 subscribers), a mass email to all schools districts in the state, and numerous conferences and workshops for farmers and child nutrition directors. The grant was released before the beginning of the school year so teachers can utilize the garden as a teaching tool throughout the year.

MDAC received applications almost immediately after it was publicized. Grants were dated upon arrival and reviewed in the order they were received. Grants were available on a first come, first serve basis as long as the application was complete and the budget included allowable (specialty crop related) expenses. By mid-October 2014, all funds had been allocated to 27 schools across Mississippi. Schools and classes that were awarded the grant ranged from kindergarten to 12th grade.

School grants were initially to last one full school year; however, not all schools were able to expend all funds by the end of May 2015. Several schools requested to extend the MOU in order to utilize all funds, gather more information and have a greater number of students to benefit from the program.

Throughout the second and third year of the grant program, MDAC worked with the schools to ensure the funds were only utilized for specialty crop gardens at the schools. This was done by reviewing reports and requests for reimbursements.

MDAC staff also planned and promoted Farm to School Week for October 6-10, 2014 and October 5-9, 2015, with MS Department of Education. Due to the popularity of the grant program, MDAC received approval from USDA to allocate all funds to the garden grant and forego using the funds set aside to create education materials. These materials were still developed, just using funds from another source.

Goals and Outcomes Achieved

This project was created to increase the awareness of students involved in gardening and agriculture by increasing materials and resources available to teachers. Once schools received notice of acceptance for the Growing Lunch School Garden Grant, they were given a grants management guide and instructed to sign a MOU. In order for school to participate they had to be willing to measure their students' awareness of such activities before, whether from gardening with their parents, grandparents, friends or others, and the teachers had to measure their knowledge after the project has ended.

The way in which the change in knowledge was collected was up to the educators. Some conducted surveys, other asked students to write about their experiences and what they learned. All 27 schools or 100% reported an overall increase in knowledge of specialty crops as a result of the school garden grant activities. The participating schools went above and beyond MDAC's expectations of the grant. We received comments that students ate new vegetables for the first time, because they were involved in the entire growing process, some classes worked with culinary classes and prepared dishes at the schools. A variety of gardens were also created from raised beds to hoop houses or high tunnels. This grant has become so popular and since we received many inquiries about the program after the funds were awarded, MDAC reapplied for Specialty Crop Block Grant funds in FY2015.

Beneficiaries

A total of 27 schools were awarded and fulfilled the requirements of the school garden grant. In some schools, the entire student body utilized the school garden; others schools utilized the garden for two years and were able to have twice the impact with students. Over 5,000 students, teachers and volunteers benefited from the garden grants over the course of the program.

Lessons Learned

The program was very well received with the schools in Mississippi. We have received requests to include pre-school, after-school and community gardens for the mini-grant program. Because of the success of the program, MDAC has requested to continue this program to include pre-school and after-school facilities as well through the FY2015 Specialty Crop Block Grant Program.

Due to the high response to the grant program, all funds were allocated in the first year of the program, it is important to keep close communication with the school and educators. It is also important that they understand the reporting requirements and are often reminded of this obligation to the grant program.

Contact Persons

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Additional Information

The 27 pins represent the school garden grants in the counties they are located.

MISSISSIPPI MARKET BULLETIN

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MISSISSIPPI DEPARTMENT OF AGRICULTURE & COMMERCE • CINDY HYDE-SMITH, COMMISSIONER

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Desire for Truck Crops Keeps Demand on Rise

By Susan Collins-Smith
MSU Ag Communications

Locally grown produce continues to increase in popularity on Mississippi's kitchen counters, grocery shelves, and restaurant menus as consumers seek fresher fruits and vegetables.

To get them, they often turn to the state's truck crops growers, who traditionally sold their specialty items, such as tomatoes, berries, nuts, and sweet corn, from the beds of their pickup trucks.

"People want to buy from a local source, whether they buy straight from the farmer or get it through their grocer," said Jeremy Maness, Smith County Extension Service agriculture agent with Mississippi State University. "My growers have definitely seen an increase in individuals coming to their farms to buy produce. Restaurants and grocery stores, including Wal-Mart and Kroger, also buy from farmers in my area."

In 2013, these specialty crops, which include nursery crops, made up about 2 percent of the state's agriculture industry, according to MSU statistics. Fruits, vegetables, nursery crops, and nuts, including pecans, were valued at an estimated $118.2 million in the same year. This figure excludes sweet potatoes, which is recorded separately, said Alba Collart, Extension agricultural economist and assistant professor in the MSU Department of Agricultural Economics. Because harvest is ongoing, data for 2014 is not yet available.

Mississippi truck crops farmers concentrate on spring and summer produce rather than fall crops. The state's hot summers require vigilant care and regular rains to grow good quality fall produce on a large scale.

However, pecans and Satsuma oranges are popular fall items that grow well in Mississippi.

"Pecans are by far the most prevalent fall crop in the state," said Eric Stafne, Extension fruit crops specialist. "From all indications, I think the crop will produce at an average rate this year."

The increased interest in locally grown produce in the last 10 years is driven by several factors, said David Nagel, Extension horticulture specialist. These include national health recalls of produce, anxiety over pesticides, a struggling economy with fewer jobs, and a strong effort by the MSU Extension Service and the Mississippi Department of Agriculture and Commerce to develop farmers markets and create a beneficial environment for growers and consumers.

This has created plenty of room for more growers in the market, and it takes many growers to sustain farmers markets. Nagel encourages interested individuals to do in-depth research before growing for or starting a farmers market.

"Each location is unique, and some vegetables sell very well in some locations and not at all in others," he said. "Some crops, such as tomatoes, peaches, and sweet corn, are always in demand in most locations. But others, such as green butter beans, have a smaller share of the market.

"New growers should understand what consumers want and decide if there are demands not being met. Some locations have a high demand for eggplant. Some have high demand for Asian vegetables, and others have a high demand for blackberries," he said.

Cooper Farms, located in Scott County, offered a variety of colorful peppers at the Mississippi Farmers Market on High Street in Jackson, Mississippi, August 5, 2014. Consumers increasingly turn to truck crops farmers for locally grown fruits and vegetables. (Photo by MSU Ag Communications/Susan Collins-Smith)

Commissioner Hyde-Smith Announces School Garden Grant Program

By Susan Head
Marketing Specialist - MDAC

Mississippi Commissioner of Agriculture and Commerce, Cindy Hyde-Smith, announced that the Mississippi Department of Agriculture and Commerce (MDAC) will be taking applications for a new school garden grant program, Growing Lunch.

Growing Lunch seeks to enhance the Farm to School effort across the state. Farm to School provides locally-grown produce to the state's schools and also seeks to educate students on agriculture.

Eligible schools can receive a grant up to $500 to purchase supplies needed to develop a school garden. All schools, grades K-12, in the State of Mississippi are eligible to apply. Schools that already have a school garden may apply for funds to further enhance their school garden. It is encouraged that schools applying have support from their local extension office or Master Gardeners. This program is on a first come, first serve basis. Only one grant can be awarded per school.

This program will act as an educational tool to enhance the knowledge of school-aged children on agriculture, healthy eating, and how food arrives on their plate three times a day. MDAC has designated a website for those interested in the Farm to School Program and educational resources and materials for Farm to School Week, www.farmtoschoolweek.org.

Growing Lunch is funded through the Specialty Crop Block Grant Program through the United States Department of Agriculture. For additional information, you may visit http://www.mdac.ms.gov/departments/marketing/lunchgarden.htm, contact Susan Head at (601) 359-1196, or email susan@mdac.ms.gov.

Article in the *Mississippi Market Bulletin* announcing the school garden grant.

CONTAINERIZED VEGETABLE PRODUCTION FOR FIELDS AND TUNNELS

Project Summary

This project, implemented by Mississippi State University, aimed to study and develop methods for production of vegetables in compost filled fabric tubes, grow bags, and other containerized vegetable crop production. The project began as a more inclusive containerized vegetable project, with the scope being narrowed in revisions of the proposal, enhancing the emphasis on the grow tubes and bags. The potential benefit for growers of these systems includes high production potential with reduced weed and pest pressure, and higher quality harvests than can be attained in the field. The project built on previous SCBGs supporting our high tunnel research and field cultivar trials in vegetables and cut flowers by exploring another niche option for Mississippi growers, especially direct market growers.

Project Approach

During the life of the project, several experiments were conducted on grow tubes, bag culture, and traditional and non-traditional potted vegetable crop production. All included solid peat-lite artificial substrates as opposed to hydroponic or other liquid-based systems.

The grow tubes are woven black mesh tubes filled with compost. Pre-filled tubes were tested for production of six vegetable crops in replicated trials. The tubes were fertilized with a balanced liquid fertilizer twice a week and found that none of the six crops grew well in the tubes. The PI suspected the compost supplied was not mature and did not represent the potential of the system well.

The growth and yield of tomatoes in three novel container pots were also tested, comparing them to production in standard 5 gal. nursery pots. Differences were found in substrate temperatures of up to 15C, with the novel pots having consistently lower mid-day temperatures than the conventional pots. The pot type also influenced root growth and morphology greatly.

The production in table top beds constructed by the Forrest County Master Gardeners was also studied. These “Salad Tables” proved very prolific in production and suitable for garden vegetable production and small farm herb production. These findings have large implications for production of vegetables and nursery crops in containers.

The novel pots, all by the Rootmaker® company, provide air holes around the pot sides and bottoms for root pruning and ventilation. The pots are expensive relative to standard nursery pots but their effects on root growth and substrate temperature may lead to increased plant growth, yield and quality enough to make them quite cost effective.

The preliminary recommendations are that the compost tube system may need some attention to compost quality, and that the alternative pots tested show great promise in improving yield and profitability for growers of vegetable and ornamental crops. Our work on data analysis and presentations will continue after the life of this project.

Dr. Evans led the project and the experiments, prepared the reports and analyzed data. He supervised the technician and guided the field labor crew. He also provided the outreach and service aspects of the project.

Although we strongly believe that these systems have potential for great success in ornamental crops, all funds provided for this project were used on vegetable crop studies.

Goals and Outcomes Achieved

One of the expected measurable outcomes was to see an increase in containerized vegetable production; findings on this will take more time to develop. As a performance measure, there is one grower who is now marketing containerized vegetable gardens to hobbyists, but we do not have data yet to support adoption of containerized crop production by vegetable growers. An on-farm trial of the compost tube system was conducted, and like the replicated trial ran at MSU-Truck Crop Branch Experiment Station, it was not as successful as hoped. The benchmark, incorporation of grow bag or compost tube technology into commercial production is more likely to be completed in 2017 or 2018, after demonstration and promotion of our results. The target of 10,000 feet of compost tube use is not likely soon, but the future adoption of other containers should make up for this.

For the second expected measurable outcome, information has been shared on soilless production systems with dozens of growers and thousands of hobbyists. We were not able to have a container production field day because trials were not conducted simultaneously and so a complete set of simultaneous training activities worthy of a field day was not possible.The studies were not conducted at the same time, so with only one or two at a time, there was not enough going on at one time to invite everyone to the station for a specific field day for the container work. We discussed and had demonstrations at the garden fest and during some individual, small group tours.

Although we were not able to document this through surveys, we have had dozens of questions and comments from growers and hobbyists about systems we have displayed at our station and at an on-farm demonstration in early 2016. We have one commercial grower that has adopted the grow tables and the compost tube system for part of their production. They continue to work on improving the quality of the growing substrate in the tubes. They have commercially produced basil, mint, lettuce, greens, tomatoes, peppers, and squash in the tables. They have even gone into the business of selling a modified wooden container system as part of their farm market sales, selling nearly 200 units to date, somewhere north of $5,000 in sales in the sixty

day selling period they had. They expect sales to double or more for the 2017 season. Many other growers have expressed interest in the table and bag culture systems.

Beneficiaries

The beneficiaries of the project include (with number of estimated direct beneficiaries): the members of the project team and support staff (6), regional research and extension personnel (100), area growers (50), and the manufacturers and suppliers of the materials used in the studies supported by this effort (three (3) companies, with unknown numbers of employees). The compost tubes were not successful under this effort. The benefit of us knowing this are two-fold: first, we have discussed this with the manufacturer and they now have an opportunity to modify the compost mix in their product, or modify recommended cultural practices for users to allow for better production in the future, and, second, we now have information for growers and extension personnel that can help them understand the plusses and minuses of this system. The more successful effort with Rootmaker® products has similar potential benefits. We can provide information to growers and the manufacturer about crop performance using the Rootmaker® systems. We also have a significant amount of temperature data from the substrates and will be able to educate fellow researchers about these unique pots and the potential they may have to increase crop quality and hasten crop maturity. We also anticipate impacts beyond the life of the project through sales by Rootmaker®), increased profits in vegetable and nursery production, and possible additional research activities that will lead to scientific outputs.

Lessons Learned

We learned much about how container type, crop and substrate influence container vegetable performance. We did not pre-test the compost tubes for substrate qualities so when the replicated studies failed to produce good growth, we had missed a chance to minimize the negative time we spent on those studies. This is also perhaps our most unexpected outcome. The tube results are not necessarily reflective of the potential of the technology, but are definitely important reminders of the importance of compost and substrate quality in containerized production systems. We also found that it was easy to integrate detailed temperature data collection into the day-to-day management of the studies using infra-red and instant read digital thermometers. This data strengthened the study and will be very valuable to our science and our growers going forward.

Our most significant positive lesson centers on the temperature data for some of the pots. It is very clear that root zone temperature influences root growth and respiration in ways that greatly alter crop growth. Our work in this area may end up being the most impactful part of this project.

We did not complete a defined field day for this project as proposed because the studies were not done at the same time. We did conduct several well received demonstrations of several containers,

and our efforts resulted in installation and adoption of containers by several groups and growers. The lesson we have on this is to plan better with administration so that funded studies can be managed appropriately to allow maximum scientific and public benefit.

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Additional Information

The Twitter feed of @npkveg provided real time updates of project activities through the life of the project.

We have provided three photographs below to show some of the containers we have studied (Figs. 1-3).

Fig. 1. Young tomato plants in RootBuilder® and conventional pots. MDAC USDA SCBG, April 2016.

Fig. RG1. Tomato root growth at harvest after growing in a RootBuilder® perforated pot. Organic and non-organically managed plants performed similarly within pot type.

Fig. 3. Tomato root growth at harvest after growing in standard black nursery pot. Organic and non-organically managed plants performed similarly within pot type.

USING SPECIALTY CROPS TO DEVELOP AND PROMOTE FARMERS' MARKETS IN MISSISSIPPI

Previously approved final report

Project Summary

Mississippi State University completed the following activities to strive to enhance and promote the farmers market program in Mississippi:

Activities during Nov. 25 – Dec. 31, 2013
Text was written for an Extension publication about consumer, grower, and community benefits of farmers' markets in Mississippi and presented to three peers for review.

The text for a promotional brochure for the August growers' conference was begun.

Website URL and university hosting space were reserved. Images, text, and publications were gathered for the site: http://farmersmarkets.msstate.edu. The site's file structure and sitemap were completed.

Activities during Jan. 1 – March 31, 2014
Initial website completed and made available to public for viewing: http://farmersmarkets.msstate.edu.

Website linked from three other MSU websites:

- http://msucares.com/crops/market/
- http://pss.msstate.edu/faculty/associate.asp?id=79
- http://www.naturalresources.msstate.edu/business/farmers-market.asp

Twitter and Facebook accounts were created:

- https://www.facebook.com/FarmersMarketsMS
- https://twitter.com/FarmersMarketMS

An Extension publication (Print On Demand version) about consumer, grower, and community benefits of farmers' markets in Mississippi was completed. Printed copies were distributed to 82 county Extension offices. A digital file was placed on website: http://farmersmarkets.msstate.edu/information/p2821.pdf

Work began on selection of speakers, facility arrangements, and final agenda for August growers conference. Work also began on brochure for August growers conference.

Activities during April 1 –June 30, 2014
The brochure promoting the growers conference was almost ready to send to the printer. Text was completed and a graphic artist worked on the proof copy. The script was written for the

radio PSA promoting the growers conference. The news release for promoting the growers conference was written and scheduled for release. Photographs and video were shot at both the Starkville and Jackson farmers' markets.

Plans and agenda for the growers conference were completed. A page was added to the Farmers' Markets website to promote the growers conference along with an application to participate. Announcements about the growers conference were posted on multiple Twitter and Facebook accounts several times.

A schedule for recording a Farm and Family radio show promoting the growers conference was in place.

Activities during July 1 – Sept. 29, 2014

The brochure was printed for the August growers conference and distributed it to all Mississippi county Extension offices. MSU recorded a radio public service announcement about the growers conference and sent it to most Mississippi radio stations. A Farm and Family radio show about the growers conference was also recorded and distributed to state radio stations. The PI prepared and distributed a news release about the growers conference to state newspapers.

The PI and Co-PI also traveled and hosted the "Microfarming: Growing for Farmers' Markets" workshop on Aug. 27 and 28 in Raymond, MS. Around 100 people registered and attended.

Photographs taken at the Starkville and Jackson markets were incorporate into the Farmers' Markets website and brochure to be printed in 2015.

Progress Toward Measurable Outcomes

The number of farmers' markets in the state grew from 81 to 85 in 2014. The original target goal of this grant was six new markets over the two-year period of the grant period. This is on target to meet the expected measurable outcome.

The benchmark for previous website traffic was 1,488 visits annually. A target goal was to double this amount. For the past six months alone, website traffic for the grant's new website was 1,934 visits. This is on target to meet the expected measurable outcome.

A 10 percent increase in the number of new specialty crop producers (at the Microfarming Conference August 2014) selling through farmers markets at the end of the conference was a goal (target 1). A survey was taken during the conference. Producers were asked if they participated in a farmers' market last year and if they intend to participate in the future. The exact questions and results were as follows:

Did you participate in a farmers market either as a grower or seller during the past year?
23 Yes 20 No

Do you intend to participate in a farmers market either as a grower or seller during the next year? 39 Yes 3 No

This met the expected measurable outcome.

FINAL: More than 98 percent of Mississippi farms are locally owned, yet specialty crops accounted for only 2 percent of the state's total agricultural production.

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This project was a comprehensive program for enhancing and promoting specialty crops found at Mississippi farmers' markets. Since specialty crops were overwhelmingly the main product that consumers sought at farmers' markets, increasing overall product consumption at the markets would lead to increased sales of specialty crops.

There were three main problems, or areas, that needed to be addressed to increase the sales of specialty crops at farmers' markets in Mississippi: (1) help growers be more competitive by encouraging and educating them about the economic advantages of selling specialty crops at farmers' markets; (2) educate and promote the economic advantages of hosting farmers' markets to community and municipal leaders; and (3) educate and promote the advantages and health benefits to consumers of shopping for specialty crops at Mississippi's farmers' markets.

The plan was to increase all of these areas through education and promotion informed by research. This research provided the necessary background so that our message for each audience – whether it was the grower, consumer or community leaders – was more "on target" and meaningful.

Project Approach

Education: To increase the grower participation in farmers' markets, as well as show the economic advantages to communities, we hosted a two-day growers conference for producers as well as municipal leaders. Speakers were mostly horticulture-related, but there were several who spoke mainly about the economic benefits to communities.

Promotion: To help increase consumer demand, several media channels were used to reach consumers about the freshness, quality, and health benefits of specialty crops found at farmers markets. Those channels included a dedicated website and several social networking pages, newspaper features distributed to state newspapers, brochures and Extension publications, and television and radio programming and public service announcements distributed to Mississippi's radio and television stations.

Separate news features, radio shows, and television PSAs were created for the grower, consumer, and community to show the benefits of farmers' markets for each.

The brochures, publications, and websites were a combination of all three.

Work Plan as presented in the grant:

I. Videos/Television
Three 30-second public service announcement videos for grower, consumer, and municipal audiences were created. Each video aired on the Farmweek television show and was posted onto the website and social networking sites for viewing at any time. DVDs with the PSAs were shipped to every state television station for broadcast.
II. Radio
A. We created three *Farm and Family* radio shows, five minutes each, which focused on the benefits of a farmers' market for the consumer, grower, and community as the daily topic of this Extension radio segment. The show aired on dozens of Mississippi radio stations and had an approximate audience of 50,000 listeners. All three shows were available for download on the website and social media sites.
B. We aired one *Farm and Family* radio show promoting the growers' conference.
C. Public service announcements for the growers' conference were created and shipped to 54 Mississippi radio stations.
III. Brochures
A. We printed full color brochures (20,000 copies) and sent 250 copies to each of the state's county Extension offices. This brochure promoted the benefits of farmers' markets to consumer, grower, and community audiences.
B. A second brochure (2,000 copies) was published to promote the conference.
IV. Extension Publication - Three peer-reviewed MSU Extension publications already existed for communities and growers. A new publication for this project pointed out the advantages for the consumer as well.
V. Website - The new URL for the Farmers' Market website is http://farmersmarkets.msstate.edu. Using text from four Extension publications (three existing and one newly written), the new website was created using stock photos. New photos, videos, audio, and publications were added as they were completed.
VI. Social networking websites - Videos and brochures were added to new YouTube and Facebook pages when appropriate. Through social media, many more people were reached than via traditional media outlets.
VII. News features - Three news features were written and distributed to Mississippi's newspapers. Articles focused on and promoted farmers' markets (consumer, grower, and community). A single news release was also sent to all newspapers promoting the conference.
VIII. Photography – Photographs of two existing farmers' market were taken and used for website, social media, brochures, and videos.
IX. Growers' Conference – A conference, with the title 'Microfarming – How to Grow For Farmers' Markets', was organized for the purpose of teaching growers about a large number of possible specialty crops that they could grow for sales at farmers' markets. The conference also attracted prospective growers – those who have never grown any crops for farmers' markets before.

Goals and Outcomes Achieved

The number of farmers' markets in the state grew from 81 to 85 in 2015. The original target goal of this grant was six new markets over the two-year period of the grant period. Although this did not meet the expected measurable outcome, we were happy that we were able to increase the number of markets.

The benchmark for previous framers' markets website traffic was 1,488 visits annually using the Mississippi State University Extension Service website. A target goal was to double this amount using a new website. For the past 12 months (Sept. 21, 2015), website traffic for the grant's website was 6,747 unique visitors, 7,601 visits, and 10,850 accessed pages. This was on target and exceeded the expected measurable outcome.

A 10 percent increase in the number of new specialty crop producers at the Microfarming Conference selling through farmers markets at the end of the conference was the goal and target. A survey was taken after the conference. Producers were asked if they participated in a farmers' market in 2013 and if they intended to participate in the future. The exact questions and results were as follows:

Did you participate in a farmers market either as a grower or seller during the past year?
23 Yes 20 No

Do you intend to participate in a farmers market either as a grower or seller during the next year?
39 Yes 3 No
This exceeded the expected measurable outcome.

Beneficiaries

Farmers, potential producers, and municipal leaders at the Microfarming Conference were direct beneficiaries. Around 100 attended over the two days. Of those completing surveys, roughly one-half had not participated in a farmers' market previously, but intended to do so in the future.

Indirect beneficiaries were Mississippi consumers, producers, and community leaders who read, heard, or watched material produced for this grant.

Over the two-year period, promotional material is estimated to have reached more than 200,000 Mississippians by audio and video media; 10,000 readers through the Internet; and 28,000 printed brochures and publications have been distributed. In addition, news features were released to Mississippi newspapers with a combined circulation of over 1,000,000 households.

Lessons Learned

The Microfarming Conference could easily become an annual event for growers and producers. Participants in 2014 were extremely focused and active during and after the conference with each other and speakers.

Extension's Center for Government and Community Development could organize a separate conference for municipal and community leaders to encourage Mississippi counties with no farmers' markets to establish venues.

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Additional Information

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MISSISSIPPI SWEET POTATO PROMOTION/MARKETING CAMPAIGN

Previously approved final report

Project Summary

The purpose of this proposed project was to influence purchasing decisions of produce buyers by promoting Mississippi sweet potatoes at the Produce Marketing Association's annual trade show.

In previous years, the Sweet Potato Council (SPC) has obtained SCBGP funding to promote Mississippi sweet potatoes through various activities with one being participation in the PMA tradeshow. Marketing studies show brand awareness requires long term commitments over several years. With the current consumption trend ticking upward for sweet potatoes, it is vital that the SPC continue with the marketing/promotion program proposed in this project. This activity highlighted the availability and quality of Mississippi's sweet potatoes to a targeted audience of national and international produce industry executives. The timing of this proposed project was perfect to raise awareness and increase sales of Mississippi sweet potatoes.

This funding built on market share gained through the efforts funded in the past by Specialty Crop Grants. The SPC received SCBGP-FY2009, FY2010, FY2011, and FY2012 funding to promote Mississippi sweet potatoes by participating in the Produce Marketing Association's annual tradeshow. As a result of past Specialty Crop Grant Program projects, Mississippi sweet potatoes are starting to gain brand awareness and allegiance among consumers and some buyers. As a result of participation at the 2012 PMA tradeshow, orders were obtained from new buyers totaling $265,000.

Project Approach

By exhibiting at the PMA Fresh Summit, the Mississippi Sweet Potato Council and Mississippi growers and shippers were part of a premier produce tradeshow. During the exhibition, contacts were made with new produce buyers searching for sweet potatoes. Two growers/shippers attended the tradeshow as a result of the grant. Additional sales generated by contacts made at the tradeshow are estimated to be $252,000. Sales continue to be made as a direct result of the tradeshow.

Only sweet potatoes benefited as a result of this project.

Goals and Outcomes Achieved

The goal of the project was to participate in the PMA trade Show in order to attract new buyers to purchase Mississippi sweet potatoes in order to increase sales.

Activity: Attendance of two growers/shippers to the PMA Fresh Summit in Anaheim, CA, in October, 2014. The SPC provided contact/informational brochures and one-on-one contacts to buyers. Additional sales of 15,000 cartons of sweet potatoes valued at approximately $252,000 were made as a result of three buyer contacts made at the PMA Tradeshow.

Participation at the PMA Tradeshow was achieved. Three new buyer contacts were established. Additional buyers may be added as a result of the show in the future.

$252,000 of Mississippi sweet potatoes have been sold as a direct result of new buyer contacts. This is an increase from $224,000 (benchmark) set in our project proposal and represents an approximate 13% increase in sales.

Beneficiaries

Mississippi sweet potato growers were the group that benefitted from the completion of this project. The Town of Vardaman and the State of Mississippi benefitted from the economic activity generated from the increased sales of sweet potatoes.

Sales of Mississippi sweet potatoes increased from $ 224,000 (benchmark) to $252,000.

Lessons Learned

As a result of completing this project, the SPC learned that the PMA tradeshow continues to be a very effective venue to make contact with buyers looking to buy Mississippi sweet potatoes.

Sales of sweet potatoes increased significantly more than anticipated. Sales can be increased as a result of quality contacts with buyers.

All goals and outcomes were achieved.

Contact

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INVESTIGATING PRE-PLANT SOIL FUMIGANTS FOR MISSISSIPPI

Project Summary

Sweet potato growers in Mississippi have expressed their collective intentions to increase the use of pre-plant soil fumigants (primarily metam-potassium) as a means of controlling increasingly problematic nematode populations with anticipated suppression of plant pathogenic fungi associated with tip/end rots. Other growers plan to include a metam-potassium application in their pest management program for the additional perceived benefit of controlling yellow nutsedge (*Cyperus esculentus* L.) and purple nutsedge (*C. rotundus* L.). Control of these weeds with soil-applied fumigants has been documented in other vegetable crops (Gilreath et al., 2005; Johnson and Mullinix Jr., 2007), but efficacy can be largely dependent upon application rate, timing, methods, and environmental conditions. However, the rate of metam-potassium Mississippi sweet potato growers plan to use, 8 to 12 gallons per broadcast equivalent acre, is well below the rate most researchers recommend for nutsedge control (Klose et al., 2008). Growers attempting to keep costs low by applying reduced rates of metam-potassium for nutsedge control may find that the treatment provides relatively little suppression.

While soil fumigation should provide control of insects in the soil at the time of application, Reed et al. (2010) reported that insect injury was greater in sweet potatoes receiving a pre-plant application of metam-potassium and recommended further research be conducted to determine the impact of soil fumigation on soil dwelling insect injury to sweet potato roots. The authors speculated that increased injury from metam-potassium treated plots may be due to suppression of beneficial organisms at the time of application.

While grower interest in fumigant applications has increased, research related to the influence of fumigant applications on sweet potato pest management are lacking. Most of the available data regarding the use of metam-potassium is from research conducted under polyethylene mulches and may not be applicable to sweet potatoes produced on bare ground. Therefore, objectives of the proposed project were to determine metam-potassium rate effects on nematode number and sweet potato injury, nutsedge control, and sweet potato yield by grade; to determine the influence of metam-potassium application on soil dwelling insect injury to sweet potato roots.

This proposal was developed in a manner that enhances the competitiveness of the sweet potato only and was not funded or submitted to any other state or federal granting agency.

Project Approach

Nutsedge Trial

Materials and Methods:

Studies were conducted at the Pontotoc Ridge-Flatwoods Branch Experiment Station in Pontotoc, MS, in 2014 and 2015. Treatments consisted of a factorial of five K-Pam rates (0, 4, 7, 10, and 13 gal K-Pam/broadcast equivalent acre) (K-Pam HL, Amvac Chemical Corp., Los Angeles, CA 90023) by three Dual Magnum herbicide rates (0, 0.75, and 1.25 pt/acre) (Syngenta Crop Protection, LLC, Greensboro, NC 27419). Weedy and hand-weeded checks were included for comparison. K-Pam treatments were applied in a 7 inch band 10 inches deep with a small plot fumigation application rig May 16, 2014, and May 22, 2015. Dual Magnum treatments were applied with a tractor-mounted CO_2-pressurized sprayer calibrated to deliver 15 gal/acre at 20 psi and fitted with 8002 XR nozzle tips (Teejet 8002 XR, Teejet Technologies, Springfield, IL). The experiment design was split-plot with four replications. Main plots consisted of K-Pam rate. Subplots of Dual Magnum rate were randomly placed within each main plot.

All plots received 3 oz/acre Valor® SX herbicide (Valent USA Corp., Walnut Creek, CA) pre-transplanting to control broadleaf weeds endemic to the field. 'Beauregard' sweetpotato slips approximately 12 inches long were mechanically transplanted 12 inches apart into ridged rows June 6, 2014, and June 19, 2015, into a Falkner silt loam (fine-silty, siliceous, thermic Aquic Paleudalfs) with pH 6.9 and 1.3% organic matter. Plot size was four rows, each 30 ft long. All four rows were treated, but data was collected from the center two rows of each plot. Yellow nutsedge was the predominant weed in fields utilized for this study. Additional weed species were hand-removed weekly. All plots were cultivated between-rows with a rolling cultivator 3 to 4 WAP and received a single application of 12 oz/acre Select Max (Valent USA Corp., Walnut Creek, CA, 94596) plus non-ionic surfactant at 0.25% v:v to control emerged annual and perennial grass species.

Foliar sweetpotato injury and yellow nutsedge control were visually evaluated 2, 4, 6, 8, 10, and 15 WAP using a scale of 0 (no crop injury, no weed control) to 100% (crop death, complete weed control). Sweetpotato storage roots were harvested from the center two rows of each plot 110 and 109 DAP in 2014 and 2015, respectively, using a single row tractor-mounted chain digger. Storage roots were hand-graded into jumbo, No. 1, canner, and cull (misshapen roots) (USDA 2005) and weighed. Total marketable yield was calculated as the sum of jumbo, no. 1, and canner grades.

Data were subjected to ANOVA and analyzed by SAS (SAS/STAT® 9.3, SAS Institute Inc., Cary, NC) Proc Mixed with the fixed effects of K-Pam rate and Dual Magnum rate and with the random effects of year and replication within year. When ANOVA indicated a significant treatment effect, means were separated by Fisher's protected LSD. Arcsin squareroot transformed data were analyzed for visual sweetpotato injury and yellow nutsedge control ratings, and presented as untransformed data for discussion purposes. The weedy and hand-

weeded checks were included in yield analysis. However, crop injury and yellow nutsedge control data from the checks were not included in data analysis due to zero variance.

Results:

Due to a lack of treatment by year interaction, data for visual crop injury, yellow nutsedge control, and sweetpotato yield were evaluated across both 2014 and 2015. Due to a lack of K-Pam rate by Dual Magnum rate interaction, the main effect of K-Pam rate was analyzed across all rates of Dual Magnum and the main effect of Dual Magnum rate was analyzed across all rates of K-Pam.

Sweetpotato Injury. Limited sweetpotato stunting injury was observed (data not shown) and it did not correlate with either K-Pam or Dual Magnum rates. Injury was limited to $\leq$ 4% at 4 WAP, was transient, and by 8 WAP was 0% for all treatments.

Yellow Nutsedge Control. Immediately prior to transplanting, yellow nutsedge control increased from 0 to 73% as K-Pam rate increased from 0 to 13 gal/a (Table 1). However, after sweetpotatoes were transplanted, there was no additional effect of K-Pam on yellow nutsedge control. Nutsedge control with metam-containing products has been historically inconsistent. Gilreath et al. (2005) reported reduced nutsedge densities in one of three growing season when metam-sodium was drip-applied at 710 L ha^{-1} in bell pepper (*Capsicum annuum* L.) grown on black polyethylene film. Locascio et al. (1997) reported that metam-sodium at 300 L ha^{-1} soil-injected or drip-applied did not improve nutsedge control compared to a nontreated check in polyethylene-mulched tomato (*Solanum lycopersicum* L.). Klose et al. (2008) exposed yellow nutsedge tubers to concentrations of metam-sodium from 10 to 2,650 µmol kg^{-1} soil and reported that "logistic models did not adequately describe the relationship between all metam-Na concentrations and the mortality of *C. esculentus*."

Dual Magnum rate influenced yellow nutsedge control throughout the duration of the study (Table 2). At 2 WAP, yellow nutsedge control was 58, 74, and 76% in plots treated with 0, 0.75, and 1.25 pt/a Dual Magnum, respectively. Nutsedge control in all treatments decreased from 2 to 15 WAP. At 15 WAP, Dual Magnum at 0, 0.75, and 1.25 pt/a provided 35, 68, and 70% yellow nutsedge control, respectively. Throughout the season, yellow nutsedge control with 0.75 and 1.25 pt/a Dual Magnum was equivalent, which suggests rates higher that 0.75 pt/a will not improve control.

Sweetpotato Yield.

Effect of K-Pam rate. Sweetpotato yields in the non-treated check were 4,130; 19,740; 6,390; 30,260; and 1,210 lb/a for jumbo, No. 1, canner, marketable, and cull grades, respectively (Table 1). With the exception of K-Pam at 4 gal/a, which had lower no. 1 and marketable yields than the hand-weeded check, K-Pam rates used in the present study resulted in yields equal to or greater than the hand-weeded check.

Effect of Dual Magnum rate. Sweetpotato yield data followed the same trend as yellow nutsedge control. Dual Magnum applied at either 0.75 or 1.25 pt/a provided jumbo, no. 1, and marketable sweetpotato yields equivalent to the hand-weeded check. Canner and cull yields were not influenced by Dual Magnum rate.

Soil-injected K-Pam does not appear to be a useful tool for yellow nutsedge management in the current Mississippi sweetpotato production system, however its use did not reduce sweetpotato yield in the present study. Alternative application methods for K-Pam in sweetpotato may be useful. For example, Johnson and Mullinix (2007) reported that 747 L ha^{-1} of non-diluted metam-sodium sprayed in a 61 cm band and incorporated with a rototiller to a depth of 7.6 cm provided 75% control of yellow nutsedge in bare-ground grown cantaloupe (*Cucumis melo* L.). Gilreath et al. (1994) reported greater nutsedge control with surface-applied metam-sodium rototilled to a depth of 15 to 20 cm than soil injected metam-sodium in polyethylene mulched tomato.

Results from the present study suggest that Dual Magnum is a useful tool in a yellow nutsedge weed management program and that the benefits of applying Dual Magnum PRE to sweetpotato fields with a history of yellow nutsedge infestation outweighs the potential risks of yield loss due to a phytotoxic response. Given that no other herbicide registered for use in sweetpotato offers equivalent control of yellow nutsedge and that nutsedge densities that typically occur in sweetpotato production fields can result in significant yield losses (Meyers and Shankle 2015), Dual Magnum should be considered for application immediately after transplanting only in fields with a history of nutsedge infestation. However, because Dual Magnum requires an activating rainfall or irrigation event prior to yellow nutsedge emergence, a system that relies solely on Dual Magnum for yellow nutsedge control is not encouraged. Other management options are to utilize integrated pest management practices by rotating to crops that are more competitive with yellow nutsedge and/or have efficacious herbicides and removing yellow nutsedge propagules from equipment before entering a non-infested field. For all other weed species controlled by other registered herbicides, Dual Magnum should still be delayed until at least 14 DAP to limit potential crop injury and yield losses.

Effect of K-Pam on Soil-Dwelling Insect Injury. Nutsedge shoots, roots, and tubers grew into and through sweetpotato storage roots in this study. It was clear that roots with nutsedge leaves or tubers remaining in the hole were the result of nutsedge growing into the storage roots (see photos at right). However, the cause of holes in the storage roots was not always this obvious. In an effort to avoid reporting false positives for soil-dwelling insect injury, it was decided that roots from this study would not be rated for insect injury.

Table 1. Effect of metam-potassium rate on yellow nutsedge control and sweetpotato yield at Pontotoc, MS across 2014 and 2015.

Treatment	CYPES[a]	Sweetpotato yield				
K-pam rate	0 WAP	Jumbo	No. 1	Canner	Marketable[b]	Cull
gal broadcast a^{-1}	%			lb a^{-1}		
Hand-weeded check	--	4,130	19,740	6,390	30,260	1,210
0	0	3,590	17,380	6,130	27,100	1,560
4	31	3,190	15,670	7,190	26,050	1,160
7	55	3,850	17,680	7,280	28,810	1,190
10	71	3,180	19,570	6,800	29,550	960
13	73	3,310	17,750	6,770	27,830	1,050
LSD (P≤0.05)	3	NS	2,830	830	3,240	420

[a]Abbreviations: CYPES = yellow nutsedge; NS = not significant; WAP = wk after transplanting.
[b]Marketable is the aggregate of jumbo, no. 1, and canner grades.

Table 2. Effect of Dual Magnum rate on yellow nutsedge control and sweetpotato yield at Pontotoc, MS averaged across 2014 and 2015.

Treatment	CYPES[a] control (WAP)					Sweetpotato yield				
Dual Magnum rate	2	4	6	8	15	Jumbo	No. 1	Canner	Marketable[b]	Cull
pt a^{-1}			%					lb ha^{-1}		
Hand-weeded check	--	--	--	--	--	4,130	19,740	6,390	30,260	1,210
0	58	47	42	37	35	2,490	16,310	7,110	25,920	980
0.75	74	75	72	71	68	3,710	17,960	6,870	28,540	1,270
1.25	76	78	75	74	70	4,090	18,660	6,540	29,290	1,290
LSD (P≤0.05)	11	10	10	11	11	1,050	2,670	NS	3,060	NS

[a]Abbreviations: CYPES = yellow nutsedge; NS not significant; WAP = wk after transplanting.
[b]Marketable is the aggregate of jumbo, no. 1, and canner grades.

Nematode Trial

Materials and Methods:

Studies were conducted at two locations in 2014, one on-farm in Big Creek, MS, and one at the R.R. Foil Plant Science Research Center (North Farm) in Starkville, MS. In 2015 and 2016, studies were conducted at the North Farm in Starkville, MS, and on-farm in Thorn, MS, respectively. Treatments consisted of a factorial of the same K-Pam rates used in the nutsedge study with one of two rates of VydateL (0 or 1 gal/acre). A summary of K-Pam and VydateL application and harvest dates can be found in Table 3. Plots size was 30 ft long by four rows wide. All rows were treated, however, data was collected from the two center rows. The experiment design was split-plot with four replications at Big Creek and Starkville in 2014 and Thorn in 2016 and six replications at Starkville in 2015. Main plots consisted of K-Pam rate. Subplots of VydateL rate were randomly placed within each main plot. At all locations, nematode samples were collected before treatment, 30 days after transplanting, and near harvest to determine the effect of treatment on nematode population over time. Four soil cores were taken, two each from the center of the middle two rows in every plot. Samples were collected from the upper 6 to 8" of soil. All samples were placed in coolers after collection and refrigerated until they could be extracted then counted. At harvest, sweetpotatoes were dug from the middle two rows and graded according to USDA standards as previously described. A subsample of roots were evaluated for insect injury type according to Reed et al. (2010).

Data were subjected to ANOVA by SAS ProcGLM. Means were separated by LSD ($P \leq 0.05$).

Table 3. K-Pam and VydateL application, transplanting, and harvest dates for nematode studies in 2014, 2015, and 2016.

	2014		2015	2016
Action	Big Creek	Starkville	Starkville	Thorn
K-Pam application	May 13	June 19	June 4	May 24
VydateL application	June 19	July 1	June 24	June 9
Transplanted	June 21	July 2	June 29	June 10
Harvested	Oct. 19	Nov. 3	Nov. 12	Sept. 21

Results:

Though trends in the data are apparent, at $P \leq 0.05$, there were few statistical differences among treatments for nematode number and sweetpotato yield. In general, K-Pam rates of 4 to 13 gal/a resulted in numerically fewer nematodes/pt at harvest in Starkville in 2014 and 2015 and Thorn in 2016 (Tables 4, 8, and 10, respectively). However at Big Creek in 2014, nematodes/pt of soil at harvest generally increased as K-Pam rate increased (Table 6). Despite this trend, No. 1 and marketable sweetpotato yields at Big Creek were greatest when K-Pam was applied at 13 gal/a. Though not statistically significant plots receiving VydateL at 1 gal/a had numerically fewer nematodes/pt soil at harvest at Big Creek and Starkville (both 2014 and 2015) compared

to 0 gal/a VydateL. Overall, neither K-Pam rate nor VydateL rate greatly affected sweetpotato yield.

In 2015, neither K-Pam rate nor VydateL rate influenced the percentage of sweetpotatoes with insect injury (data not shown). However, in 2016 VydateL at 1 gal/a resulted in greater insect injury (71%) than 0 gal/a (55%).

Table 4. Effect of K-pam rate on nematode number and sweetpotato yield at Starkville, MS in 2014.

	Nematode no.			Sweetpotato yield				
K-pam Rate	Pre-trt	30 DAP	Harvest	Jumbo	No. 1	Canner	Marketable	Cull
(gal/ broadcast A)		Per pint				lb/plot		
0	1,942	1,985	5,347	8.9	29.8	5.1	43.8	0.4
4	4,486	1,003	3,983	10.1	28.1	4.6	42.8	0.6
7	2,272	1,226	2,630	9.4	30.7	4.3	44.4	1.2
10	3,075	939	2,708	9.9	28.2	4.3	42.4	1.5
13	6,612	2,064	3,204	9.5	30.2	5.3	45.0	1.5
LSD (P≤0.05)	NS	NS	246	NS	NS	NS	NS	NS

Table 5. Effect of VydateL rate on nematode number and sweetpotato yield at Starkville, MS in 2014.

	Nematode no.			Sweetpotato yield				
VydateL Rate	Pre-trt	30 DAP	Harvest	Jumbo	No. 1	Canner	Marketable	Cull
(gal/ broadcast A)		Per pint				lb/plot		
0	2,547	1,422	3,712	8.9	29.1	4.8	42.8	1.1
1	2,610	901	3,310	10.2	29.7	4.6	44.5	0.9
LSD (P≤0.05)	NS	42	NS	NS	NS	NS	NS	NS

Table 6. Effect of K-pam rate on nematode number and sweetpotato yield at Big Creek, MS in 2014.

	Nematode no.			Sweetpotato yield				
K-pam Rate	Pre-trt	30 DAP	Harvest	Jumbo	No. 1	Canner	Marketable	Cull
(gal/ broadcast A)		Per pint				lb/plot		
0	2,888	496	931	6.5	48.7	10.0	65.2	0.6
4	4,243	450	457	5.9	49.6	8.0	63.5	0.5
7	4,333	86	1,577	7.0	46.3	8.1	61.4	0.1
10	4,303	316	9,461	5.8	50.9	6.6	63.3	0.1
13	4,005	224	6,532	7.9	59.0	8.6	75.5	1.2
LSD (P≤0.05)	NS	NS	836	NS	11.5	2.8	11.8	0.5

Table 7. Effect of VydateL rate on nematode number and sweetpotato yield at Big Creek, MS in 2014.

	Nematode no.			Sweetpotato yield				
VydateL Rate	Pre-trt	30 DAP	Harvest	Jumbo	No. 1	Canner	Marketable	Cull
(gal/ broadcast A)		Per pint				lb/plot		
0	3,963	376	4,051	8.0	51.6	8.4	68.0	0.4
1	3,854	220	1,955	5.2	50.2	8.1	63.5	0.4
LSD (P≤0.05)	NS	NS	NS	NS	NS	NS	NS	NS

Table 8. Effect of K-pam rate on nematode number and sweetpotato yield at Starkville, MS in 2015.

	Nematode no.			Sweetpotato yield				
K-pam Rate	Pre-trt	30 DAP	Harvest	Jumbo	No. 1	Canner	Marketable	Cull
(gal/ broadcast A)		Per pint				lb/plot		
0	1,084	355	2,483	7.7	38.7	6.2	52.5	2.2
4	935	409	3,451	6.7	26.7	5.9	39.3	3.3
7	849	108	2,000	6.9	33.4	5.4	45.7	3.6
10	1,269	204	1,806	8.8	38.4	6.9	54.1	3.8
13	1,659	430	774	8.8	38.5	6.0	53.3	5.0
LSD (P≤0.05)	NS	NS	NS	NS	11.7	NS	NS	NS

Table 9. Effect of VydateL rate on nematode number and sweetpotato yield at Starkville, MS in 2015.

	Nematode no.			Sweetpotato yield				
VydateL Rate	Pre-trt	30 DAP	Harvest	Jumbo	No. 1	Canner	Marketable	Cull
(gal/ broadcast A)		Per pint				lb/plot		
0	1,104	151	2,309	7.0	35.5	5.4	47.9	3.1
1	1,204	452	1,896	8.6	34.8	6.7	50.0	4.1
LSD (P≤0.05)	NS	NS	NS	NS	NS	NS	NS	NS

Table 10. Effect of K-pam rate on nematode number and sweetpotato yield at Thorn, MS in 2016.

	Nematode no.			Sweetpotato yield				
K-pam Rate	Pre-trt	30 DAP	Harvest	Jumbo	No. 1	Canner	Marketable	Cull
(gal/ broadcast A)		Per pint				lb/plot		
0	194	150	8,897	6.8	54.7	21.0	82.5	5.1
4	276	21	6,175	7.7	60.6	22.7	91.1	5.4
7	284	3	1,586	11.0	55.4	19.0	85.4	7.2
10	177	11	3,728	10.1	56.9	17.6	84.5	6.3
13	160	5	2,057	6.7	54.4	20.6	81.8	4.2
LSD (P≤0.05)	NS	133	3,517	NS	NS	NS	NS	2.7

Table 11. Effect of VydateL rate on nematode number and sweetpotato yield at Thorn, MS in 2016.

	Nematode no.			Sweetpotato yield				
VydateL Rate	Pre-trt	30 DAP	Harvest	Jumbo	No. 1	Canner	Marketable	Cull
(gal/ broadcast A)		Per pint				lb/plot		
0	240	41	3,988	7.9	57.2	19.8	84.9	6.1
1	197	35	4,989	9.1	55.6	20.6	85.2	5.1
LSD (P≤0.05)	NS	NS	NS	NS	NS	NS	NS	NS

Goals and Outcomes Achieved

Benchmark data pertaining to the role of the soil fumigant K-Pam was established for sweetpotato. These findings were shared with stakeholders as described in the Beneficiaries section. It was the goal of the researchers that a minimum of 30% of sweetpotato producers would adopt at least a portion of the recommendations developed from this research. We believe we have accomplished this by altering the following production practices: 1) State-wide acreage treated with K-Pam for nutsedge control has decreased by approximately half (~500 acres). Findings from the study showed no benefit of K-Pam for nutsedge control after transplanting. This change in practice represents a savings of $60,000 per year to the industry in chemical costs alone (500 acres * 10 gallons K-Pam/a * $12/gallon). 2) In 2014, more producers followed university recommendations to rotate away from nematode-host crops. This resulted in increased corn and grain sorghum plantings in Northeast Mississippi. Unfortunately, following the 2014 season, the potential return on investment for grain sorghum greatly declined due to the costs associated with controlling a new pest of the crop (the sugarcane aphid) and lower market prices. Growers also increased rotations to soybean for nutsedge management. After three years of proper weed management in a soybean rotation, nutsedge is virtually eliminated from a field. This demonstrates grower willingness to adopt crop rotations aimed at nematode and/or nutsedge management. 3) We believe that nutsedge is problematic on at least 1,500 sweetpotato production acres in Mississippi. Data from our research suggest a net gain of 9% in marketable yield when Dual Magnum is applied immediately after transplanting to control nutsedge. At least half of the affected acreage receives Dual Magnum as recommended in our findings. This equates to a net increase of 1,800 lb of marketable sweetpotatoes per acre. At an average unit price of $0.27/lb (averaged across all grades of sweetpotato), the gross return to the industry is $364,500/year.

Beneficiaries

Findings from this research were shared with both industry stakeholders and the greater scientific community via the following outputs.

- Findings were presented to sweetpotato stakeholders at 2 Sweetpotato Field Days, on each in 2014 and 2015 (~70 in attendance each year); 2 Winter Sweetpotato Production Meetings in 2015 and 2016.
- Findings were presented at the National Sweetpotato Collaborators Group Annual Meeting and as an abstract in the annual report:
    - Meyers, S.L. and M.W. Shankle. 2015. Pre- and postemergence yellow nutsedge management in sweetpotato. National Sweetpotato Collaborators Group Annual Meeting. 33:15.
- Information gleaned from the nutsedge research associated with the project were included in Mississippi State University Extension Publication 2909 entitled “Nutsedge Management

in Mississippi Sweetpotatoes". This publication is available in print and online at http://extension.msstate.edu/sites/default/files/publications/publications/p2909.pdf

- A manuscript entitled "An Evaluation of Metam-Potassium and *S*-metolachlor for Yellow Nutsedge Management in Sweetpotato" detailing results from the nutsedge portion of this proposal was submitted for publication to WeedTechnology on September 22, 2016. It was accepted for publication on November 28, 2016 and will appear in the journal in 2017.

Lessons Learned

It is clear from the data that perceived benefits of soil fumigation are not often realized and efficacy of fumigation treatments is highly variable. There is now sufficient data to support an application of Dual Magnum immediately after transplanting in fields with historically high levels of nutsedge. Conversely, the data discourage K-Pam applications for nutsedge control and suggest that such applications will result in greater input costs with no net gain in yield. Similar results were found for nematodes. Although some locations had a general decrease in nematodes at harvest, yields were largely unaffected.

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Additional Information

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TEA EVALUATION TRIAL IN MISSISSIPPI

Previously approved final report

Project Summary

Mississippi State University implemented this project to create and investigate the potential of tea production in Mississippi. Activities performed during this reporting period include collecting tea cultivars and developing appropriate production techniques. Tea plant material has been donated from many sources across the Southeast. International importation of *Camellia* sp., other than seed, has been prohibited due to concern of importing two long-horned beetle species. This has led to the importation of seeds with the cooperation of The Great Mississippi Tea Farm and Teacraft Ltd. Plants from different sources will be planted into the field in late 2014 and 2015 and used for selection of elite cultivars.

Two studies have been conducted to investigate the appropriate production techniques. The first study focused on propagation of tea cuttings. Several experiments were set up to evaluate the effects of cutting type, substrate, and use of plant growth regulators on cutting survival rate. Initial results suggest that cuttings stuck in a peat based substrate and treated with indole acetic acid (IAA) increased rooting percentage, when compared to cuttings lacking IAA and planted in a pine bark based substrate. The second study was conducted to determine the appropriate rate of nitrogen application for nursery production of tea plants. Data taken included: plant size, leaf photosynthetic rate, and pest and disease incidence.

Research has been disseminated to growers and public at different field days and grower meetings, including a field day at the Beaumont Experiment Station, a Mississippi Sustainable Agriculture farm tour at The Great Mississippi Tea Company in Brookhaven, MS, and a blueberry grower meeting at J & D Blueberry Farm in Poplarville, MS. These events gave MSU the opportunity to share the progress to over 100 participants.

The experiment was set up and conducted in line with our goal.

- Dr. Bi and Judson LeCompte, graduate student, set up and conducted experiments.
- Drs. Bi and Nagel, and Judson disseminated the project progress and preliminary results during field days and grower meetings.
- Drs. Bi and Judson prepared the progress reports.
- Jason McDonald from the Great Mississippi Tea Farm in Brookhaven donated many plants to the project and supported the research effort in many different ways.
- Nigel Melican from Teacraft Ltd also supported us in many different ways, including providing information on tea cultivar acquisition and tea production techniques, and connecting us with national and international tea researchers and institutions.
- The cooperation and support from the Great Mississippi Tea Company and Teacraft Ltd. has been invaluable.

The PIs have gathered data on cutting survival rate in response to cutting type, substrate, and use of plant growth regulators in the propagation study, plant growth, leaf photosynthetic rate, and pest and disease incidence in the fertilization study.

This project has garnered a lot of grower and public interest. The work at the Great Mississippi Tea Farm in Brookhaven and the research we are conducting under this project have been reported by many media including newspapers, magazines, and websites.

Final:Tea (*Camellia sinensis)* is an evergreen plant that grows mainly in tropical and subtropical climates. Tea beverage is the most widely consumed beverage in the world next to water. Research has shown that consumption of tea is potentially beneficial to health and longevity, given its antioxidant and other health beneficial contents. However, a majority of the tea consumed in the United States is imported, and there is currently very limited tea production in the US. Climate in Mississippi is suitable for tea production. The objective of this project was to conduct a tea cultivar evaluation trial and investigate the potential of tea production in Mississippi.

Through collaboration with tea growers and other interested parties across the country, we have collected about 20 tea accessions over the past two years. Initial evaluation has indicated that accessions varied in leaf size, leaf color, and growth habit. Some accessions showed more cold and/or heat tolerance than others. We also conducted several studies to investigate the optimum production practices, including propagation, fertilization, and weed management. Propagation studies evaluated rooting growth regulators and cutting types on rooting performance. Results showed that the use of plant growth regulators increased rooting performance for some accessions, but had no effect on others. Single-node cuttings rooted as well as multi-node cuttings. Fertilization studies investigated the appropriate rate of nitrogen (N) for nursery container production. Preliminary results suggest that tea plants are heavy feeders, and plants fertilized with higher N rates had more growth. A weed management study evaluated organic and conventional weed control methods for tea fields. Preliminary results suggest that organic practices may result in increased tea plant growth while offering similar weed suppression when compared to conventional methods. The project's activities and results have been shared during workshops and field days. Plans have been made to present results at regional and national conferences.

Project Approach

Tea materials have been collected domestically and internationally over the past two years. About 20 accessions have been donated from tea growers, nurseries, and other interested parties across the country. We also received donated tea seeds imported from country of Georgia. Initial evaluation has indicated that accessions varied in leaf size, color, and growth habit. Some accessions showed more cold and/or heat tolerance than others. Because these plants are still young, we plan to continue monitoring them to obtain data on some of the main commercial performance attributes, many of which require at least three-to-five-year-old

bushes for assessment. Those traits include plant vigor, yield, harvestability, pest and disease tolerance, heat, cold, and drought tolerance, processability, and cup quality.

In the past two years, we have conducted several studies to investigate sustainable production practices for growing tea, including propagation, fertilization, and field weed management.

Propagation studies were conducted to evaluate rooting growth regulators and cutting types on rooting performance. Cuttings were treated with different rooting hormones at 0, 3000, or 8000 ppm IBA and then stuck in 36-cell trays filled with a peat-based propagation mix. All cuttings were then placed under an intermittent mist irrigation system on raised benches in a glass greenhouse at Dorman Greenhouse Complex at Mississippi State University. Cutting types (single node vs. multi-node) were also evaluated. Data taken included time to root initiation, rooting percentage, and survival rate. Initial results indicated that the use of plant growth regulators increased rooting performance for some accessions, but had no effect on others. Single-node cuttings rooted as well as multi-node cuttings. We also observed that appropriate pH is critical for root initiation. Future research will be designed to determine the optimal pH ranges.

A fertilizer study was conducted to determine the appropriate nitrogen rate for nursery production of tea plants. Rooted liners were planted in 1-gal containers with pine bark substrate and treated with one of 5 N rates: 0 (control), 5, 10, 15, or 20 mM N. Other macro and micro nutrients were pre-plant incorporated at the labeled medium rate across all treatments. Data taken included plant size, leaf photosynthetic rate, and pest and disease incidence during the growing season, and plant dry weight and nutrient content at the end of the growing season. Preliminary results suggest that tea plants are heavy feeders, and plant growth increased with increasing N rates.

A weed management study was conducted to evaluate organic and conventional weed control methods for tea fields, including selected pre-emergent herbicides and organic mulch. Tea plots were cleared of weeds using glyphosate to kill present weeds before treatment. Herbicide were applied using a sprayer at recommended rate. Data recorded include symptoms of phytotoxicity, plant growth, weed species, and weed density. Preliminary results suggest that organic practices may result in increased tea plant growth while offering similar weed suppression when compared to conventional methods.

The significant contributions and role of project partners in the project:

- Bi and LeCompte collected tea accessions.
- Bi and LeCompte conducted evaluation trials and experiments on propagation, fertilization, and field weed control.
- Bi, LeCompte, and Nagel hosted tours that showcased the studies being done under this grant.
- Bi, LeCompte, and Nagel presented the project results at local and regional workshops and field days.
- Bi, LeCompte, and Nagel prepared the progress reports and final report.

Goals and Outcomes Achieved

The objective of this project was to conduct a tea cultivar evaluation trial and investigate the potential of tea production in Mississippi. For the long-term goal, we aim to develop cultivars that are "fine-tuned" for local conditions, thus producing the best possible commercial crop of tea with a unique and very marketable Mississippi signature. In the past two years, we collected about 20 tea accessions from domestic and international sources. Preliminary data indicated some accessions are more suitable to southern climate than others. Further research will be conducted to obtain data on some of the main commercial performance attributes, many of which require at least three-to-five-year-old bushes for assessment. Production related studies provided us preliminary data on propagation, fertilization, and weed management practices. We delivered the findings and preliminary recommendations through workshops, field days, tours, and individual contacts.

Proposed measurable outcomes included (1) outreach materials reporting data and outlining nursery propagation methods and initial field growth and hardiness performance of tea cultivars in Mississippi; (2) a research and demonstration site of tea cultivars for future research and outreach activities; and (3) an improved knowledge base on tea cultivar availability, nursery propagation, and field plant growth among growers, researchers, and Extension agents. This project resulted in more than 500 direct contacts at field days, workshops, tours, with many more indirect contacts and social media interactions. The project increased the knowledge base of the research team and attendees at field days and workshops. The project helped us advise clients on tea cultivar availability, production related techniques, and the potential of growing tea as a specialty crop in Mississippi. We are preparing 2 publications that will be completed after the official end of the project period. These include one peer-reviewed journal publication and one experiment station bulletin.

Examples of the presentations related to this project include, but are not limited to, the following:

<u>Conference presentation:</u>
LeCompte, J. and J. MacDonald. 2015. Growing tea in Mississippi. Mississippi Fruit and Vegetable Conference. Natchez, MS. Dec. 2-3.

LeCompte, J. and G. Bi. 2016. Tea as an alternative crop for Mississippi. Southern-Region American Society for Horticultural Science Annual Conference, San Antonio, TX. Feb. 5-7, 2016. (Title submitted)

<u>Field day/Tours/Events:</u>
Results of research were shared at the following events:

- US League of Tea Growers Annual Meeting, Spring Round-up. February 19-21, 2015. Approximately 30 attendees.
- Beaumont Horticulture Field Day. June 4, 2015. Approximately 75 attendees.

- The Great Mississippi Tea Company Field Day. October 2, 2015. Approximately 20 attendees.
- Fall flower and Garden Fest. Oct. 16-17, 2015. Approximately 200 people attended the tea seminars during the 2-day Fest event.
- Beaumont Horticulture Field Day. June 2014. Approximately 40 attendees.
- Mississippi Sustainable Agriculture Network Field Day at The Great Mississippi Tea Company in Brookhaven. October 2014. Approximately 30 attendees.
- A blueberry growers meeting at J & D Blueberry Farm in Poplaville, MS. 2014. Approximately 30 attendees.
- Many small and individual tours have occurred throughout the project period (total 100 contacts).

Our research on tea and collaboration with local tea farms such as The Great Mississippi Tea Company in Brookhaven MS has generated considerable interest and was highlighted in a number of media reports, including

- *Mississippi Agricultural News-MSU Ag Communications*
  - "Tree farmer starts first tea farm in Mississippi," 2013, http://msucares.com/news/print/agnews/an13/20131017_teafarm.html;
  - "Mississippi's first tea farm off to good start," 2014, http://msucares.com/news/print/agnews/an14/20140702.html;
  - "Tea farm begins process of developing taste samples," 2015, http://msucares.com/news/print/agnews/an15/20151006.html
- *Mississippi Business Journa*l
  - "State's first tea garden survives bad weather with some losses," 2014, http://msbusiness.com/2014/07/states-first-tea-garden-survives-bad-weather-losses/;
- *The Clarion-Ledger* (a state-wide newspaper)
  - "Mississippi tea garden in the works," 2014, http://www.clarionledger.com/story/news/2014/07/24/mississippi-tea-garden-works/13109183/.

Beneficiaries

Beneficiaries of the project have included new and existing specialty crop growers in MS and surrounding states. More than 500 growers, gardeners, and general public have been reached over the life of the project. Knowledge gained from this project has supported grower and agent trainings in Mississippi.

Lessons Learned

Tea has great potential as an alternative crop for MS growers, especially for small- and medium-sized farmers. Tea can help farmers diversify their crop profile and stabilize income, as well as increase the availability of locally grown produce. Many consumers have expressed interest in purchasing locally grown tea to support their local economies. Many growers have expressed interest in including tea into their crop profile but are hesitant because of lack of information on production techniques and potential market profitability. Preliminary results from this project demonstrated great potential for growing tea in Mississippi; however, further research is needed to facilitate the development of a tea industry. A multi-state proposal for continued tea research is under preparation for submission to the USDA-NIFA Specialty Crop Research Initiative program.

Contact Persons

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FINANCIAL AID & WORKSHOPS FOR BEGINNER BEEKEEPERS

Project Summary

Increased awareness of the shortage of bees (both wild and domestic) due to diseases such as Colony Collapse Disorder and parasites has led to the public wanting bees to pollinate their gardens and orchards. With the decline in wild and managed honey bee colonies, it is important that populations of honey bees are maintained to meet pollination needs. Honey bees are the most economically valuable pollinators of agricultural crops worldwide. They pollinate approximately 130 agricultural crops including fruit, vegetable, fiber, and nut crops.

The project was initiated by the Mississippi Beekeepers Association (MBA) with two major approaches to increase and enhance participation in beekeeping as an avocation and as a budding financial venture: (1) a cost-share reimbursement program that paid individual beekeepers $180.00 to offset the cost of their first two colonies of honey bees, and (2) the use of funds to conduct a variety of beginning beekeeping workshops to continue the education of new beekeepers in Mississippi. The primary goal of the first component was to incentivize new participation, while the second goal was to increase educational opportunities for new beekeepers.

Previous financial aid grants were used to develop a successful cost-share program to help beginner beekeepers. The cost-share program assisted new beekeepers in getting started with bee production, and more people continue to show an interest in beekeeping. The program had planned to establish a 50/50 cost share program aimed for 50 new beginning beekeepers. Each would be reimbursed $180, which is the approximate cost of one of the two hives. At the completion of this project, we fell well short of the intended goal, and only 11 people received cost-share reimbursements.

While the beginning beekeeping workshops laid a foundation for beginner beekeepers, those interested in beekeeping needed further assistance to help them get started in honey bee production. In the past, specialty crop grant money has also been used to fund workshops for the cost-share applicants for educational purposes. It is very important to continue the education of new beekeepers from the basics of beekeeping to the important area of pest management. There are several serious parasites, diseases and hive pests that require significant knowledge and understanding to adequately manage the problems. For this reason, funds from this grant were used to hold two beginning beekeeper workshops per year and another two workshops per year targeting safe disease and pest control strategies for beekeepers.

The project was much more successful at conducting educational workshops to help further the development of new beekeepers. The majority of the funds were used to pay for the costs associated with bringing top national speakers into various workshops, particularly the Beginning Beekeepers Workshop associated with the Mississippi Beekeepers Annual Convention, which was held in late October or early November during each of the two funded years. These speakers are highly sought

after by many beekeeping organizations in the U.S. because they are dynamic speakers well versed in apiculture, and many of these speakers have proven track records as educators of beekeeping at national and regional beekeeping events. Some of the speakers were bee researchers and apiculturists at other universities where they have much experience in interacting with new beekeepers.

This project built upon previously funded Specialty Crop Grants, including a cost-share program in FY08 and FY10 and beekeeping workshops funded through FY09 and FY10 grants. Due to the demand of participants willing to take part in this opportunity and need for bees to pollinate many of our specialty crops, the PI saw the need to continue this program. Recent MDAC grants have been used to implement two to four beginning beekeeper workshops per year over the last few years. There has always been an attempt to distribute these workshops to the southern, central and northern areas of the state so that beekeepers would not have to travel hundreds of miles to attend a workshop. A similar philosophy will be continued, but it is too difficult to hold the same workshop in three different locations and have time to implement workshops with other types of information. For that reason, beginning beekeeping workshops from this proposal will only be repeated at two locations – south central and north central.

Project Approach

Adult educational workshops were the primary focus for use of funds from this block grant. Most of the money funded speakers to attend our larger venues each year, but the Mississippi Beekeepers Association and its affiliate clubs and Mississippi State University Extension worked hand-in-hand during the funding period to deliver a number of beginner and intermediate beekeeper workshops itemized below:

1. Beginning Beekeepers Workshop in collaboration with the Central Mississippi Beekeepers Association; 1.5 days at the Mississippi Agriculture & Forestry Museum, Jackson, MS; March 15-16, 2014.

2. Beginning Beekeepers Workshop in collaboration with the Southwestern Mississippi Beekeepers Association; 1 day at the Franklin County Extension Office, Meadville, MS; April 19, 2014.

3. Workshop on the Management and Identification of Major Honey Bees Diseases, Pests and Parasites in collaboration with Meridian Beekeepers Association, Meridian, MS; May 17, 2014.

4. Queen Rearing with Emphasis on Non-grafting Techniques. Pike County Extension Office, Magnolia, MS; May 30, 2014.

5. Queen Rearing Workshop. Clay Lyle Bldg., MSU Campus; September 13, 2014.

6. Beginning Beekeepers Workshop in collaboration with the Southwestern Mississippi Beekeepers Association; 1 day at the Pike County Fairgrounds, McComb, MS; October 4, 2014.

7. Beginning Beekeepers Workshop; Sponsored by the Central Mississippi Beekeepers Association; Ag & Forestry Museum, Jackson, MS; March 14, 2015.

8. Intermediate Beekeeping Workshop with the Southwestern Mississippi Beekeepers Association; Pike County Fairgrounds, McComb, MS; April 11, 2015.

9. Beginning Beekeepers Workshop. Marshall County Fairgrounds, Holly Springs, MS; April 18, 2015.

10. "A Day in the Hive" – Intermediate Beekeeping Workshop with the Meridian Beekeepers Association, Meridian Farm Bureau Office and Fish Hatchery, Meridian, MS; May 2, 2015.

11. Swarm Biology and Splitting Hives – Intermediate Beekeeping Workshop with Randall Nevins (Monroe County) and Reid Nevins (Lowndes County); Clay Lyle Building, MSU Campus; May 23, 2015.

12. Varroa IPM, Management of Small Hive Beetle, Other Diseases of Honey Bees was presented jointly with John Adamczyk and Aleš Gregorc. Thad Cochran Southern Horticulture Lab, USDA, ARS; Poplarville, MS; September 26, 2015.

13. Beginning Beekeepers Workshop as a sub-component of the Mississippi Beekeepers Association annual convention. Ellisville, MS; November 6-7, 2015.

14. Beginning Beekeepers Winter Workshop. Ordering the Correct Equipment and the Basic Biology of Honey Bees to Survive Your First Year of Beekeeping. Jointly presented by Johnny Thompson and me. Broke_T Ranch, Philadelphia, MS; December 12, 2015.

We also utilized funds to help with the education of children about beekeeping. In particular, various lectures and components of the Mississippi State University's Beekeeping Summer Camps were sponsored via this grant. The Beekeeping Summer Camp was an inter-generational camp for kids (each with a parent or guardian) on the MSU Campus in Starkville; June 8-12, 2014.

Dr. Jeff Harris provided significant input to the organization of all workshops, but the personnel of various MBA affiliate clubs either lectured or prepared instructional materials for these events. In particular, the Central Mississippi Beekeepers Association, Southwest Beekeepers Association, Meridian Beekeepers Association and the Southeast Beekeepers Association provided logistical support throughout.

Goals and Outcomes Achieved

The most concrete measurable outcomes that this project can document is increased participation in beekeeping workshops from just 300-425 people in previous years. Total workshop participation was ca. 1,090 for all workshops during the two years of funding, or about 540 for each year.

Beneficiaries

It is estimated that native Mississippians (not including migratory out-of-state beekeepers) operate 20,000 to 30,000 hives in the state. In the fall of 2009, membership in the Mississippi Beekeepers Association (MBA) was approximately 500, compared to 300 at the end of 2008. Of great significance is that membership in the MBA has more than doubled since the start of the program. Membership in the Mississippi Beekeepers Association remained high with approximately 650 active members during the funded years. This represents an increase of 3-5% new members each year. However, we have more than 1,000 members in our database, but some recent or new members from previous years were no longer keeping bees.

Lessons Learned

The biggest shortcoming of the project was a failure to reimburse a total of 50 beekeepers (only 11 were reimbursed) for part of the cost of their first two hives. The primary problem was that Dr. Harris simply was overextended throughout the period, and he could not sustain the effort needed to see these payments are made. They required receiving evidence of purchase, evidence of keeping the bees alive through time and evidence of recipients attending workshops and beekeeping conferences. If the MBA were to seek funds for this activity again in the future, the role of implementing the cost-share program should be given to the MBA Treasurer because Dr. Harris's extension job is already overwhelming.

The most successful component of this project was the delivery of great keynote speakers at our annual conventions. This is money well spent because it brings experts from a variety of backgrounds and experiences to lecture and interact with Mississippi beekeepers. Quite often these speakers are true professionals with expertise in a particular or critical aspect of bee culture. These kinds of speakers not only inform and entertain, but they can energize folks and mobilize them to adopt better management practices or adopt techniques that can help beekeepers maintain healthier and more useful colonies of honey bees.

Contact Person

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DEMONSTRATION EXPERIMENTS DURING 2013-2015

This project was terminated, no specialty crop funds were utilized for this project.

Mississippi Specialty Crop Garden

Project Summary

This project was developed through recognition of the need for improved educational opportunities for Mississippi's diverse specialty crops at the MS Ag Museum.

The aim of the project was to develop a specialty crop garden in the location of an existing unmaintained rose garden in order to increase the accessibility the MS Ag Museum ground's gardens, as well as enhance the ease of interpretation for visitors to the garden.

This project has not been submitted for funding to any other federal or state grant program. This project is not a continuation of a previously funded SCBGP.

Project Approach

The Jackson Old Rose Society had relinquished care of a rose garden in 2013, and the 1/10 acre site had sat unmaintained for over 2 years. The MS Ag Museum staff, with the guidance of Mississippi State Extension-Truck Crop Experiment Station staff, developed a garden plan for the site. Select rose specimens were offered to Jackson-area Master Gardener clubs, and viable plants were transplanted on the grounds as to not lose unique specimens in the Jackson area. The MS Specialty Crop Garden was planted in the spring of 2016 and produced over 200 lbs. of produce over the summer months.

Aaron Rodgers oversaw the design, completion, and implementation of interpretive material for the garden. MS Ag Museum Staff developed educational programming to coincide with the newly renovated garden.

Volunteers have been obtained and will continue to be used to present educational demonstrations in the garden. MS Ag Museum staff will maintain the garden and rotate crops for summer and winter plantings.

Goals and Outcomes Achieved

One of the ways we are measuring the outcome of this project is by giving benchmark pre-tests to determine existing knowledge on the subject, followed by post-tests after visitors have had exposure to our new signage and/or programming in the MS Specialty Crop Garden.

Our test-takers improved in their knowledge of specialty crop production and usage. The average score on the given benchmark pre-test was 36.9%. This average increased to 100% on the post-test, which is an average overall increase of 63.1%.

The long-term outcome that this project will provide will manifest itself in the form of increased interest and activity in this part of the museum, as well as increased interest in Mississippi's specialty crops.

In implementing this program, we have enhanced educational capabilities, especially pertaining to the $100 million specialty crop industry in Mississippi.

Beneficiaries

The most direct beneficiaries of this project are the numerous visitors to the campus each year. The museum hosts over 100,000 visitors on average every year.

Specifically, guests who have an interest in specialty crops, either at the gardening level or the truck crop level should benefit from potential specimen trials and programming that can be associated with the MS Specialty Crop Garden.

Lessons Learned

In completing this project, the MS Ag Museum recognized how we could effectively use Cooperative Extension as a resource and redesign existing space to fit the demands of a new generation of museum goers and those interested in gardening and truck crops. Through this experience we have learned to create viable relationships with community organizations and acknowledge the great value of these partnerships.

Completing this project and seeing its positive results gives the MS Ag Museum the confidence to continue seeking opportunities to enhance and improve all the museum has to offer.

Contact Persons

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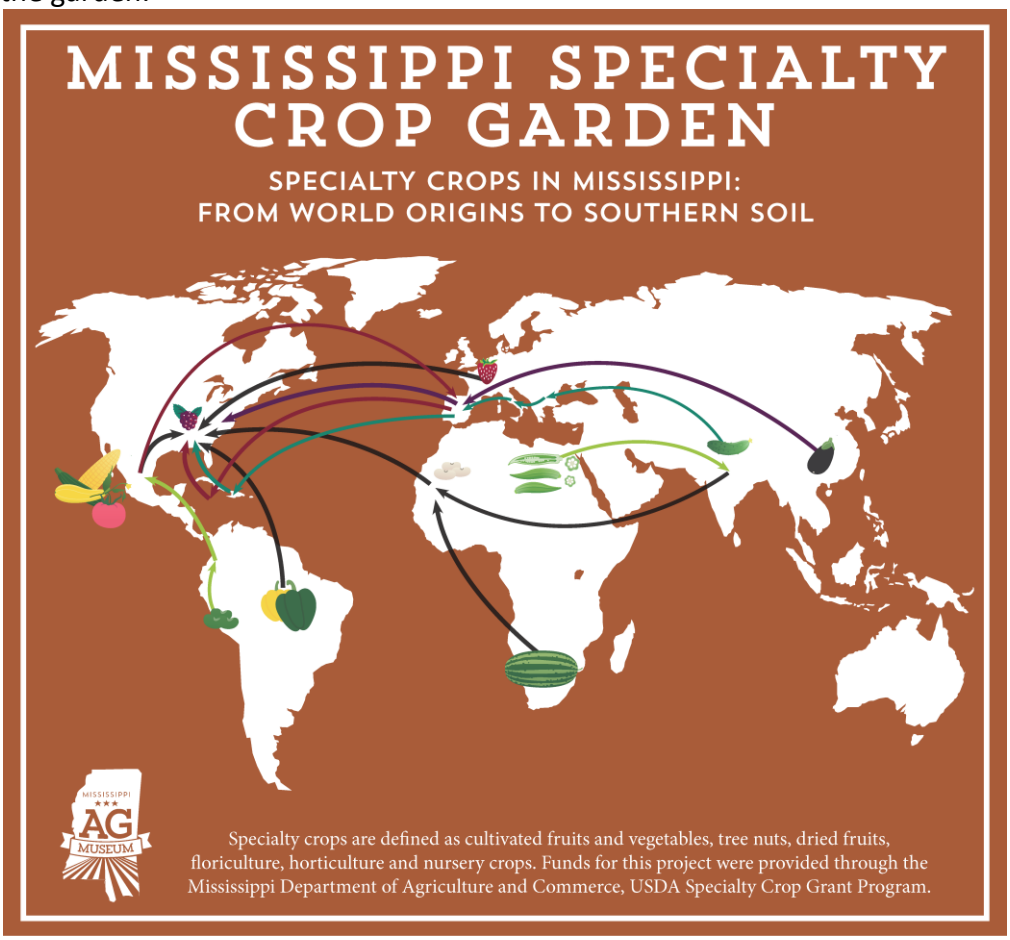
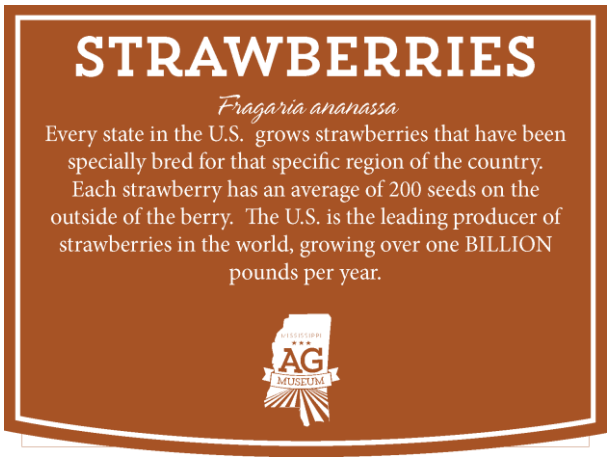
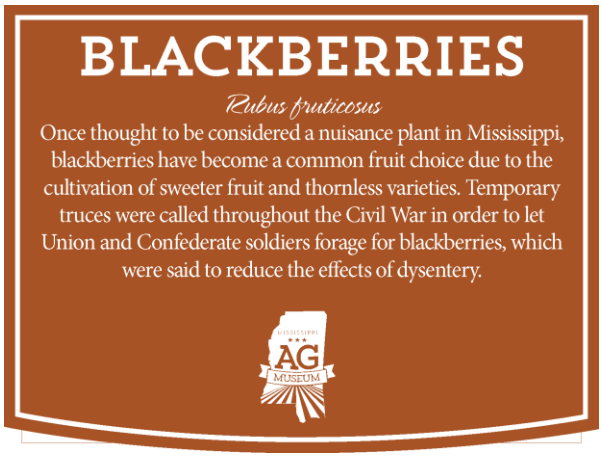
Additional Information

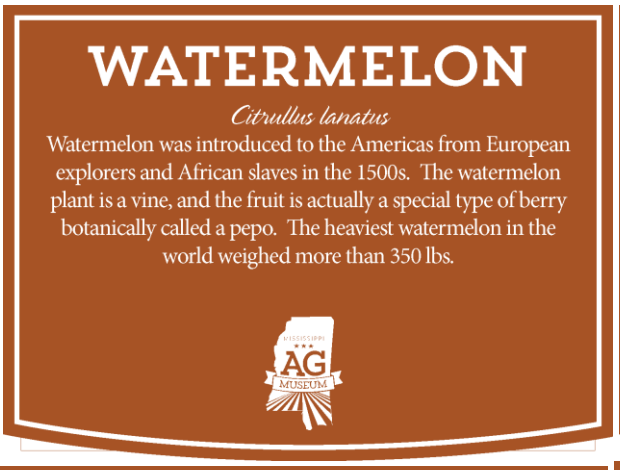
Signs for the garden:

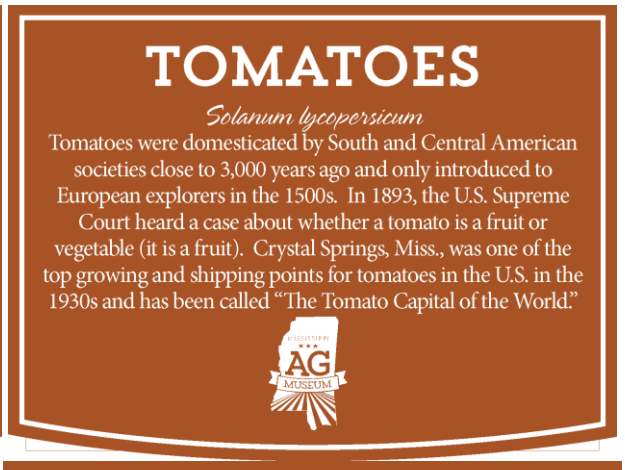


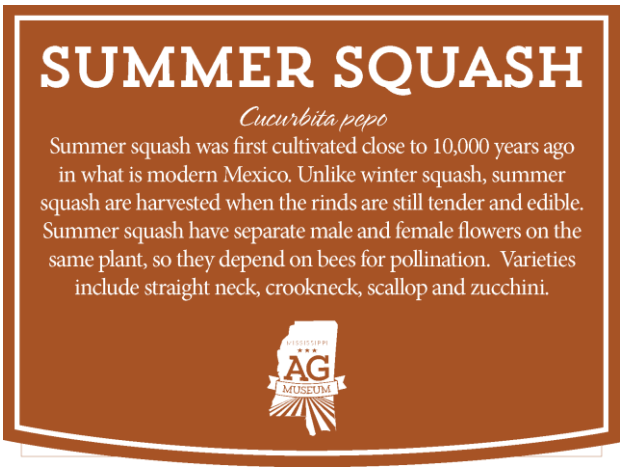


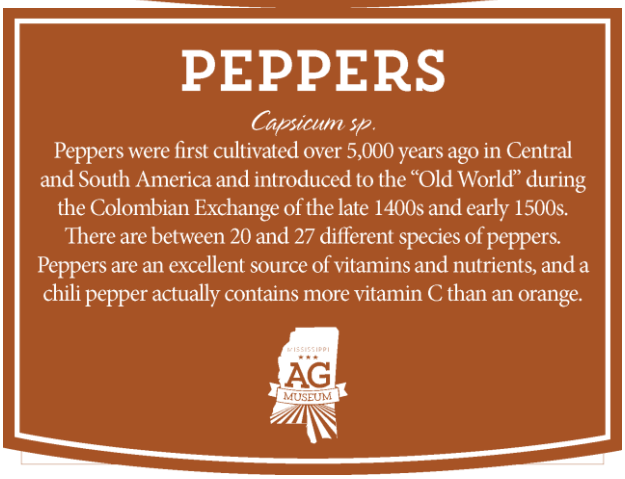



SWEET CORN
Zea mays
Corn was bred from the grass Teotinte in Central America over 7,000 years ago. The first sweet corn variety, Papoon, was introduced to European Settlers by the Iroquois Tribe in 1779. In 1917, 111 million acres of corn were grown – the largest crop ever grown in the U.S. and more than 3 times the acreage of ALL of Mississippi! A typical sweet corn cob has about 800 kernels.
OKRA
Abelmoschus esculentus and/or Hibiscus esculentus
The okra plant grows naturally on the banks of the Nile River and was cultivated by Egyptians over 3,000 years ago. After traders and farmers carried the plant to India, West Africa and the Mediterranean, it arrived in Brazil in the 1600s and New Orleans in the 1700s. While okra can be prepared many different ways, it is historically either fried or used in gumbo in the southern U.S.
EGGPLANT
Solanum melongena
Eggplant was originally cultivated in both India and China. Thomas Jefferson is credited with introducing eggplant to North America. Eggplant cultivars come in a variety of shapes and colors such as purple, pink, green, black and white.
CUCUMBER
Cucumis sativus
Cucumber belongs to the Cucurbitaceae family which includes watermelon, cantaloupe, pumpkin and squash. A cucumber consists of 96% water, and while on the vine, the interior of the fruit can be up to 20°F cooler than the outside temperature.
BLACK-EYED PEA
Vigna unguiculata
Black-eyed peas were likely first cultivated in West Africa. Along with lima beans, they gained wide popularity in the southern U.S. because they are easily shelled and stored. Farmer and inventor George Washington Carver heavily promoted the planting of these legumes for their health benefits and ability to add nitrogen, a key plant nutrient, to the soil.
LIMA BEAN
Phaseolus lunatus
Lima beans were first cultivated over 2,000 years ago in the Andean Mountains of South America. Along with black-eyed peas, they gained wide popularity in the southern U.S. because they are easily shelled and stored. Farmer and inventor George Washington Carver heavily promoted the planting of these legumes for their health benefits and ability to add nitrogen, a key plant nutrient, to the soil.


WATERMELON
Citrullus lanatus
Watermelon was introduced to the Americas from European explorers and African slaves in the 1500s. The watermelon plant is a vine, and the fruit is actually a special type of berry botanically called a pepo. The heaviest watermelon in the world weighed more than 350 lbs.


TOMATOES
Solanum lycopersicum
Tomatoes were domesticated by South and Central American societies close to 3,000 years ago and only introduced to European explorers in the 1500s. In 1893, the U.S. Supreme Court heard a case about whether a tomato is a fruit or vegetable (it is a fruit). Crystal Springs, Miss., was one of the top growing and shipping points for tomatoes in the U.S. in the 1930s and has been called "The Tomato Capital of the World."


SUMMER SQUASH
Cucurbita pepo
Summer squash was first cultivated close to 10,000 years ago in what is modern Mexico. Unlike winter squash, summer squash are harvested when the rinds are still tender and edible. Summer squash have separate male and female flowers on the same plant, so they depend on bees for pollination. Varieties include straight neck, crookneck, scallop and zucchini.


PEPPERS
Capsicum sp.
Peppers were first cultivated over 5,000 years ago in Central and South America and introduced to the "Old World" during the Colombian Exchange of the late 1400s and early 1500s. There are between 20 and 27 different species of peppers. Peppers are an excellent source of vitamins and nutrients, and a chili pepper actually contains more vitamin C than an orange.

Eating with the Seasons

Project Summary

The Mississippi Department of Agriculture and Commerce (MDAC) created this project from funds relinquished from other projects that were not able to complete the project or did not use full funding amounts as awarded at the beginning of the grant process. Through this project, funds were utilized to increase the awareness of specialty crops grown in Mississippi, a $193 million dollar industry, by creating a unique portrayal incorporating MS fruits and vegetables into at least one meal a week for an entire year. Each month spotlighted a different fruit or vegetable that is in season at that time. This will increase marketing opportunities for local farmers. If there is more demand for these products, this could potentially increase our state's specialty crop economy.

MDAC submitted a FY2011 Specialty Crop Grant that this new project will essentially build upon. The FY2011 project was focused on our Farm to School program and that project included development of a seasonality calendar. This new project will take it a step further by incorporating recipe ideas to use in conjunction with the seasonality calendar.

Project Approach

A brochure was developed to highlight one specialty crop each month and focus on five different recipe ideas to entice people to think of new ways to incorporate specialty crops into their meals once a week. The hope was for consumers to eat local Mississippi fruits and vegetables at least once a week using the brochure and therefore also increasing awareness of the specialty crops that are grown and available in Mississippi throughout the year.

Specialty crops were only highlighted in this brochure. MDAC staff worked to create the content and utilized a graphic designer to make the brochure eye-appealing.

Goals and Outcomes Achieved

A survey was conducted at the Mississippi Farmers Market in fall 2016 to identify consumer awareness of specialty crops in Mississippi. All respondents or 100% said they will purchase more Mississippi specialty crops throughout the year as a result of reviewing the brochure.

Beneficiaries

This project benefits fruit and vegetable growers all across the state of Mississippi. This will benefit the growers as the public's knowledge will increase as they learn about the viability of purchasing local fruits and vegetables throughout the year. Given the survey mentioned, consumers said they

would look and purchase more seasonal produce throughout the year. As a result of this brochure, it is expected there will be an increase the sales of specialty crops, which was a $193 million dollar impact to the state's economy in 2015, according to USDA-NASS.

Lessons Learned

MDAC has strived to educate consumers and farmers market shoppers that there is Mississippi produce available throughout the year, this idea to create a recipe brochure was a great addition to increasing that awareness. It is important to keep the information short but also informative so consumers can get an idea of how to utilize new and different specialty crops into their everyday meals.

Contact Persons

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Additional Information

Eating with the Seasons brochure:


EATING WITH THE SEASONS
RECIPE IDEAS TO EAT LOCAL ALL YEAR LONG!
GENUINE MS GROWN
To find these fruits, vegetables and nuts, visit your local farmers market.
Visit MSFarmersMarket.com.
Mississippi Department of Agriculture and Commerce
Cindy Hyde-Smith, Commissioner
www.mdac.ms.gov 601-359-1100
JANUARY
Kale
FEBRUARY
Cauliflower
MARCH
Carrots
APRIL
Strawberries
MAY
Kohlrabi
JUNE
Blueberries
JULY
Eggplant
AUGUST
Bell Pepper
SEPTEMBER
Okra
OCTOBER
Butternut Squash
NOVEMBER
Sweet Potatoes
DECEMBER
Pecans