

NORTH MISSISSIPPI RESEARCH & EXTENSION CENTER

ANNUAL REPORT

2023



MISSISSIPPI STATE UNIVERSITY™
MS AGRICULTURAL AND
FORESTRY EXPERIMENT STATION



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EXTENSION



NORTH MISSISSIPPI RESEARCH & EXTENSION CENTER

THE NORTH MISSISSIPPI RESEARCH AND EXTENSION CENTER (NMREC) listens to your concerns. Our scientists conduct research and implement solutions to the everyday challenges Mississippians face. This annual report highlights some of the many research projects and extension programs conducted by faculty and staff in 2023. Research sponsors, stakeholders, and volunteers made valuable contributions and are appreciated for their continued input and support.

As part of the Mississippi State University Division of Agriculture, Forestry, and Veterinary Medicine, NMREC supports the missions of the Mississippi Agricultural and Forestry Experiment Station (MAFES) and the MSU Extension Service. NMREC works to improve your life by responding to your needs: collaborating to conduct and share innovative agricultural research; offering practical education for everyone; and serving communities and businesses. As one of four Research and Extension Centers strategically located in the state, NMREC brings Mississippi State to north Mississippi, facilitating research in different soil types and

climates, and providing local education and technical assistance to our communities.

Researchers based in North Mississippi conduct programs in agronomy, horticulture, animal science, and forestry. NMREC includes four MAFES research locations:

- **Northeast Mississippi Branch Experiment Station (Verona)**
 - *Agronomy Unit*
 - *Horticulture Research and Education Unit*
- **Prairie Research Unit (Prairie)**
- **Pontotoc Ridge-Flatwoods Branch Experiment Station (Pontotoc)**
- **North Mississippi Branch Experiment Station (Holly Springs)**

Please visit <https://www.mafes.msstate.edu/branches/north.php> to contact NMREC or any of its research locations.

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SERVING STAKEHOLDERS, ELEVATING THE NORTH MISSISSIPPI COMMUNITY

JANE PARISH

In 2023, faculty and staff of the North Mississippi Research and Extension Center (NMREC) focused our efforts on agronomic crops, sweetpotato, horticulture, beef cattle, and forestry research to address important needs in North Mississippi and beyond. Our scientists and staff engaged in Mississippi Agricultural and Forestry Experiment Station (MAFES) research projects and Extension programs to provide relevant technical assistance to help you, our stakeholders. Extension specialists developed and shared research-based information through field days, individualized technical assistance, online educational resources, and much more. As always, we seek to match our expertise and work to the needs of North Mississippians in ways that deliver information that matters to you.

This past year, we welcomed new faculty members, Drs. Amee Bumguardner and Ibukun Timothy Ayankojo. Both are based at the Northeast Mississippi Branch Experiment Station in Verona and have dual research and extension appointments. Dr. Bumguardner is a soil scientist focused on helping the row crop industry. Dr. Ayankojo is a horticulturist focused on vegetable crops.

Sweetpotato research and extension programs continued to garner national attention through the Mississippi State University-led CleanSEED Project. Created

at the behest of the sweetpotato industry to address virus, pest, and disease problems and improve the sustainability of U.S. sweetpotato seed programs, the program is funded through a \$4.8 million competitive grant from the U.S. Department of Agriculture's National Institute of Food and Agriculture. The multi-state collaboration, led by Drs. Mark Shankle and Lorin Harvey, plant and soil sciences faculty based at the MAFES Pontotoc Ridge-Flatwoods Branch Experiment Station, is just one project in a diverse portfolio of sweetpotato and row crop studies. Our research covers topics from weed control strategies in agronomic crops, sweetpotato varietal comparisons and development, to emerging uses of precision agriculture technologies. Frequent interactions with growers direct and inform our sweetpotato research efforts.

We remain at the forefront of agronomic and horticultural research vital to the region. From soil nutrient management, cover crop use, and nutrient deficiencies, MAFES scientists are studying perplexing questions relevant to local producers. Both the Northeast Mississippi and Pontotoc stations were also contributors to the MAFES Official Variety Trials programs for major row crops in the region, including corn, soybean, cotton, peanuts, and wheat. Our horticulture research discovered which

tomato and southern pea varieties perform best in field trails. We also established a vegetable processing laboratory this past year to increase our research capabilities. And we're even interested in helping make your holidays more homegrown, as a research trial to evaluate different Christmas tree species native to the area and different tree management practices entered its third year.

At the MAFES Prairie Research Unit, our scientists work to help the state's 16,000 beef producers through relevant and timely research. We explore various management approaches to improve reproductive and other performance outcomes in cow-calf and stocker cattle production. Recently, we investigated various estrous synchronization strategies in heifers and cows. Nutritional management was also a major research theme for our team. Our projects aimed at discoveries in mineral consumption, bovine anaplasmosis, feeding behavior of newly received calves, exercise access in drylot settings, and stair-step nutritional approaches. Animal health research included a study on deworming protocols for weaned calves.

Research projects involving multiple agricultural commodities grew in number and scope. Our team at the MAFES Prairie Research Unit continued work on integrated row crop and cattle enterprises involving soybean production and forage cover crops.



We sought to find innovative ways to include unused material from crop production into animal diets.

The development and launch of Sweet Potato Dog Treats, now available for purchase in the MAFES Sales Store, is a successful first step toward creating new value-added sweetpotato products for inclusion in animal diets to better utilize all grades of sweetpotato production. Also in 2023, we launched the IGNITE (Ideas Growing into Needed Innovations, Technologies, and Entrepreneurship) Lab at Verona as an incubator for business development in this area.

We hosted the annual North Mississippi Producer Advisory Council at the Center in February 2023. During this event, we engaged with stakeholders to gain critical insights into current and emerging research and education needs for a wide range of agricultural commodities in the region. Throughout the year, MAFES scientists and Extension specialists shared up-to-date agricultural science with stakeholders on a regular basis. Several field days and workshops were held at North Mississippi MAFES stations this past year to showcase current information on row crops, sweetpotato, horticultural crops, and beef cattle. Our growers, producers, allied industry, and community members can see research in progress firsthand. They also learn the results of completed research trials and get

guidance on how to apply these discoveries to make more informed management decisions for their farms, businesses, and homes.

A signature Extension focus during the year was the statewide Mississippi Master Gardener training program based out of the North Mississippi Research and Extension Center, which offered self-paced online training options to expand program accessibility and reach. The program was available to anyone with an interest in improving horticultural knowledge and offered opportunities for volunteer service in local communities. In 2023, active program participation was robust with Mississippi Master Gardeners across the state reaching nearly 150,000 contacts in local communities and contributing more than 70,000 volunteer hours valued at nearly \$1.8 million. Horticulture education at the Center included hands-on workshops such as pruning in the demonstration orchard at the MAFES Northeast Mississippi Branch Experiment Station and the inaugural Greenhouse Vegetable Short Course hosted in Verona in 2023. Educational events were routinely held in the Magnolia Botanical Garden at the Northeast station, including a new Fall Garden Fest that brought a large crowd to the garden in October. Public access to self-guided tours in the Magnolia Botanical Garden are available year-round.

Research projects and Extension programs that matter and were put into action by the North Mississippi Research and Extension Center were made possible by the financial support of numerous funding agencies and organizations, including the Mississippi Agricultural and Forestry Experiment Station and the MSU Extension Service. This annual report seeks to provide an overview of some of our efforts. Additional research projects and Extension programs are ongoing and under development, with expanded programming being offered this year. As always, we are available anytime to share further details of projects and programs upon request. We are here to help all the stakeholders of our community from agricultural producers to home gardeners to children and youth. We are happy to provide technical expertise and community support in agronomy, horticulture, animal science, forestry and more. We appreciate you delving into our 2023 discoveries and educational resources and look forward to serving you throughout 2024 and beyond.

Jane Parish
Professor and Department Head
North Mississippi Research and
Extension Center

A close-up photograph of several green leaves with prominent yellow variegation. The leaves are arranged in a cluster, with some in sharp focus and others blurred in the background. The lighting is bright, highlighting the texture and color variations of the foliage.

AGRONOMY



EVALUATING THE EFFECTS OF POTASSIUM ON SOYBEAN GRAIN YIELD

CAMDEN OGLESBY AND JAGMANDEEP DHILLON

SOYBEANS TAKE UP POTASSIUM (K) in large amounts, second only to nitrogen (N) (Bohner, 2007). In soybeans, K is used for energy and water regulation (stomatal function), which impacts photosynthesis, and it also effects quality of the grain (oil and protein content and larger seed size). When soybeans are experiencing a K deficiency, symptoms present as yellowing of the leaf margins in older leaves, and, in severe cases, leaf edges may become brown and progress into the upper leaves. In some cases, deficiency symptoms may be present while soil tests are in the normal range for K; this is due to the plant being unable to access or uptake K from the soil due to drought conditions. Drought conditions were experienced throughout the state of Mississippi for the 2023 growing season, particularly during peak growth stages. The objective of this research was to evaluate the effects of various potassium fertilizer rates on soybean grain yield and potassium use efficiency.

This study was located at the MAFES Northeast Mississippi Branch Experiment Station in Verona, on a Leeper silty clay loam, and evaluated the effects of six different potassium rates on soybean grain yield, potassium use efficiency (KUE) and leaf tissue potassium concentrations. The soybean variety Asgrow 48X9 was planted on May 9, 2023, at 120,000 seed ac^{-1} on 38-inch raised beds. The experimental design was a randomized complete block design. The treatments were six potassium rates (0,

25, 50, 75, 100 and 150 lb K ac^{-1} in the form of Muriate of Potash (0-0-60)) and were replicated four times for a total of 24 plots at 35 feet in length. Soil samples were collected prior to fertilizer application, and analysis was conducted at the Mississippi State University soil-testing lab using the Lancaster extractant. The soil test K level was 172 lb ac^{-1} , which is low in K according to the MSU lab.

Greater grain yield resulted from the 50, 75, 100 and 150 lb K ac^{-1} treatments. However, yields were not significantly greater than the 25 lb K ac^{-1} treatment (Fig. 1). Potassium use efficiency was not significantly affected by the various K fertilizer rates (Table 1). Leaf tissue K was not significantly affected by the various K fertilizer rates at the R1 growth stage. With these preliminary results, producers with a soil test resulting in low potassium (<191 lb K ac^{-1}) or when under drought conditions may want to apply 25 lb K ac^{-1} to their soybean crop to experience an increase in soybean grain yield. This study will be repeated in the following years to further evaluate these findings.

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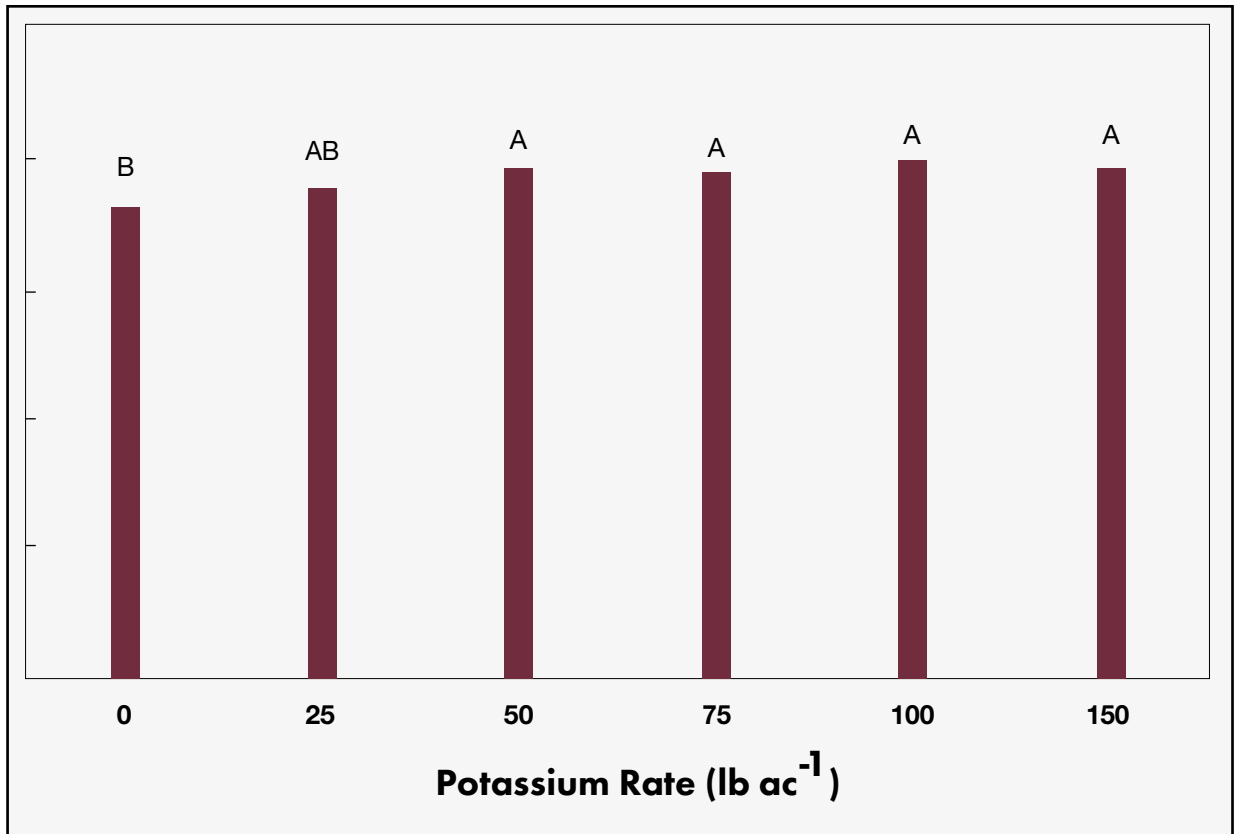


Figure 1.
Soybean grain yield determined in 2023.
The same letter is not different at $P < 0.05$
by Fisher's protected LSD. The vertical bars
represent the standard error of the mean.

Rate (lb ac ⁻¹)	KUE (lb)
25	0.129
50	0.121
75	0.070
100	0.075
150	0.043

Table 1.
Potassium
use efficiency
as affected by
fertilizer rate.

BIOLOGICAL PRODUCT EFFECTS ON SOYBEAN IN NORTHEAST MISSISSIPPI

TUCKER HILYER, COREY BRYANT, MICHAEL MULVANEY, TOM ALLEN, AND TRENT IRBY

BIOLOGICAL PRODUCTS ARE BECOMING INCREASINGLY prevalent in agricultural systems with many new products entering the market each year. Over the last six years, the Mississippi state average soybean yields have plateaued at 54 bu/a with an increase to 57 bu/a in 2023 (USDA, 2024). As soybean producers continue to pursue even greater yields, biologicals are one option producers are looking to explore. However, there is limited independent third-party data available to aid Mississippi soybean producers when making biological product decisions to understand the effects on soybean growth, development, and yield. The objective of this project was to produce independent data on the tested biologicals so producers can make better informed decisions.

This study was conducted in 2023 to determine the effect of commercially available biological products on soybean growth, development, and yield. Fifteen treatments

were arranged in a randomized complete block design and consisted of 10 biological products, some with varying application timings or rates, compared to an untreated control (untreated soybean seed) and a treated control (soybean seed with a standard seed-treatment). Canopy closure data were recorded using the Canopeo app at 20, 30, and 40 days after planting (Figure 1). Leaf tissue sampling was conducted at R1, R3, and R5 for nitrogen (N) (Figure 2) and phosphorus (P) (Figure 3) concentrations. Yield (Figure 4) data were collected from the center two rows and adjusted to 13% moisture. Due to differences in active ingredients between products, each product was compared to the untreated and treated controls only.

Biological product had no effect on canopy closure rate or soybean yield in year one of this study. For tissue N concentrations, Fertiactyl significantly increased N

concentrations at R1, but had no effect on R3 and R5 concentrations, while Zyro and Bio-P at-plant decreased R3 N concentrations. HM-2163 increased P concentrations at R3, and AZterknot decreased P concentrations at R5.

Results from this study location do not change when combined with the results from two other locations in the state where this trial was also conducted. Although there was no effect on canopy closure rate or soybean yield in year one, there is a possibility that differences will develop with multiple years of testing. Additional testing is required to confirm these trends.

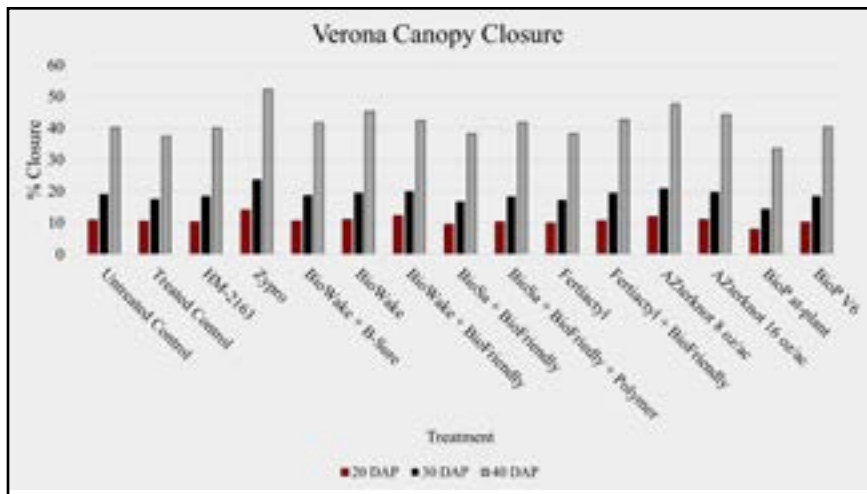


Figure 1. Canopy closure ratings in percent closure at 20, 30, and 40 days after planting using the Canopeo app.

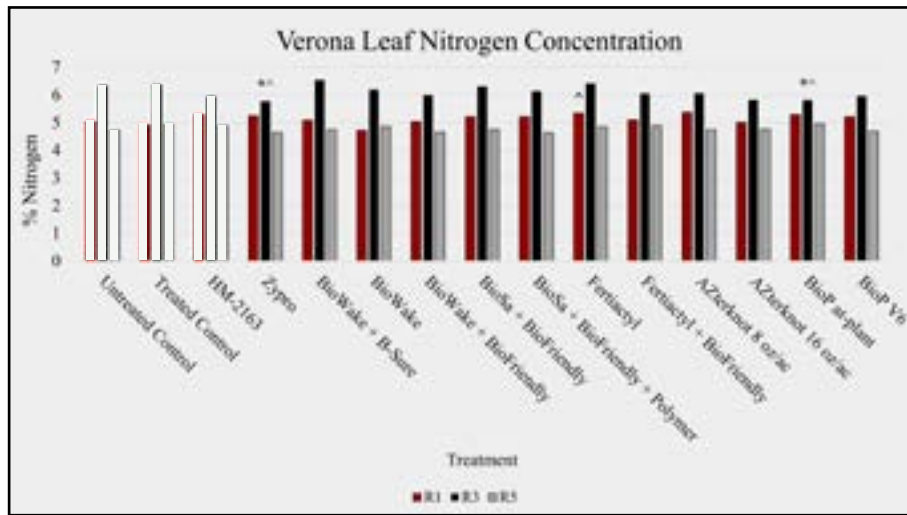


Figure 2. Uppermost trifoliolate nitrogen concentrations taken at R1, R3, and R5. (* = significantly different compared to the untreated control, ^ = significantly different compared to the treated control).

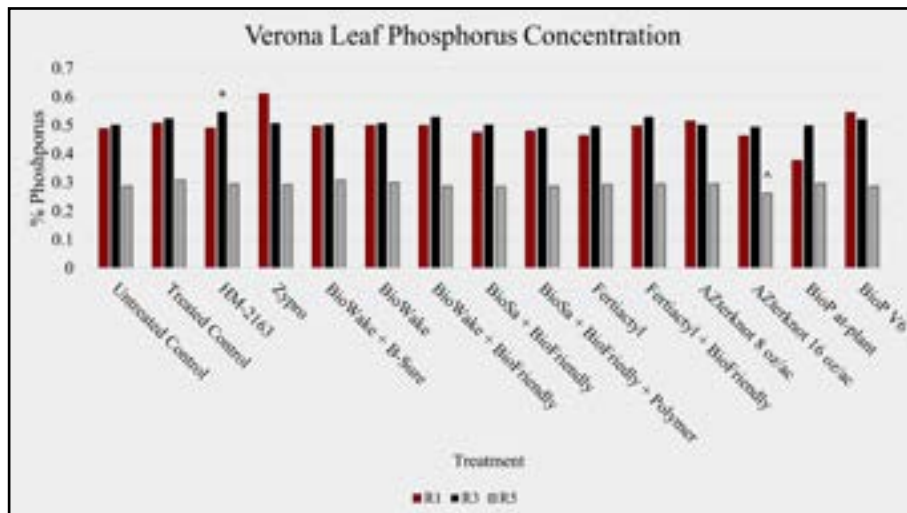


Figure 3. Uppermost trifoliolate phosphorus concentrations taken at R1, R3, and R5. (* = significantly different compared to the untreated control, ^ = significantly different compared to the treated control).

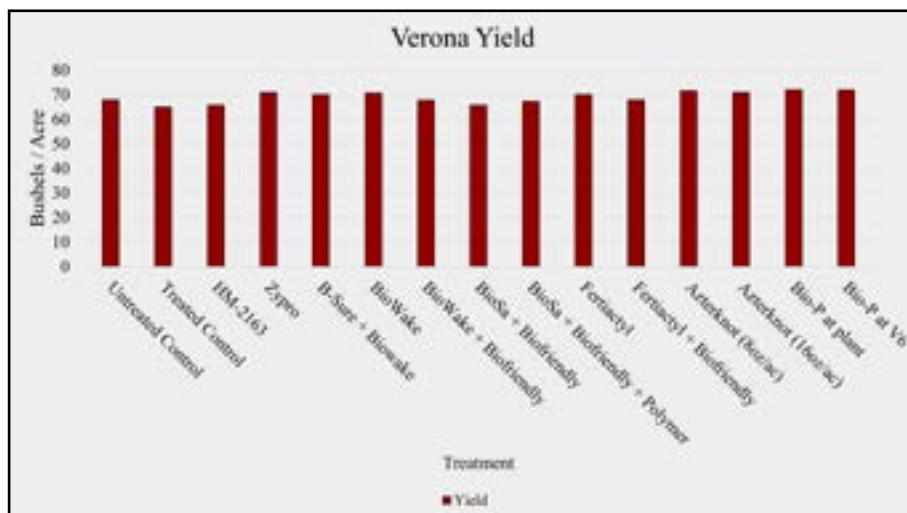


Figure 4. Soybean yield in bushels per acre.

AGRONOMY PROJECTS ATTRACT YOUTH TO AG SCIENCE CAREERS

BILL BURDINE, ALEX DEASON, JAMES SHANNON, AND GINA WILLS



YOUTH INTERESTED in agronomy or science have new opportunities to gain career skills through a group of agronomy projects. Agronomy is the study of field crops grown for food and fiber and includes crops, soils, ecology, and more. Major crops in Mississippi are soybeans, corn, cotton, and rice. The projects are Agronomy Science Experiments, Agronomy Day Camp, Agronomy Bowl, and Seed Judging. The goal for each of the projects is to provide STEM opportunities where students learn how science guides today's agriculture. Most youth do not realize how agriculture relies on innovative technologies and the multitude of careers that are available.





AGRONOMY SCIENCE EXPERIMENTS - Approximately 80 youth participate each year. Participants are provided an experiment kit that includes seed, pots, and other needed supplies. Students first learn the scientific method before deciding on a research study and developing a hypothesis. Next, they design their study, collect data, draw conclusions, and submit a report. Reports are ranked with top scores receiving awards. This is the most popular agronomy contest because experiments are conducted at home, and youth are given great latitude in setting up their experiments. Students are encouraged to think big and to be creative.

AGRONOMY DAY CAMP - Day Camps are hosted at MAFES Experiment Stations for youth between 12 and 18 years old to better understand the many careers in agronomy and related disciplines. Camps combine classroom and field tours that demonstrate various technologies and career options.

Topics include crop production, physiology, nutrient management, and pest management. Participants also learn how Genetically Modified Organisms (GMO's), uncrewed aerial vehicles (drones), and water quality management affect agronomic practices. The highlight at all camps is the opportunity for students to operate a drone.

AGRONOMY BOWL COMPETITION - This team contest is restricted to senior 4-H members and is an opportunity to gain knowledge agronomists use daily. A study guide provides many questions used in the bowl contest. Being a bowl competition, teams 'buzz' in, and the quickest to buzz is allowed to answer. Questions are true/false, multiple choice, and fill in the blank. The Agronomy Bowl is a fun way to form friendships, learn with people sharing similar interests, and prepare a resume for college and beyond.

RELATED EXTENSION PUBLICATIONS

- P3595 Agronomy Projects for 4-H and Youth
- P3596 4-H Agronomy Bowl
- P0464 4-H Seed Judging
- P1397 4-H Seed Identification



SWEET POTATOES



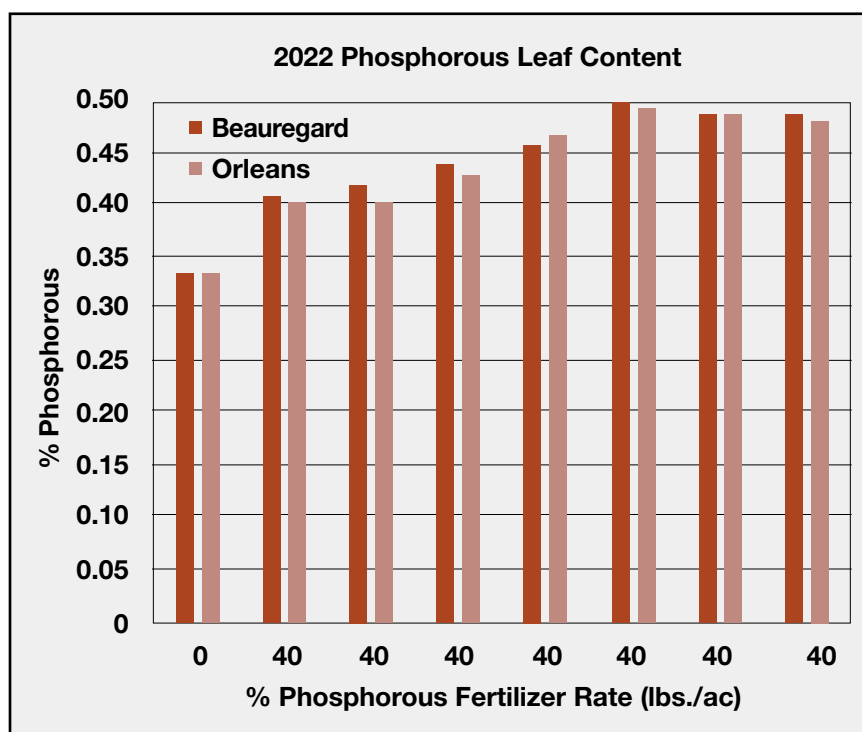
SWEETPOTATO RESPONSE TO INCREMENTAL RATES OF PHOSPHORUS FERTILIZER

MARK A. HALL, LORIN M. HARVEY, MARK W. SHANKLE, AND CALLIE J. MORRIS

FIELD RESEARCH WAS CONDUCTED AT the Pontotoc Ridge-Flatwoods Branch Experiment Station in 2022 and 2023 evaluating sweetpotato root yield response to incremental rates of phosphorous. The trial consisted of 2 row plots, 30ft long with 4 replications in a randomized complete block design. Phosphorus (P_2O_5) treatments consisted of 8 different rates: 40, 80, 120, 160, 200, 240, and 280 lbs phosphorus per acre, and an untreated check. All treatments received a uniform application of nitrogen (N) and potassium (K_2O) based on soil test recommendations. Fertilizer treatments were spread by hand then incorporated into the soil before transplant. Two varieties were used, Beauregard B-14 and Orleans.

Leaf samples were collected at approximately 35 days after transplanting (DAT) and analyzed for nutrient content. Phosphorus levels in the leaves for both varieties were greater than the untreated check for all treatments in 2022 (Figure 1). Similar results occurred in 2023 with phosphorous levels in the leaves greater than the untreated check for all treatments receiving phosphorous.

Sweetpotatoes were harvested 117 DAT in 2022 and 110 DAT in 2023. Sweetpotatoes were graded according to USDA standards to determine US No. 1, Canner, Cull, and Jumbo yield grades. Total marketable yield was recorded as the sum of US No. 1, Canners, and Jumbo grade yields. Analysis of variance was conducted using Fisher's protected LSD ($\alpha=0.05$). Beauregard total marketable yield for 2022 ranged from 341 to 512 boxes/ac with the 160 lbs./ac treatment yielding greater than the untreated check. Beauregard total marketable yield for 2023



ranged from 357 to 573 boxes/ac with the 200 lbs./ac treatment yielding greater than the untreated check (Figure 2). Orleans total marketable yield in 2022 ranged from 325 boxes/ac to 427 boxes/ac with 200 lbs./ac yielding greater than the untreated check. Orleans total marketable yield for 2023 was similar to results in 2022 with 200 lbs./ac along with 280 lbs./ac treatments being greater than the untreated check (Figure 3). This experiment is ongoing and will be used to determine how the availability of phosphorous impacts sweetpotato root yield over time.

Figure 1. Phosphorous leaf content in Beauregard and Orleans sweetpotato varieties measured 35 days after transplanting in 2022 at the MAFES Pontotoc-Ridge Flatwoods Branch Experiment Station.

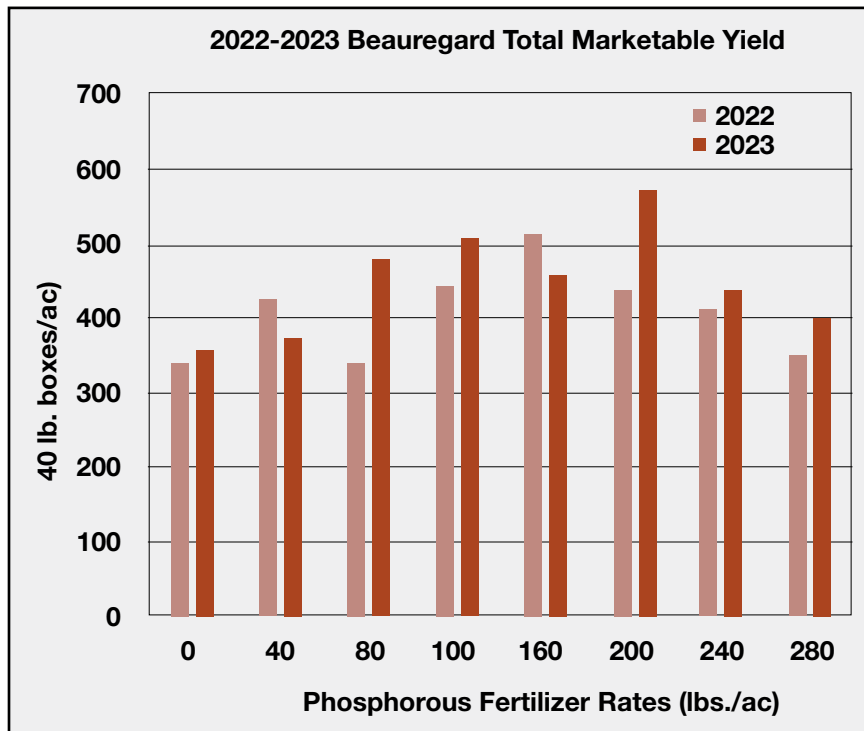


Figure 2. Beauregard variety total marketable yield with incremental phosphorous fertilizer rates in 2022 and 2023 at the MAFES Pontotoc Ridge-Flatwoods Branch Experiment Station.

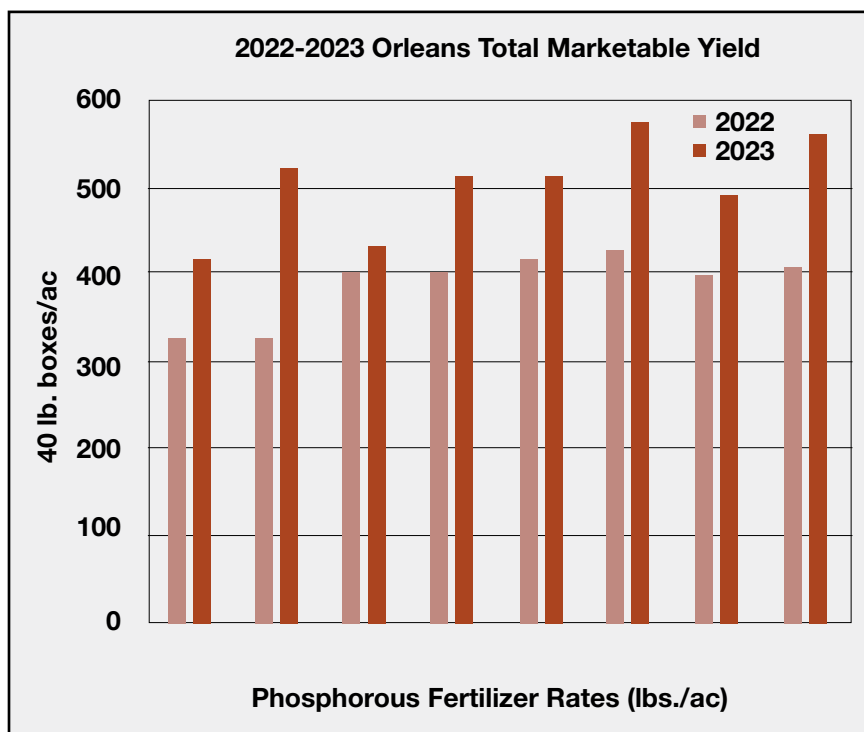


Figure 3. Orleans variety total marketable yield with incremental phosphorous fertilizer rates in 2022 and 2023 at the MAFES Pontotoc Ridge-Flatwoods Branch Experiment Station.

ASSESSING CHALLENGES AND NEEDS OF SWEETPOTATO INDUSTRY STAKEHOLDERS THROUGH A NATIONAL SURVEY

MARK A. HALL, LORIN M. HARVEY, CALLIE J. MORRIS, AND MARK W. SHANKLE

AN ASSESSMENT survey to understand challenges and perceptions of clean foundation seed (CFS) by stakeholders in the United States sweetpotato industry was conducted from April 1, 2021, to May 17, 2021. This online survey was created using Qualtrics software and administered by Mississippi State University. The term CFS refers to seed roots or plants produced from greenhouse slips established with virus-tested plant material in a laboratory and sourced from a National Clean Plant Center or certified seed producer.

The survey consisted of three sections of questions: general, role specific, and virus testing and terminology questions. Survey participants were asked to select their role in the sweetpotato industry (producer, packer/shipper, industry representative, processor, crop improvement agency, researcher/scientist, or extension faculty/agent). There were 134 respondents that completed the survey with 98 reporting as sweetpotato producers. The remaining 36 respondents were separated from the larger pool of producers due to their role in the industry being either research related or an industry representative that supplied crop management products. Survey questions were formatted as yes/no, multiple choice, or Likert scale to gauge respondent understanding.

When asked of the importance of CFS to a survey participants' operation, increased



yield and improved sweetpotato quality were the two main answers (Figure 1). Survey results also concluded that over 44% of producer respondents purchase new CFS plant material annually from either a National Clean Plant Center or certified clean seed producer (Figure 2). The results of this survey guided discussions at a sweetpotato stakeholder 2-day workshop on July 20-21, 2021, with 75

attendees from across the nation. Following the survey and workshop, researchers and Extension specialists were able to prepare a proposal and successfully apply for SCRI funding to establish research and Extension efforts to promote the increased use of CFS.

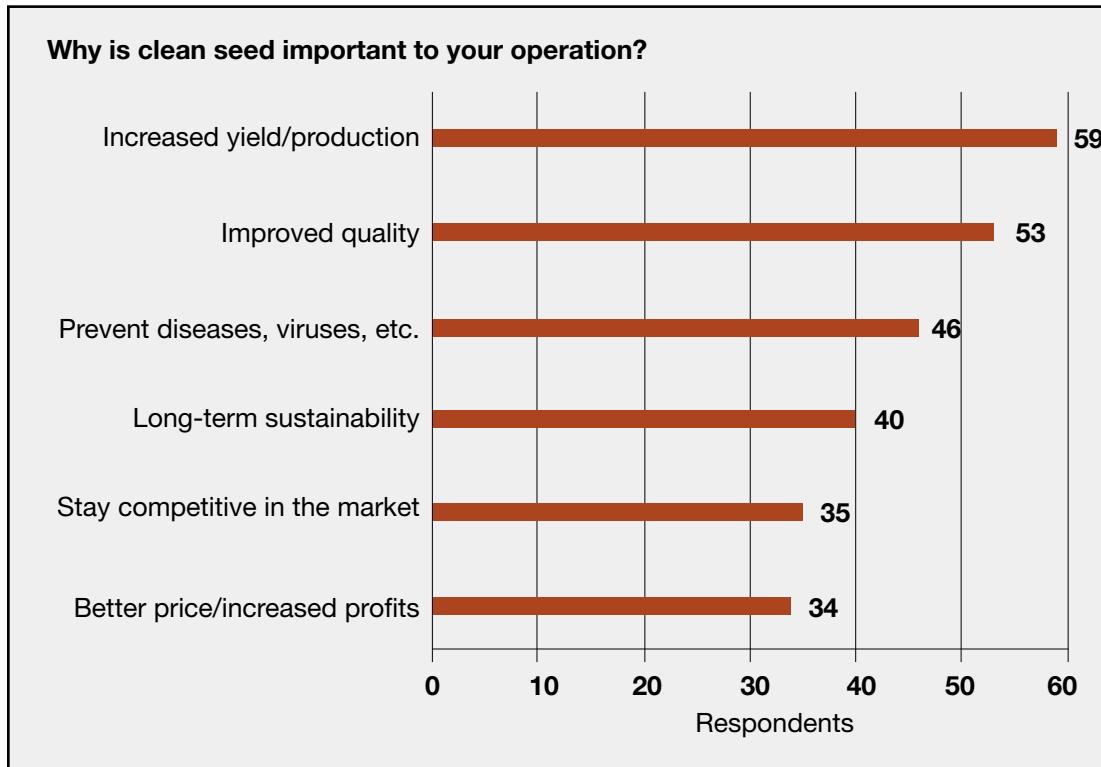


Figure 2. Reasons of importance of clean seed to producer respondents that incorporate its use in their operations. Respondents could select all reasons that apply to them.

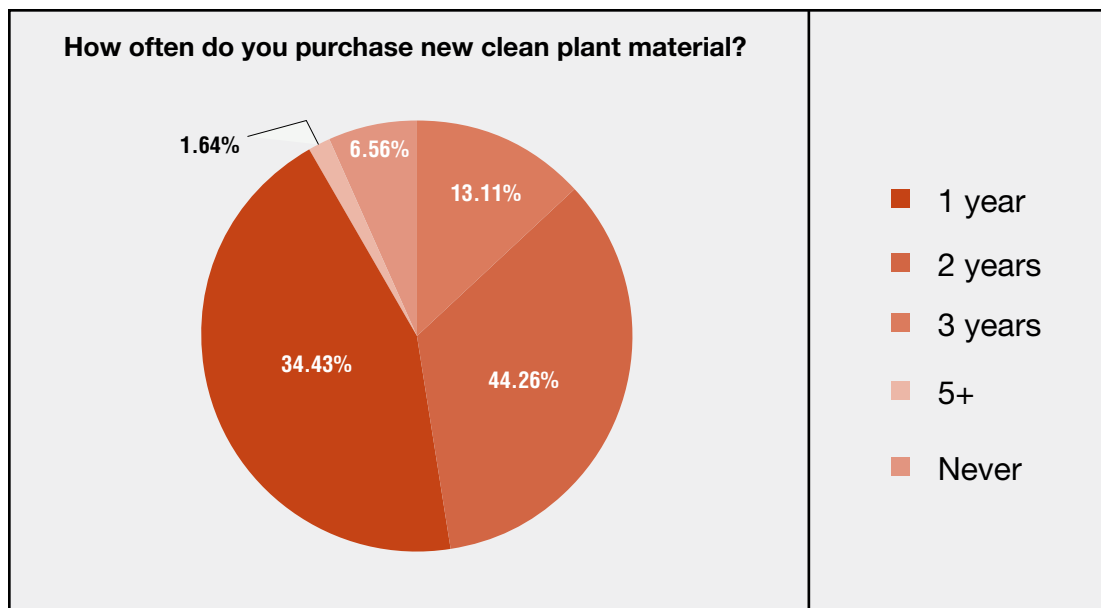


Figure 2. When asked how often they purchase new clean plant material, 44.26% of respondents indicated they purchase new clean plant material annually.

BEEF CATTLE





COMPARING THE EFFICACY OF SAFEGUARD TO VALCOR IN WEANED BEEF CALVES

BRANDI KARISCH, MASON DREWERY, TORIANN WINTON, RHONDA VANN, AND KELSEY HARVEY

INTERNAL PARASITES COMMONLY impact grazing livestock, with the United States cattle industry alone spending over \$2.5 billion in an effort to control parasites. Severe internal parasite load is associated with decreased feed intake and growth performance, which negatively impact profitability. To treat and mitigate these challenges, producers rely on a broad spectrum of anthelmintic drugs available in a variety of formats (injectable, oral, topical). One of the most common times cattle receive these drugs, or deworming, is at the time of weaning. However, limited information is available regarding the efficacy of these products alone or in combination, and the subsequent impacts on calf performance. Therefore, the objective of the present study is to determine the impact of internal parasite treatment on fecal egg count, dry matter intake, feeding behavior, and growth performance of newly weaned beef steers. Eight weaned beef steers sourced from resident MAFES herds that had not previously received dewormer were utilized in this experiment. Prior to weaning, steers were weighed and vaccinated for clostridial and respiratory and boosted according to label instructions. An electronic identification and visual ID tag were applied to all steers. At weaning, all steers were weighed and transported to the working facility at the MAFES Prairie Research Unit located in Prairie, MS. Steers were sourced from either the resident MAFES Prairie Research Unit herd or the MAFES Beef Unit herd. Upon arrival (day -1), steers were comingled for 24 hours, stratified by

body weight and source and assigned to 1 of 4 pens (1 pen/treatment, 20 steers/pen) equipped with VytelleSENSE™ automated feed intake monitoring bunks. Pens were then randomly assigned to receive one of the following deworming treatments on day 0: 1) Fenbendazole, 2) Doramectin/levamisole injection, 3) Fenbendazole combined with doramectin/levamisole injection, or 4) Fenbendazole combined with ivermectin pour-on. On day 0, steers were weighed, a rectal fecal sample was collected, and a temperament score recorded. Throughout the experiment (day 0 to 42), steers received a complete cottonseed hull-based diet (14% crude protein) provided for ad libitum consumption. On days 14, 28, and 42, steer body weight and temperament score was

recorded and fecal samples collected. Steer body weight recorded on day 42 and 43 were averaged to represent final body weight. Any injection site lesions were noted and ultrasounded every 14 days throughout the experiment. Analysis of this data will provide valuable insight into deworming recommendations for newly weaned beef steers. The next step in this work includes analyzing inflammatory markers during the post-weaning period of these steers to further understand the impact of deworming protocol on cattle productivity.

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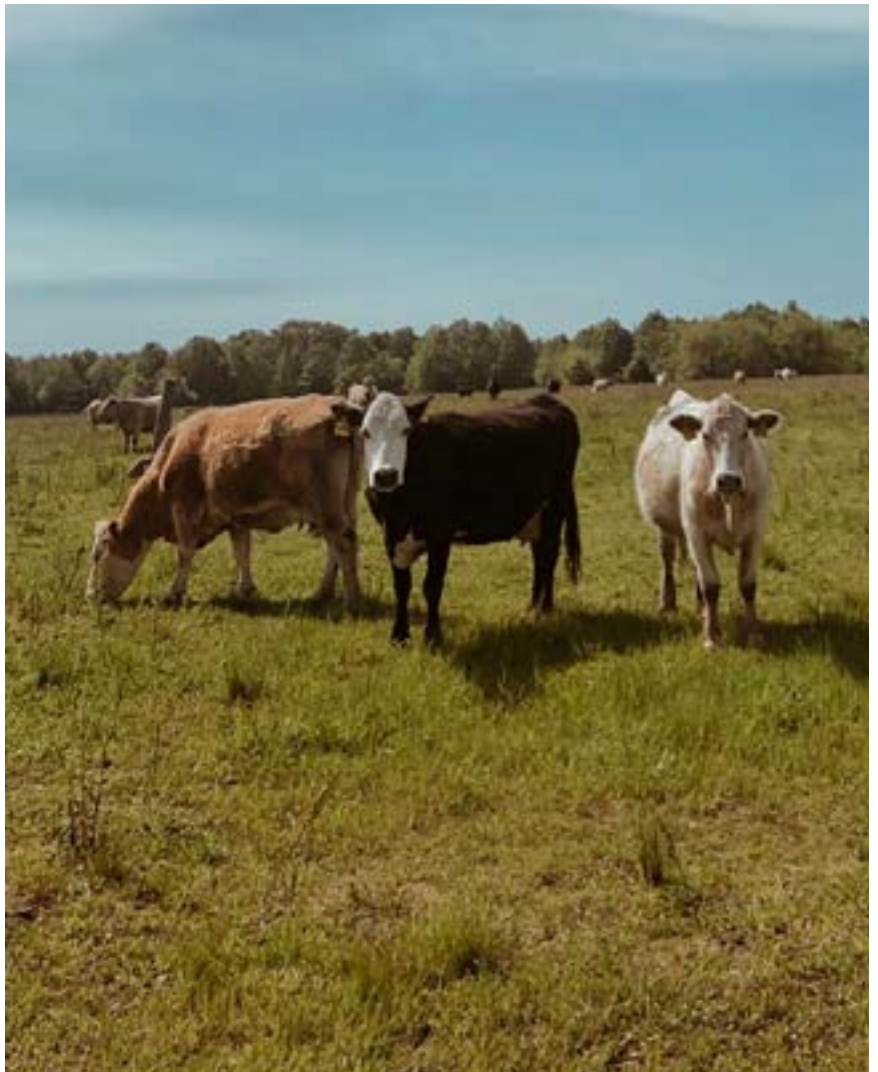


A SURVEY OF MANAGEMENT AND MARKETING CHARACTERISTICS OF STOCKER OPERATIONS IN THE DEEP SOUTH

BRANDI KARISCH, SARAH MONTGOMERY, AND KELSEY HARVEY

REGIONAL SURVEYS OF MANAGEMENT

techniques and nutritional practices of beef cattle producers drive university research and indicate how such research is interpreted and used by those in the industry. A plethora of published literature is available about the cow-calf and feedlot sectors of the beef industry, whereas little information is known about the stocker sector. Two nationwide surveys of stocker cattle producers have been conducted. In 2008 and again in 2020, Beef Magazine issued a nationwide survey to stocker cattle producers and recently published the results of the 2020 survey. However, the Deep South has been underrepresented in this survey. Based on producer response to the question, “Please indicate in which state or states you typically manage the majority of your stocker/backgrounder cattle,” only 1% of respondents listed AL, MS, or GA as their response. The favorable forage grazing season present in the states of Georgia, Alabama, and Mississippi provides a competitive advantage to stocker growers over many parts of the United States, hence an assessment of current practices and characteristics is warranted. Information gained from this assessment will be used to further research in this area of cattle production and provide science-based information on best management and marketing practices. Survey topics will be determined, and specific survey questions finalized based on previous surveys and recommendations from those in the industry. The following sections will comprise the survey: management/operation, procurement, receiving, receiving nutrition/management, health, nutrition, marketing, risk management, and communication/education. The results of this completed



survey analysis will be directly applicable to Mississippi beef cattle producers and producers across the southern United States. Information gained from this assessment will be valuable for Extension personnel as they develop new programs designed to fill the

needs of cattle producer clientele. Results will be made available through Extension publications, workshops, short courses, and continuing education meetings, as well as the aforementioned scientific abstracts and publications.

DESCRIBING THE CONSUMPTION OF CHLORTETRACYCLINE-CONTAINING MINERAL OFFERED FREE-CHOICE TO GESTATING COMMERCIAL BEEF COWS ON PASTURE

MADELINE MCKNIGHT, ISAAC JUMPER, KELSEY HARVEY,
MASON DREWERY, CODY POTTS, JUAN CORDERO, JASON RUSSELL, AND DAVID SMITH

MANY BEEF CATTLE PRODUCTION SYSTEMS rely on free-fed mineral supplementation to meet animal nutrient requirements. Feeding mineral supplement in a free-choice manner precludes monitoring daily intake. When free-choice mineral supplement is used to deliver medication such as chlortetracycline (CTC), variation in daily supplement intake may lead to individual over or underconsumption of the medication. Chlortetracycline is commonly included in mineral supplements to mitigate the risk of bovine anaplasmosis in beef herds. The objective of this study was to describe the consumption patterns of a granular, CTC-containing mineral supplement offered free-choice to cows on pasture. A total of 100 nonlactating, pregnant, crossbred beef cows were assigned to 1 of 3 pastures equipped with a portable, self-contained individual feeding unit (SmartFeed; C-Lock Inc.). SmartFeed units were used to record individual animal supplement intake and frequency. Cows were offered dried distillers' grains with salt for 14 days of acclimation (mean intake of 1.03 kg/day) before transitioning to a commercially available granular mineral containing CTC (6,160 mg/kg) on day 0 for 162 days. Using individual body weights collected prior to the study, the expected total CTC intake for



the trial period was calculated for each cow. According to label instructions, cows should be fed such that they consume 1.1 mg CTC/kg body weight daily. The average study cow (BW=530 kg) should, therefore, consume a total of 15.3 kg (94.4 g/cow/day) of mineral supplement over 162 days to receive a total of 94.5 g (0.58 g/cow/day) of CTC during the trial. However, mean mineral supplement consumption was 86.6 g/cow/day, which led to a mean CTC consumption of 0.54 g/cow/day. The mean number of consecutive days a cow did or did not consume mineral was 2.4 and 3.1

days, respectively. Throughout this study, only 42.1% (40/95) of cows consumed their total expected amount of mineral. In conclusion, feeding CTC-containing mineral supplement in a free-choice manner did not ensure cows consumed the labelled CTC dose of 1.1mg/kg/day.

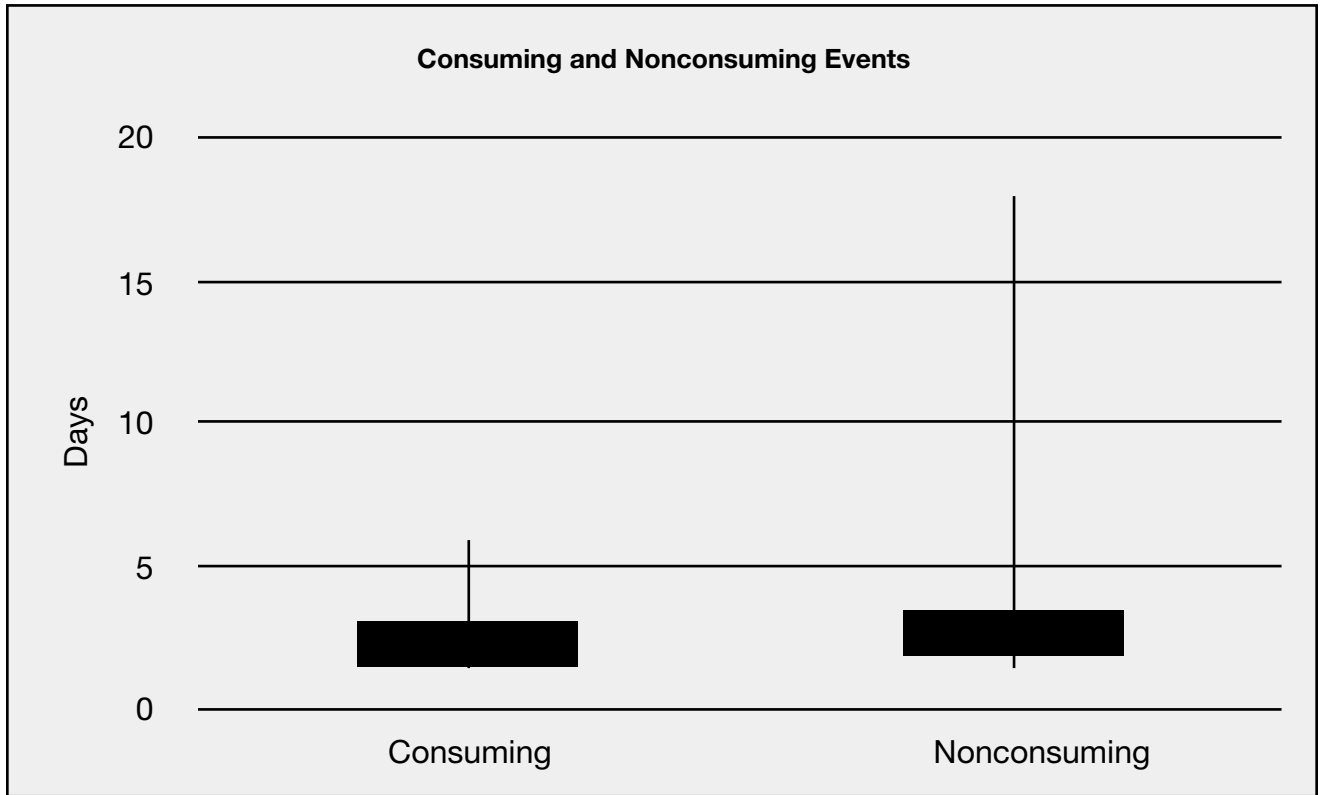


Figure 1. The distribution of consuming and nonconsuming events. The minimum number of consuming events was 1.3 days while the maximum being 5.9 days. The minimum number of nonconsuming events was 1.6 days while the maximum being 18.1 days.

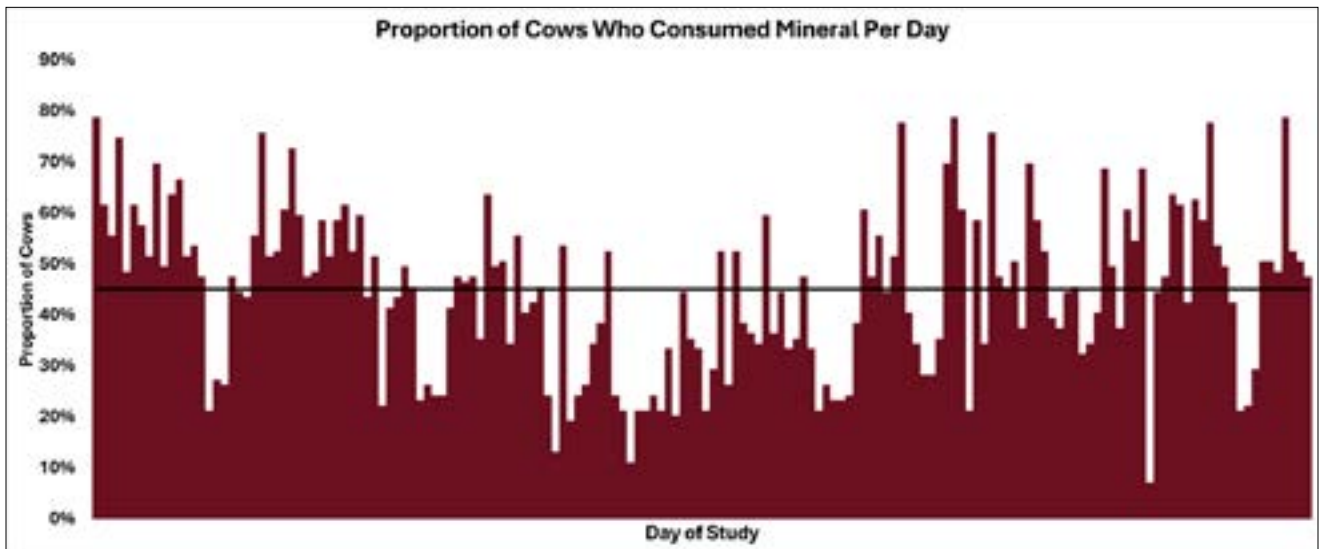


Figure 2. The overall percentage of cows that consumed any mineral per day. The black line represents an overall average of 33.7% of cows that consumed mineral each day.



HORTICULTURE



EFFECTS OF NITROGEN APPLICATION RATES ON FIELD TOMATO IN NORTH MISSISSIPPI

TIMOTHY AYANKOJO, THOMAS HORGAN, AND JEFF WILSON

NITROGEN IS AN ESSENTIAL CROP nutrient and is a major production requirement in vegetable crops, critical for optimum yield and fruit quality. An adequate nitrogen supply improves plant growth and health and can reduce plant susceptibility to diseases. Although nitrogen is needed by plants in relatively large quantities, excessive application may reduce crop productivity and increase the risk of groundwater and/or surface water pollution. This study was conducted to determine the amount of nitrogen needed for optimum field tomato productivity.

Tomato variety “Red Deuce” was transplanted on July 24, 2023, six weeks after seeds were seeding in the greenhouse. Seedlings were transplanted in raised beds made with a pressed-pan-type bed shaper that lays

white plastic mulch and drip tape in one pass. Seedlings were planted in a single row spacing 2 feet apart. In this study, a total of 6 nitrogen application rates were evaluated. For each treatment, the total required amount of nitrogen application was applied at a split rate of 50% preplant and fertigation using ammonium nitrate (33-0-0). The remaining nitrogen was applied weekly as fertigation using calcium nitrate (15.5-0-0) starting at 6 weeks after transplanting. Both potassium and phosphorus were applied 100% pre-plant using 0-46-0 and 0-0-60 fertilizers respectively.

Insecticides Mustang Maxx (Zetacypermethrin), Entrust (Spinosad) and Pyganic (Permethrin) were mixed with fungicides Quadris Plus (Aoxystrobin), Bravo WS (Chlorothalonil) or Kocide (Copper

Hydroxide) every 7 to 10 days. Harvest started October 3 and ended October 24 for a total of 3 harvest events. All harvested fruits were graded according to the USDA standards of extra-large, large, and medium.

Tomato yield was highest at 240 lb per acre nitrogen application rate across all harvest categories except for medium fruit and the unmarketable fruits. The total marketable yield increased with an increase in total nitrogen application while the unmarketable yield was highest at the lowest nitrogen application rates. This experiment will be repeated to validate the current results.

N application rate	Extra Large	Large	Medium	Unmarketable Fruit	Total Marketable	Total Yield
lb per acre						
0	31588 c	3669 c	937 ab	11677 ab	36195 c	47872 c
60	37466 bc	9715 ab	377 b	16382 a	47559 bc	63942 b
90	41977 bc	6493 bc	251 b	7442 b	48726 bc	56165 bc
120	44438 bc	8471 ab	2469 a	8517 b	55379 b	63896 b
180	47959 b	7351 ab	903 ab	9889 b	56213 b	66103 b
240	61804 a	10723 a	377 b	9477 b	72905 a	82382 a

Table 1. Nitrogen (N) application rate, average yield by fruit category, total marketable, and total yield (lb per acre).



Figure 1. Bed formation and plastic laying before planting.



Figure 2. Planting operation. Seedlings planted at 2 ft. apart.



Figure 3. Tomato plants at near harvest maturity.



Figure 4. Tomato fruit after harvest maturity.

EVALUATION OF COWPEA VARIETIES AND PLANTING DATES FOR PRODUCTIVITY IN NORTH MISSISSIPPI

TIMOTHY AYANKOJO, THOMAS HORGAN, AND JEFF WILSON

COWPEA (*VIGNA UNGUICULATA* L.) IS a relatively low-resource input grain legume crop with an important source of low-cost protein for humans, making it an important crop for sustainable agricultural production and food security. Cowpea varieties are classified according to their growth habits (determinate or indeterminate), maturity group (early, medium, and late), tolerance to stress conditions, and productivity.

Therefore, appropriate variety selection at the optimum planting date is critical to ensure optimum crop growth and productivity. This research sought to identify high-yielding cowpea varieties at two different planting dates. A total of three commercially available varieties (Quick Pick, Top Pick, and Top Pick Crowder) and two

planting dates (May 6, 2023, and June 23, 2023, as early and late planting dates, respectively) were evaluated. The study was conducted at the MAFES Northeast Mississippi Branch Experiment Station. Treatments were arranged in a randomized block design with eight replicates per treatment at both planting dates. Nitrogen (N), phosphorus (P₂O₅), and potassium (K₂O) were applied as 100% pre-plant at 30, 50, and 70 lb per acre respectively. Both planting dates were machine harvested at 62 and 99 days after planting for early and late planting dates, respectively. Harvested pods were shelled and all shelled weights were recorded for each variety at both planting dates.

Results indicated significant differences in yield (shelled weight) among treatment

and planting dates. Regardless of variety, shelled weight was significantly higher at late planting (June 23, 2023) compared to early planting date (May 6, 2023). Higher yield at the late planting date was due to higher frequency of rainfall, thus increasing plant available water in the soil compared to the drier early planting. Similarly, cowpea yield was highest for Top Pick Crowder regardless of planting dates compared to other varieties. Therefore, the results suggest that late planting of Top Pick Crowder could be an important strategy for yield maximization in cowpea production.



Figure 1. Cowpea plot during the early growing stages.



Figure 2. Cowpea plot during the maximum vegetative growing stage.



Figure 3. Mature pods at harvest.



Figure 4. Machine harvesting and bagging operations.

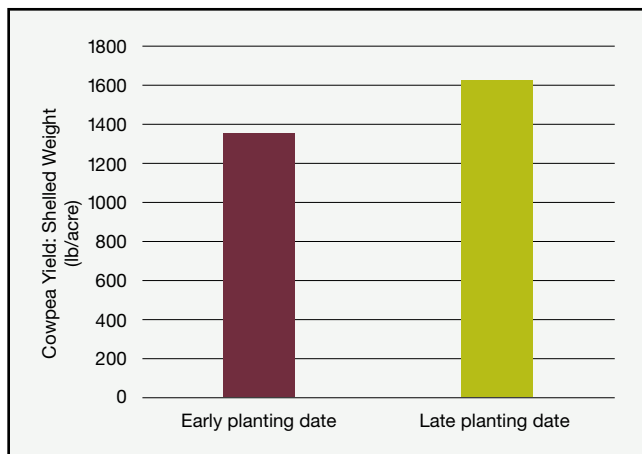


Figure 5. Effects of planting dates on cowpea.

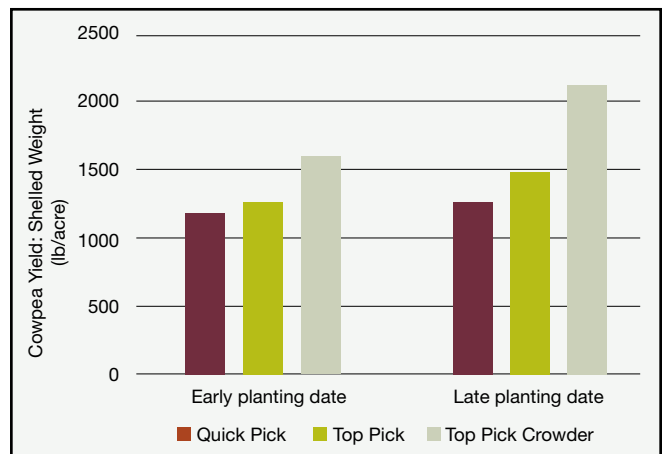


Figure 6. Effects of variety dates on cowpea yield.

MISSISSIPPI MASTER GARDENER VOLUNTEER PROGRAM

JEFF WILSON AND SUSAN MCGUKIN

MASTER GARDENER (MG) VOLUNTEERS HAVE been assisting county MSU Extension offices since 1992. There were 1,600 active MGs covering 69 counties as the program completed its 32nd year. The MG program is a major contributor to MSU Extension’s ability to meet its consumer horticulture clients’ needs. MGs assist Extension agents and specialists statewide to provide research-based educational programs and information to improve the economic, social, and cultural well-being of all Mississippians.

MG Trainees (Interns) receive 40 hours of classroom/online instruction. Sections taught are introduction, botany, soils, weeds, honeybee care, propagation, urban trees, ornamentals, lawns, entomology, diseases, fruits and nuts, vegetables, and volunteerism.

Interns then take a final exam to complete the initial training, before volunteering 40 service hours to complete the certification process. To maintain active MG status, volunteers give a minimum of 20 service and 12 education hours each year thereafter.

In 2023, 209 participants registered for the online MG training with 185 completing the training. This was an 89% completion rate. Overall, 836 MGs entered 70,019 volunteer hours into the reporting system. Volunteers from 57 of the 82 counties entered hours into the reporting system. MGs volunteered enough time to be equivalent to 34 full-time employees. Their volunteer service is valued at \$1.78 million.

Master Gardeners make a difference in their local communities. They provide

horticulture education to teach clients how to garden efficiently and safely. They promote buying plants and supplies from MS producers to support the Green Industry. MGs also use horticulture to encourage gardeners to be more active and develop a healthier lifestyle. MS Master Gardeners are truly using this volunteer training to make a difference for Mississippians!

Ten Master Gardeners, along with the state MG coordinator, attended the International Master Gardener Conference in Overland Park, Kansas. Numerous presentations were provided by horticulture/landscape authorities from around the world. Educational garden tours were also provided. The state coordinator gave an oral presentation praising the volunteers in Mississippi.

	# Of MGs	Dollar Value (\$)
Master Gardeners	836	
Times Volunteered	22,652	
Contacts	148,891	
Miles Driven	461,504	\$ 265,364
Education Hours	18,202	\$ 462,873
Service Hours	51,817	\$ 1,317,718
Total Hours	70,019	\$ 1,780,591



Figure 1. Touring a garden during the International Master Gardener Conference in Overland Park, Kansas.



Figure 1. Ten Master Gardeners, along with the state MG coordinator, attended the International Master Gardener Conference in Overland Park, Kansas.

MAGNOLIA BOTANICAL GARDENS 2023

JEFF WILSON AND SUSAN WORTHEY

THE MAGNOLIA BOTANICAL GARDEN WAS built in 1997 to serve north Mississippi as a demonstration and educational garden for consumers, green industry professionals, and horticulture educators. It serves as a greenspace for families/consumers to enjoy and as a resource for plant evaluations and educational programs (Figure 1). The main educational event for 2023 was the Fall Garden Day in October. Over 250 people attended the event to hear dynamic speakers, shop with local garden vendors, and enjoy the beautiful gardens.

EVALUATING NATIVE CHRISTMAS TREE SPECIES Production in North Mississippi – Four tree species were installed in 2021. Varying nitrogen fertilizer treatments were applied in spring and summer of 2022 and 2023. Initial and final annual growth data were collected to determine the treatment effect on the different tree species (Figure 2). Fresh and dry weight mass will also be calculated at harvest. Tree species lost during the first growing season were replaced in 2023. This study will continue through 2025. Second year data showed treatment L3 to be significantly greater than all other treatments ($P = 0.01$) for stem height. Data also showed treatment L2 to be significantly greater than treatment L4 ($P = 0.04$) for stem caliper (Table 1).

Treatment	Height (cm)		Caliper (mm)	
L1 - .25x	82.40	B	25.16	A,B
L2 - .50x	87.11	B	34.79	A
L3 - 1.0x	102.95	A	28.22	A,B
L4 - 2.0x	62.56	C	15.37	B

Table 1. Leyland Cypress ‘Ovensii’ Christmas Tree Stem Height & Caliper Year 2.



Figure 1. Magnolia Botanical Garden Education Program.

AMERICAN ROSE TRIAL FOR SUSTAINABILITY (A.R.T.S.) – Two separate trials spanning 2 years each with 17 and 21 unknown industry-submitted rose cultivars were grown (Figure 3) with no additional inputs beyond sufficient irrigation. Plants were installed in beds amended with ammoniated pine bark and then top-dressed with shredded pine bark mulch. The research included a completely randomized block design with 1 replication per block. A pre-designed rating system based on 45% flowering, 45% foliage health, and 10% plant form was used to evaluate twice monthly for 8 months by two Master Gardener teams. Evaluations were submitted electronically in real-time direct to the trial manager. The regional and national winning selections are released each May until the study is completed in 2025.



Figure 2. Native Christmas Tree Year 2.



Figure 3. American rose trial for sustainability field trial.



Figure 4. Verbena in the Proven Winners herbaceous annual and perennial trials.



Figure 5. Lettuce grown in patio-picker containers.

PROVEN WINNERS HERBACEOUS ANNUAL & PERENNIAL TRIAL –

Industry partners provided annual and perennial ornamental varieties for evaluations over 6 months at 3 Mississippi research sites. Plant material included bidens, calibrachoa, sweet potato, nemesia, petunia, coleus, salvia, and verbena (Figure 4). Numerous plant data such as plant health, bloom stage, insect rating, and landscape value was recorded by the MSU trial manager. This trial not only provided research, but it also enhanced the MBG’s annual area and provided consumers with a firsthand view of new plant materials. The results from this trial will be published in a future MAFES publication.

COMPARING LETTUCE GROWN IN CONTAINERS WITH 2 POPULAR

Soilless Medias to Those Grown in Raised Beds – Trials were conducted in spring and fall of 2023 and will be repeated in 2024. Lettuce varieties “Green Forest” and “Vulcan” were each grown in eight Patio-Picker containers with Pro-Mix, eight with Sta-Green Flower & Vegetable Garden Soil, and the rest in an equal-sized raised bed area (Figure 5). All plots were fertilized, watered, and maintained equally, with the only difference being the soil type or having a container.



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