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LOUISIANA Agriculture

Assuring Our Future Through Scientific Research and Education

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Louisiana Specialty Crops

Specialty Crop Block Grants Enhance AgCenter Research

Rick Bogren

Over the past several years, the LSU AgCenter has received grants totaling more than $750,000 for research and promotion projects to support specialty crops in Louisiana.

They're part of a U.S. Department of Agriculture competitive grant program that provides funding for a range of specialty crops, which include fruits, vegetables, tree nuts, dried fruits, horticulture, and nursery crops, including floriculture.

Funding comes from the USDA Specialty Crop Block Grant Program to enhance competitiveness of specialty crops. The grants are awarded through the Louisiana Department of Agriculture and Forestry.

Recent specialty crop grants support the following AgCenter projects:

- Increase the safety and competitiveness of Louisiana pecans by developing a safe, economical way to thermally treat pecans in a way that does not adversely affect the pecans' taste and quality but will be consistent with increasing safety standards.
- Combat the spread of bacterial wilt, which is causing severe losses to Louisiana tomato, eggplant and pepper growers by creating and disseminating new management tactics involving resistant rootstock lines grafted to popular tomato varieties.
- Increase the marketability of Louisiana sweet potatoes by studying the nutritional content of new varieties and providing information to producers for product labeling. Reduce the harmful effects on growth and yield of sweet potatoes due to off-target movement or drift of herbicides by documenting the effects of reduced rates of herbicide 2,4-D and dicamba and providing the results to local growers. Improve management options for the sugarcane beetle through integrated pest management to benefit the Louisiana sweet potato industry.
- Increase marketability and sales of Louisiana specialty crops by providing producers with training on using Good Agricultural Practices (GAP) and Good Handling Practices (GHP). Workshops provide producers with knowledge about these programs and the tools to implement them.
- Promote the purchase of Louisiana specialty crops and improve youth nutrition through a program to promote the consumption of Louisiana specialty crops in schools and other institutions.
- Promote the production and sales of Louisiana olives by creating a demonstration olive orchard to study the varieties that will best produce in Louisiana and how best to manage and raise them, and use the results to inform and promote production.
- Raise sod producers' awareness of zoysia shade tolerance by investigating variety selection, establishment methods and production times for saleable sod and informing consumers of the benefits of zoysia as a grass for home or commercial lawns.
- Promote the selection and evaluation of new ornamental plants, with emphasis on native and naturalized species, for nursery production and landscape use in Louisiana.
- Enhance competitiveness of Louisiana specialty crop growers through MarketMaker, a comprehensive interactive database of food industry marketing and business information.
- Determine the best course of action to mitigate the potential disease epidemic vectored by the Asian citrus psylid by studying the insect and the pathogens involved.
- Identify and promote plants that perform exceptionally well in Louisiana through the Super Plants program to serve all producers and retailers in the state.

Rick Bogren is a professor in AgCenter Communications.

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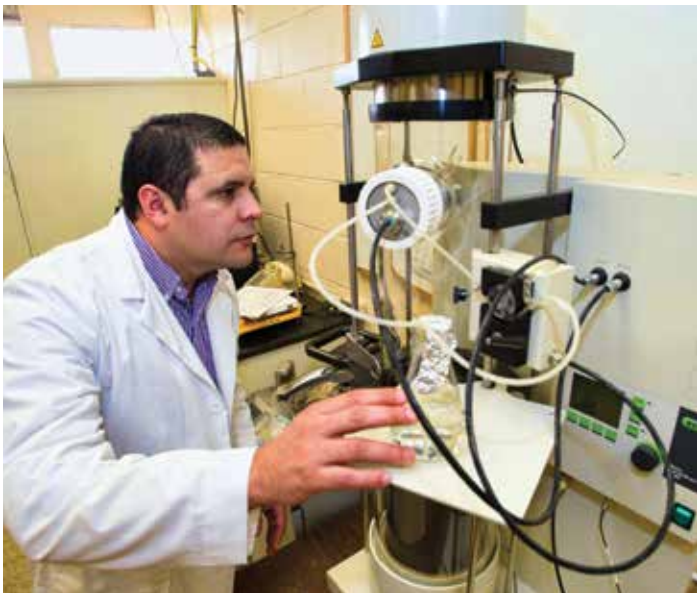
ON THE COVER: A wide range of specialty crops, including sweet potatoes, fruits, vegetables, tree nuts, horticulture and nursery crops, make a significant contribution to the Louisiana economy. Research in the AgCenter supports these crops and markets in a variety of ways.

Scientist uses 'nanosalt' to reduce sodium in foods



Marvin Moncada, an LSU AgCenter food scientist, has developed nanosalt, a powder made of salt particles about 1,000 times smaller than kosher salt. He is seen in this photo working with the nanospray drier used to make the nanosalt. Photo by Olivia McClure

Marvin Moncada, an LSU AgCenter food scientist, has found a way to use less salt in foods without sacrificing flavor.

Moncada developed nanosalt, which is a powder made of salt particles about 1,000 times smaller than kosher salt. By reducing the size of the particles to make a powder instead of coarse granules, the salt can cover more surface area of foods and enhance the perception of saltiness.

Nanosalt is the first product of its kind, and Moncada is hoping to market it after completing more lab tests. It offers a natural route to reducing the sodium content of foods, instead of using salt substitutes like potassium chloride.

Moncada recently used the nanosalt to make cheese crackers — a popular snack food, but one laden with sodium. The nanosalt crackers had up to 50 percent less sodium than their commercially available counterparts.

In sensory tests, a majority of consumers said they'd be willing to purchase the nanosalt crackers if they were available, Moncada said.

Another potential use for the nanosalt is in nebulizers for asthma treatment, Moncada said. His nanosalt particles are slightly smaller than those currently used in most nebulizers, which would offer more salt particles in the solution, he said.

Moncada has worked on the nanosalt project with AgCenter biological engineer Cristina Sabliov and dairy foods technology researcher Kayanush Aryana. **Olivia McClure**

71 earn advanced Master Gardener status

Seventy-one Master Gardeners received certification as the first class of advanced master Gardeners during a ceremony in New Orleans on May 12.

These volunteers have received an additional two years of training, which included obtaining a private pesticide applicator license and completing five core classes.

Participants also completed two interest-area classes and passed an exam on horticulture concepts.

The Louisiana Master Gardener program was started in Baton Rouge in 1994 to extend the educational outreach of the AgCenter's Louisiana Cooperative Extension Service.

To become a Master Gardener, an individual must complete a 50-hour training program and in the first year volunteer 40 hours. In succeeding years they must give 20 hours of service each year and complete six continuing education hours. **Johnny Morgan**

Many of the 71 new advanced Master Gardeners participated in a ceremony in New Orleans to receive their certificates. Photo by Johnny Morgan

Potential new rice varieties on the horizon

One or two breeding lines of rice will be chosen this year for seed increases that could result in the first variety release for new rice weed control technology called Provisia.

At field days in May, LSU AgCenter rice breeder Steve Linscombe said whichever is selected will undergo a seed increase in Puerto Rico next winter for a possible release in 2017. "The good news is by 2018, we should have plenty of seed available."

Provisia will provide farmers with an alternative technology to fight red rice, extending the viability of Clearfield rice, which is a herbicide-resistant rice that has allowed farmers to control red rice, a weed that plagues the rice industry in Louisiana.

The AgCenter released the first Clearfield variety in 2002, but outcrosses of red rice with the Clearfield trait have been causing farmers problems in recent years. Provisia is expected to control those problems. The new technology discovered by BASF has been in development for the past four years.

Linscombe also said he will identify one or two lines of Clearfield Jazzman this year for seed increases in Puerto Rico this winter, and a new variety could be chosen next year. **Bruce Schultz**

Workshop promotes agritourism

Keachi Acres in DeSoto Parish is more than just a destination. It's recreation in its most natural form started by Mary Nesbitt as an agritourism business in 1999.

Nesbitt hosted an LSU AgCenter agritourism business workshop for landowners on May 10.

The workshop attracted about 50 people who wanted to know more about using their property as an agritourism destination.

"The workshop focused on teaching agritourism operators how to engage their visitors through a variety of topics: recreation, lodging, food systems and nature," said AgCenter agritourism coordinator Dora Ann Hatch. "Agritourism offers an experience for those who are not familiar with farm settings to learn in a fun atmosphere where food and fiber come from."

The workshop featured guest speakers who already own an agritourism business, like Nesbitt and Evan McCommon, who owns Mahaffey Farms in Princeton, in Bossier Parish.

A focus of the workshop was to encourage potential operators to get their state agritourism certification, Hatch said.
Tammi Arender

New sugarcane variety on the way

The latest sugarcane variety to be released shows some positive characteristics. Known as HoCP 09-804, the new variety was bred and selected at the USDA-ARS Sugarcane Research Unit in Houma, said AgCenter sugarcane specialist Kenneth Gravois.

The process of releasing a new variety is a cooperative effort and concludes by a vote of the three sugarcane organizations – the American Sugar Cane League, the LSU AgCenter and USDA-ARS. This cooperative effort of the three agencies dates back to the mid-1920s.

HoCP 09-804 proved its ability to withstand lodging, or falling over, following Hurricane Isaac in 2011. "After that storm, I was really impressed to see that it was one of the few varieties still standing," Gravois said.

The variety will be distributed by the American Sugar Cane League to growers for planting this year, and growers will normally buy 10 to 25 tons to begin growing their seed cane for next year.
Johnny Morgan

USDA grant to aid grass-fed beef study

LSU AgCenter researchers have received a grant from the U.S. Department of Agriculture to study the production and marketing of grass-fed beef.

Guillermo Scaglia, who conducts beef cattle research at the AgCenter Iberia Research Station, is working with AgCenter economists to evaluate grass-fed beef breeds and ways to market and deliver the beef.

In the next three years, Scaglia will study four breeds of cattle – Angus, Brangus, Holstein and Pineywoods – fed solely on one year-round system of forages such as grasses. He will determine productivity, grazing behavior and meat quality by studying characteristics such as tenderness and fat content.

This is a continuation of research Scaglia has been doing on grass-fed beef. He spent several years identifying forage systems and that work best in the Gulf South. Now, he is looking at breed types.

"We will look at the type of carcasses and beef these breed types can produce," Scaglia said. Grass-fed beef yields meat that is less fatty and has a different texture than grain-fed cattle.

AgCenter economist Jeff Gillespie will delve further into what the market wants. The economist will study how strategic alliances can be formed among producers, restaurants and grocery stores.

Part of his plan is to study farm-to-market structures that the beef industry is already using.

"We plan to study the needs of grocery store and restaurant managers and see what they prefer and what agreements they might enter into," Gillespie said. **Tobie Blanchard**

AgCenter scientists develop cataract-reducing eye drops

LSU AgCenter scientists have formulated a nanoparticle matrix that could be used in eye drops to both prevent and treat cataracts, a leading cause of vision loss in older adults.

Professor Cristina Sabliov, left, and assistant professor Carlos Astete, of the LSU AgCenter Department of Biological and Agricultural Engineering, have formulated a nanoparticle matrix that could be used in eye drops to both prevent and treat cataracts. Photo by Olivia McClure

Professor Cristina Sabliov and assistant professor Carlos Astete in the Department of Biological and Agricultural Engineering have found a way to use nanoparticles to efficiently deliver hydrophobic lutein and enhance its stability and antioxidant properties so it can be used effectively in eye drops.

Lutein is a naturally occurring yellow pigment known as a carotenoid, and it can be found in the human eye. Studies have shown that dietary supplements can help replenish ocular lutein. But treatments using lutein have been limited in the past by the substance's poor water solubility, its susceptibility to degradation and low absorption efficiency.

"The nanoparticle matrix can deliver lutein to the eye efficiently as an eye drop formulation," Sabliov said. "Direct application of lutein to the eye in this formulation improves its effect against cataracts."

The nanoparticle matrix may enhance the benefits of lutein by preventing it from disintegrating before it collects in the eye lens, where cataracts occur, Sabliov said. Improving lutein's stability would also help it remain in the lens, potentially preventing future damage.

"This new product would have the unique advantage of both being able to prevent cataracts before they start or to treat cataracts after they form," she said.

Traditional treatment involves surgical removal of cataracts from the eye lens. The lutein eye drops could offer an effective, non-surgical and more accessible treatment option.

The AgCenter is in the process of patenting the technology. **Olivia McClure**

Fashion Association holds 10th annual runway show

A model walks the runway wearing a design by student Jessica Wainright at Decadence, an annual runway show put on by the Fashion Association at LSU. Wainright's collection won best in show in the senior category. Photo by Tobie Blanchard

The Fashion Association at LSU held Decadence, an annual runway show, on May 13 at the Royal Cotillion Ballroom in the LSU Student Union. The show featured more than 100 student garments and included collections by juniors and seniors. The students also participated in the Marsh on the Catwalk competition, which included use of alligator skin, and the Retro Reboot styling competition.

Grace Chetta, a senior studying textiles, apparel and merchandising in the LSU College of Agriculture, described the show as a fitting culmination of students' time in the program.

"I think our collections are a testament to what we learned in college, and they show our grasp on our aesthetic," she said.

Senior Jessica Wainright won best in show for her collection. Amber Nguyen won junior best in show. Chetta placed for best individual design.

Tobie Blanchard

Six receive University Medals at College of Agriculture commencement

Six LSU College of Agriculture students received University Medals at the college's commencement ceremony on May 13 at the LSU Maddox Field House. The University Medal is LSU's highest academic honor and is awarded to students who receive a 4.0 or higher. The students who received the medals were (left to right) Nicholas Adams, agricultural education; Ashley Allemand, animal, dairy and poultry sciences; Michelle Bourgeois, animal, dairy and poultry sciences; Brittany Craft, nutrition and food sciences; Anna Ribbeck, plant and soil systems; and Alexis Allen, natural resource ecology and management. At the ceremony, the college awarded 243 degrees, which included 211 bachelor's degrees, 18 master's degrees and 14 doctorates. Photo by Tobie Blanchard

Douthats create international internship

John and Annette Douthat have established an endowed international internship in the LSU College of Agriculture. Photo by Tobie Blanchard

One year spent in Thailand and another in South Korea changed John and Annette Douthat's world view. The Douthats lived abroad early in their careers while John worked for the Ralston Purina Company. Annette said the experience was eye-opening.

Now they are helping college students gain international exposure.

The Douthats have endowed the Annette and John Douthat International Agriculture Internship for students in the LSU College of Agriculture with preference given to those who have never traveled out of the country.

"International travel changes your perception of everything," Annette said. "It improves human relations and teaches you about different cultures, religion and food."

Annette, a College of Agriculture alumna, met John, a University of Florida graduate, while she was traveling as a Danforth Fellow, which was part of a Ralston Purina leadership program.

The couple eventually settled in Baton Rouge and started AllBrands, a thriving retail and online business specializing in sewing machines and sewing-related items, which is celebrating its 40th year in business.

The Douthats' international experiences continue. Their business often takes them overseas. Of their four children, one lives in Austria. They also host international college students in their home near the LSU campus. **Tobie Blanchard**

Turkey research aims to improve land management

Landon Schofield, a graduate student in the LSU College of Agriculture School of Renewable Natural Resources, is studying the turkey population on Barksdale Air Force Base in Bossier City. Schofield is one of several graduate students working on a project to help landowners better manage their land for turkey habitat. The students are working under the guidance of Bret Collier, assistant professor in the college, who said this research will help landowners manage their land to attract and retain turkeys. Collier said the students' research and collaboration with state agencies and private landowners is a primary example of a land-grant university fulfilling its mission. Photo provided by Bret Collier

Terese named outstanding La. dietetic senior

Julia Terese, of Shreveport, received the Irene Toliver Pyburn Merit Award from the Louisiana Academy of Nutrition and Dietetics. The award is given to an outstanding Louisiana college senior focused on dietetics.

Terese, who graduated from the LSU College of Agriculture in nutrition and food sciences in May, said she was "humbled and honored to receive the recognition."

In August, Terese will begin a 10-month internship with the Medical University of South Carolina in Charleston.

The scholarship she received with the award will help her financially while she is in the internship program, which is required before she can become a registered dietitian.

"I've worked with food banks and soup kitchens. It's just something I've done," she said. "I want to help people who aren't already healthy."

As a student, Terese has worked as nutrition assistant for the LSU Office of Wellness and Health Promotion, where she authored the cookbook "Beyond Ramen Noodles." She describes the cookbook as having recipes adapted to dormitory and campus cooking. **Tobie Blanchard**

Julia Terese, an LSU College of Agriculture senior studying nutrition and food sciences, received the Irene Toliver Pyburn Merit Award from the Louisiana Academy of Nutrition and Dietetics. Photo by Tobie Blanchard

Agriculture students set up research project in Mozambique

LSU College of Agriculture students Brandy Malbrough, Tanner Jones and Jamie Amato received dive certification while in Tofo, Mozambique, so they could look at fish populations in the area and take water samples at different depths to analyze the phytoplankton and other aspects of the water. Photo provided by Reagan Errera

Three students in the LSU College of Agriculture accompanied Reagan Errera, an instructor in the School of Renewable Natural Resources, on a research mission to the coast of Mozambique.

The students, Jamie Amato, of Kenner; Tanner Jones, of Tyler, Texas, and Brandy Malbrough, of Houma, were in and around Tofo, Mozambique, from March 17-26, 2016, helping Errera set up a project to study the connection between phytoplankton and whale shark abundance in the area.

The organization All Out Africa was looking to better understand whale sharks and turned to Errera for help.

Errera said they are looking for a reason why fewer whale sharks have been coming to the Tofo area during the past decade.

Tofo developed around tourism based on whale sharks and other marine life. Part of the students' research was surveying tourists on ocean safaris.

When they saw marine life, the students recorded approximate GPS coordinates, size and numbers and noted behavior. The information will assist in research efforts identifying areas frequented by specific species.

Errera plans to go back next year with five to 10 students and stay for three weeks.

Tobie Blanchard

Louisiana's Diverse Specialty Crop Industry

Allen Owings

In Louisiana, the specialty cop industry is indeed special. From sweet potatoes to nursery crop production to strawberries to citrus to mayhaws and sod, and even Christmas trees, the horticulture industry in Louisiana is diverse and wide encompassing. Every parish in Louisiana has commercial horticulture production of some capacity. And this does not even include the backyard vegetable gardens, home fruit trees and expansive residential ornamental landscapes that keep a significant portion of Louisiana citizens involved in horticulture in their day-to-day life.

The history of horticulture production in Louisiana goes back at least to the 1880s when nursery crops were being produced in the well-drained loamy soils of Forest Hill. Our parents and grandparents in the Florida Parishes may remember around 100 refrigerated strawberry-filled boxcars a day during harvest season leaving the railroad depot in Hammond during the 1940s heading to Chicago. St. Francisville, New Orleans and River Road plantation homes were landscaped many years prior to these days. Ornamentals like roses, camellias, azaleas and Southern live oaks planted hundreds of years ago are still around today.

AgCenter sweet potato breeding is still a national leader. New efforts in landscape horticulture research and plant trials are ongoing at the Hammond Research Station. The AgCenter has started a public gardens outreach initiative with new directions at the AgCenter Botanic Gardens at Burden in Baton Rouge. Turfgrass and ornamental researchers in environmental sciences are using new research techniques to preserve levees, slow coastal erosion and help nursery growers manage irrigation more efficiently. Fruit and vegetable crops continue in importance. The next generation of growers are doing more small-scale farming and producing for local markets. Many Louisiana citizens want to buy locally grown fresh produce.

While research is important, it takes a strong extension delivery program to "bring the university to the people." The AgCenter still considers that the "state is our campus." Every parish has an Extension Service office providing local, timely delivery of horticulture information. And in every office, most daily communication pertains to gardening and horticulture.

Programs such as Get It Growing, featuring LSU AgCenter horticulturist Dan Gill, provide daily radio along with weekly newspaper articles and television stories statewide. The Louisiana Super Plants program is a success story, featuring more than 30 highly recommended plants for Louisiana landscapes backed by AgCenter testing. Louisiana Master Gardeners and Advanced Master Gardeners have been trained to aid faculty and volunteer thousands of hours each year in support of horticulture programming initiatives.

Extension turf specialist Ron Strahan reports that sod demand has increased in the past five years and should continue over the next couple years. Sod growers and landscape contractors have expanded their businesses by installing athletic field turf and maintaining turfgrass on high school sports fields.

In garden centers most bedding plants and shrubs are sold in spring from mid-March through Mother's Day. Independent garden centers having the most success are those diversifying their products by selling hard goods and seasonal holiday items. Garden centers in metropolitan areas also are expanding their sales to landscape professionals, providing a convenience for smaller landscape firms and allowing garden centers to expand beyond the home gardener for additional revenue streams.

Landscape installers and lawn maintenance firms serve both commercial and private customers with mowing and applying weed control products and fertilizers as well as installing and maintaining ornamental plantings.

Larger wholesale nurseries in Louisiana are doing well and even expanding production acreage because of plant shortages and gaps in inventory. On the other hand, small and mid-size nursery growers are struggling more to find their place in the market. Although the number of nursery growers is down to 460 from 625 over the past 10 years, overall wholesale production sales are up from $90 million to $118 million over the same period.

AgCenter sweet potato specialist Myrl Sistrunk reported 9,300 acres in production in 2015 – more than in recent years – with yields at 450 bushels per acre. Sweet potato growers are producing more products for the processing market.

AgCenter vegetable specialist Kiki Fontenot reports that yields and quality of fall and winter vegetable crops have been good. Trends toward urban agriculture and small farms are leading to more organic production in the vegetable industry and small farms operated by one to two people who market locally at farms markets.

According to AgCenter pecan and fruit specialist Charlie Graham, the 2015 pecan crop in Louisiana was 5 million pounds compared with the 2013-2014 harvests of 11-14 million pounds. Pecan harvest from native stands is still strong in Louisiana with new international marketing opportunities.

Citrus growers saw a small orange crop in 2015. Peach production continues to decline in Louisiana while strawberry production continues to be stable in the Florida parishes.

While forestry is the No. 1 agriculture industry in Louisiana, specialty crops rank No. 2 in terms of overall annual contributions to the state's economy. The nursery and landscape industries – production, landscape services and retail sales – contribute $2.5 billion annually to the state's economy. The fruit and vegetable sector of sweet potatoes, other commercial vegetable production, small-scale fruit production and home gardens contributes another $400 million.

Horticulture has always been here and will always be here. Every person is touched daily by agriculture and every person is touched even more by horticulture – Louisiana's growing industry.

Allen Owings is a professor of horticulture at the Hammond Research Station in Hammond.

Louisiana Pecan and Fig Production Remain Strong While Peaches Fade

Johnny Morgan

Pecans and figs continue to be popular crops in Louisiana while continuous freezes in north Louisiana have nearly decimated the peach industry, said LSU AgCenter horticulturist Charlie Graham.

"During the decade of the 90s, I think there were only one or two years that there was a full peach crop in the state," he said. "All of the other years, there were either total losses or partial crops due to late-season freezes."

In addition to the freezes, disease also has been a big problem for peach growers, Graham said. "Some of the larger growers in the state have been battling armillaria root rot for the past decade."

Graham said peaches are down to below 400 acres statewide. The U.S. Department of Agriculture doesn't even include Louisiana in its list of peach production by state.

This is nearly opposite of the situation with pecans and figs.

"When you look at the pecan industry, for a number of decades, we didn't see that much change in prices or production," Graham said. "It was pretty much a stagnant industry."

But in the late 2000s, there was a large increase in the export industry, with China being the driving force behind that increase. "They ramped up fairly quickly, beginning with about 10 million pounds and now importing about 80 million pounds," he said. "That has had a large impact on the price of pecans."

By 2011, this caused pecan prices to rise to their highest price ever. "That has caused an increase in the number of trees being planted," Graham said. "And another change we are seeing in the industry is growers now have funding to help promote the industry in foreign markets."

The pecan industry continues to be strong, mainly because of increased exports to Asian and Middle Eastern countries, Graham said.

The U.S. pecan industry began working cooperatively with the USDA Foreign Agricultural Service in 2011, Graham said. It receives primarily Market Access Program funding but has also received some Emerging Markets Program funding.

This helps U.S. pecan growers participate in promotional activities aimed at expanding exports in several foreign countries.

Figs have been an important fruit crop in Louisiana for more than 150 years and are one of the most popular small fruit crops grown in the state, according to AgCenter horticulturist Allen Owings.

"With local farmers markets becoming more prominent in major population areas of the state, there is now more demand for fresh figs for local sales," Owings said.

Louisiana retailers sell about 10 to 15 varieties of fig trees, but some individuals and small nurseries have many additional varieties, ranging up to as many as 60 to 100, he said.

"Figs are one of our lowest-maintenance fruit trees," said AgCenter horticulturist Jason Stagg. They are relatively easy to grow and can easily fit into an organic food production system. Figs join blueberries and citrus as the most sold fruit plants at garden centers in Louisiana.

After being dormant for a number of years, the AgCenter renewed the process of selecting potential varieties in the 1990s under the leadership of AgCenter horticulturist Charlie Johnson, now retired. Since then, the AgCenter has released new varieties named Champagne, LSU Gold, LSU Purple, O'Rourke, Tiger and Scott's Black.

"These selections are distinct from other available fig cultivars and offer a unique blend of color and size for commercial and residential use," Stagg said. They enhance the diversity of fruit characteristics offered for sale and produce larger, good-quality fruit that can increase demand for retail sales.

The new releases also extended the harvest season for figs.

"In addition to these six varieties, several other unnamed figs from the LSU AgCenter program have been grown and distributed by fig enthusiasts over the years," Stagg said.

The AgCenter now has one of the few accurate "true-to-type" fig variety collections in the Southeast, Owings said. The fig research program and orchard are being relocated from the AgCenter Botanic Gardens at Burden in Baton Rouge to the Hammond Research Station.

"The newly planted research orchard in Hammond will serve as an accurate germplasm collection, which will allow industry cooperators to obtain cuttings of desired varieties for 10 to 20 years into the future," Stagg said.

Because figs are easily propagated and can be grown to a saleable tree in about 10 months, this should present a good opportunity for local plant nurseries.

Johnny Morgan is a specialist in AgCenter Communications.

Researching Roses in the Bayou State

Allen Owings

Roses continue to be one of the most widely planted flowering shrubs in Louisiana. The majority of nursery growers in Louisiana produce roses. These plants have a wholesale value of $10 to $15 million annually in the state.

Rose trials and evaluations have a long history in Louisiana. Notably, rose research has been conducted by the LSU AgCenter in cooperation with several partners for more than 20 years. Regional performance of roses and disease resistance in roses are important to growers, landscapers, retailers and gardening consumers.

In Louisiana, active rose variety trials are ongoing at the AgCenter Botanic Gardens at Burden in Baton Rouge and the Hammond Research Station in Hammond, along with the Gardens of the American Rose Center in Shreveport. Typical peak spring bloom on roses is early to mid-April with fall peak bloom in October.

Finding good-performing roses in Louisiana should be a good indication of roses that will do well in other parts of the country. Louisiana has much more rainfall than other states in the southeastern and south central United States. Every year, 65 inches of rain is common in south Louisiana, with 40-45 inches regularly occurring in north Louisiana. Climate conditions favor blackspot and Cercospora leaf spot diseases, with Cercospora being a more significant problem than many rose growers realize. Many roses that have little to no blackspot fungus problems show high susceptibility to Cercospora.

Current rose research and promotion and marketing in Louisiana include studying Earth-Kind; evaluating Easy Elegance, David Austin, Certified Roses and Kordes; recommending Easy Tea hybrid tea cultivars; selecting Louisiana Super Plant roses; initiating a Gulf District Rose of the Year program; participating in the American Garden Rose Selections and American Rose Trials for Sustainability studies and more.

Louisiana is home to both of the relatively new national programs to evaluate roses. The American Garden Rose Selections (AGRS) debuted in 2013, and the American Rose Trials for Sustainability (ARTS) began plant trials in 2014. The LSU AgCenter is participating in both of these programs.

AGRS is replacing the All-America Rose Selections program. The last winner in this program was named in 2014, and the first winners in the new AGRS program will be in 2016. This trial embodies a model using a long-used rose trialing method from Germany. This method includes evaluating disease resistance, hardiness, attractiveness and habit for both sustainability and marketing. Roses are not treated with any pesticides in the evaluations. United States regional winners will include the Northeast, Southeast, North Central, South Central, Northwest and Southwest. The LSU AgCenter Botanic Gardens at Burden is one of 12 AGRS trial sites in the country. The motto of this new program is "bringing you great roses you can grow where you live." The initial winning varieties for 2016 are Looks-A-Likes Phloxy Baby, Thomas Affleck and Dee-Lish. You can see more information on ARGS trials at www.americangardenroseselections.com.

The first year of the American Rose Trials for Sustainability evaluations in Louisiana was 2015. The goal is to identify, through regional evaluation and testing under low-input conditions, the most disease- and pest-resistant, hardiest and best garden-worthy rose cultivars. In addition, the trials provide the industry and gardening public with objective, accurate and reliable information about the cultivars tested for each region. The methodology used will establish and maintain an environmentally responsible testing model that incorporates current research-proven landscape management techniques for the evaluation of rose cultivars for regional suitability in the United States for landscape use under minimal input conditions. More information on ARTS trials is located at www.americanrosetrialsforsustainability.org.

Kordes Rose Trials

The LSU AgCenter is also looking for the better-performing Kordes rose varieties for the Gulf South. Kordes is one of the largest and one of the oldest rose-breeding companies in the world. Fungicides are not used in their rose development and evaluations. Disease resistance in hybrid teas, sustainability in rose growing and growing "own-

The Rose Garden and the Steele Burden Memorial Orangerie at the LSU AgCenter Botanic Gardens at Burden in Baton Rouge. Photo by John Wozniak

root" modern roses can be achieved with some of these varieties. Well-known older Kordes varieties that have successfully been growing in Louisiana many years include Shreveport and Iceberg.

Some of the newest Kordes hybrid tea and floribunda roses being evaluated at the Hammond Research Station and at the Botanic Gardens at Burden include Beverly, Grand Amore, Pink Enchantment, Sunny Sky, Wedding Bells, Winter Sun, Poseidon and Summer Sun.

More Rose Trials – David Austins, Easy Elegance, Easy Teas

David Austin English roses are crosses between modern and old garden varieties. They have the profuse flowering of modern roses along with the fragrance and disease resistance of older garden roses. A new three-year AgCenter trial on these varieties started in 2014 and includes observations of factors such as flowering, plant size, flowering cycles, leaf spot susceptibility, blackspot susceptibility and more to determine the best of these roses for south Louisiana. The study is partially financially supported by the Louisiana Society for Horticultural Research. Plants are being exposed to typical rose cultural practices with the exception of disease and pest control; fungicides and insecticides will not be used.

The five most popular David Austin English roses in Louisiana are Graham Thomas, Heritage, Pat Austin, Abraham Darby and Molineaux. Prior studies in Louisiana from about 10 years ago found

Cercospora leaf spot is higher in occurrence in Louisiana and the Gulf States when compared to other areas of the country. Photo by Allen Owings

Belinda's Dream in the Earth Kind Rose Trials at the LSU AgCenter. Photo by Mark Claesgens

Heritage and Molineaux to be the best performers, with other top performers being Abraham Darby, Tess of the d'Urbervilles, Benjamin Britten, Jude the Obscure, Charlotte and Cordevale.

Easy Elegance roses from Bailey Nurseries have been trialed in Louisiana to a small degree before, but a 2015 planting at the gardens in Shreveport along with AgCenter gardens in Hammond will help to clarify the best of these roses for the Gulf South. Easy Elegance roses – such as My Girl – have been proven to do very well in other trials in the South and in previous trials in Louisiana.

Any Louisiana rose research article must mention the Easy Tea Hybrid Tea Rose trial winners from the four-year AgCenter study at the Gardens of the American Rose Center. Tahitian Sunset, The McCartney Rose, Fredric Mistral, Traviata and Pink Traviata were treated with fungicide only four times annually in a minimum-spray study and were shown to be blackspot free for the majority of the four growing years.

Gulf District Rose of the Year

The American Rose Society Gulf District, which includes Louisiana and Mississippi, started a rose-of-the-year program in 2015. AgCenter research observations are included in the selection process. The inaugural winner was Belinda's Dream.

Belinda's Dream has proven to be one of the best in Louisiana. It is frequently recommended by rosarians in the South

Cinco de Mayo, the American Rose Society Gulf District (Louisiana and Mississippi) Rose of the Year for 2016. Photo by Allen Owings

as the "rose to grow" for rose-growing first timers. Belinda's Dream has an attractive shrubby growth habit and excellent disease resistance. Bushes reach heights of 5-6 feet with an equal spread, but they can be easily maintained at 4 feet. Flowers are medium-pink and fully double with the form of hybrid tea roses. The fragrant blooms are larger than most landscape roses and produce spring through fall. Belinda's Dream is an excellent low-maintenance, easy-care landscape rose with large hybrid-tea flowers.

The 2016 Gulf District Rose of the Year is Cinco de Mayo. This floribunda rose has done well in southern U.S. trials since its 2009 introduction from Weeks Roses and is an All-America Rose Selections winner. Cinco de Mayo flowers have 25 petals, are 3 to 3 1/2 inches in diameter and are slightly fragrant with the scent of cut apples. The uniqueness of Cinco de May is the bloom color – described as smoky lavender to a blend of rusty-orangy red. In the landscape, Cinco de Mayo is a slower grower. Mature height is 36-42 inches with an equal spread. Plants have a nice deep glossy green foliage appearance

Roses have a great tradition in Louisiana, and AgCenter horticulturists hope this will continue. Research is finding new roses for improved landscape performance.

LSU AgCenter Louisiana Super Plant roses include Belinda's Dream, Red Drift, Pink Drift, Peach Drift, Apricot Drift, Popcorn Drift, Icy Drift, Sweet Drift and Coral Drift.

Allen Owings is a professor of horticulture at the LSU AgCenter Hammond Research Station and Gulf District director for the American Rose Society.

Portions of this article were previously published in a publication of the American Rose Society, the American Rose Annual 2015 edition. Used with permission.

Plants with Potential: An Ornamental Plant Material Awareness Program

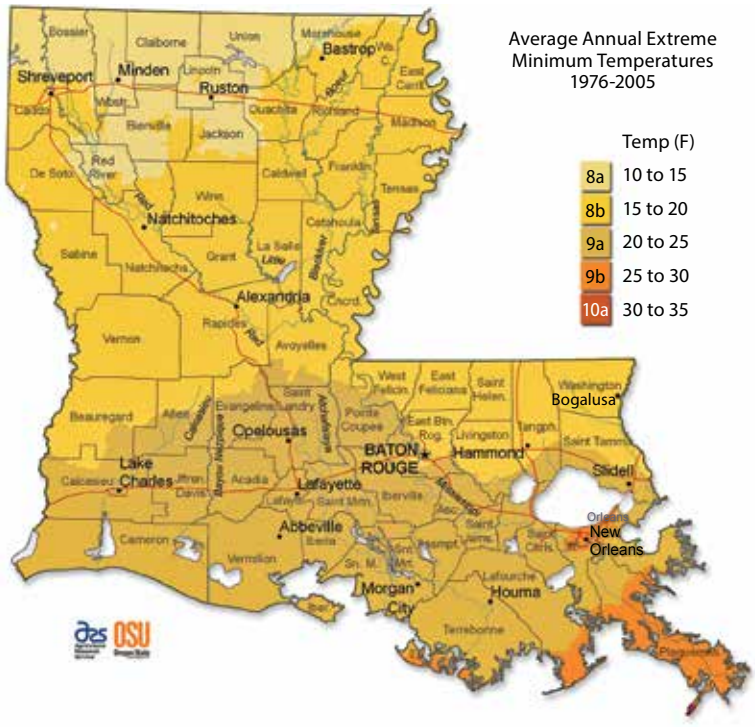
Jason Stagg, Allen Owings and Gina Hebert

The LSU AgCenter Hammond Research Station created a new outreach program in 2015 to annually introduce and distribute unfamiliar, non-patented plants to Louisiana's ornamental nursery and landscape industry. Plant species or varieties selected for the program suffer from limited or no commercial availability and use in the state, but evidence suggests they have excellent landscape performance potential in the challenging Gulf South climate.

While this program is not an official trial study, the industry may benefit from learning about and receiving these stock plants for evaluation of growth characteristics or customer interest. Nurseries may be able to broaden their product lines, and landscapers could diversify their plant material palettes to enhance profitability, while increased distribution of these plants will help preserve unique varieties.

Using plant material free from propagation regulations can present a significant cost savings to the industry when introducing alternative variety selections. A core component of the program is offering "unprotected" plants that can be propagated without any restrictions. Increasing numbers of newly developed varieties on the market carry invention patents, and protecting the inventor's development costs is important. Patented plants, however, generally require a license to propagate and payment of royalties to the inventor. Another form of protection enables companies to trademark existing unprotected varieties under a new name, which prevents anyone else from propagating and selling the plant with the trademarked name. Because both types of protected plants are generally more expensive, the Plants with Potential program helps the industry by identifying a good mix of economically-grown companion plants to sell alongside premium varieties.

Participants in the program who receive stock plants include small to medium-size wholesale growers, retail nurseries, landscapers, landscape architects, Master Gardener plant sale groups, professional horticulture organizations, public gardens and other university or research facilities. Plants in the program are generally easy to propagate and were chosen based on observed landscape performance of existing plant material at the Hammond station. Plant sources include heirloom varieties, passalong favorites, older or forgotten cultivars, limited regional releases and new non-patented releases. Nine plants were propagated and distributed during 2015. Each plant is listed below along with a brief description. Common names are in parentheses.



Map of Louisiana with USDA Hardiness Zones 8a, 8b, 9a and 9b

***Acalypha wilkesiana* Kapiolani Bronze (Kapiolani Bronze copper plant)**

Tropical shrub producing a dense mass of small reddish-bronze leaves. This foliage plant performs best in full sun and has an upright growth habit, reaching 5 feet tall and 3 feet wide. Propagated by cuttings. Usually not winter hardy in USDA hardiness Zone 8 but may overwinter in warmer regions of Zone 8b and Zone 9.

Jason Stagg is an instructor, Allen Owings is a professor and Gina Hebert is a research associate at the Hammond Research Station.

Acalypha wilkesiana Musaica (Musaica copper plant)

Tropical shrub with very large multi-colored leaves in shades of orange, bronze and green with red-to-orange markings. Musaica is another foliage plant that grows best in full sun, reaching 3 to 4 feet tall and 3 feet wide. Propagated by cuttings. Usually not winter hardy in Zone 8 but may over-winter in southernmost areas of Zone 8b and in Zone 9.

Begonia sp. Barbara Rogers (Barbara Rogers begonia, possibly Friendship begonia)

This plant is believed to belong to the semperflorens group of begonias and was collected from South Carolina. The plant is vigorous and somewhat upright, growing 2 to 3 feet tall and 2 feet wide. Glossy or waxy dark green foliage is enhanced by flowers of very light pink to white from spring to fall. Landscape performance is comparable to the BabyWing series of begonias. Although it can be planted in full sun, it prefers part sun. Propagated by cuttings. Perennial in Zones 8 and 9.

Lantana camara Belle Starr Gold (Belle Starr Gold lantana)

Vibrant yellow and gold flower clusters bloom from spring to frost on this plant and are highly attractive to butterflies. Belle Starr Gold is 2 to 3 feet wide and about 2 feet tall. Propagated by cuttings. Reliable perennial in Zones 8 and 9.

Pelargonium sp. Mary Helen (Mary Helen geranium)

This is an unusual drought- and heat-tolerant heirloom variety from south Texas. Mary Helen produces medium-red to orange-red flowers from spring to fall, but it prefers good drainage and protection from the afternoon sun. Plants are vigorous and can reach 3 to 4 feet tall with some support. It was brought to Texas A&M University by horticulturist Jerry Parsons and has been considered for their Texas Superstar plant trials. It is not available commercially but is easily propagated by cuttings. Overwintering potential has been inconsistent in Zones 8 and 9.

Pentas lanceolata Nova (Nova pentas, Nova Pink pentas, Egyptian Star Flower, Egyptian Star Cluster)

This 1999 Georgia Gold Medal Winner is reportedly one of the hardiest and most vigorous pentas varieties. It easily grows 3 feet tall and 2 feet wide in full sun. Large clusters of 3-to-4-inch rose-pink, star-shaped flowers appear atop dark green leaves from late spring through fall, making this plant an excellent butterfly attractant. There is limited commercial availability, but it is easily propagated by cuttings and can be a perennial in Zone 9b.

Portulaca oleracea Florida Dwarf Rose (Florida Dwarf Rose purslane)

The trailing or creeping prostrate growth habit of this plant forms a dense mat of succulent foliage that bears fuchsia or magenta-colored flowers. This purslane is a passalong annual that prefers full sun and well-drained soil, but it is not winter hardy. It can be used as a border or in containers. Easily propagated by cuttings.

Salvia sp. Silke's Dream (Silke's Dream salvia)

This is a beautiful perennial salvia found in Texas from a cross of *S. darcyi* x *S. microphylla.* The plant produces 15-inch-long spikes of dark orange-red flowers that attract hummingbirds and butterflies. Silke's Dream blooms from summer to frost and performs best in full sun. It prefers good drainage and will grow 2 feet tall and 3 feet wide. Propagated by cuttings. Winter hardy in Zones 8 and 9.

Turnera ulmifolia Trailing Yellow (Trailing Yellow turnera, Creeping Buttercup turnera, trailing or creeping yellow alder)

This wonderful little plant is the trailing or creeping form of the yellow-flowering tropical shrub turnera. Bright yellow flowers bloom midspring through fall atop small, serrated, dark green leaves. The plant does best with protection from the afternoon sun. The prostrate growth habit up to 8 inches tall and 2 feet wide makes it great for hanging baskets, containers or borders. It is easily propagated by cuttings but has poor winter hardiness below 40 degrees.

Honeybee on sugar maple flower. Photo by Claudia Husseneder

Evaluating Public Health Pesticides on

Honeybee Health and Mortality

Kristen Healy

Honeybees are important for both honey production and pollination services. Approximately one out of every three bites of food we eat relies on bees for pollination, and honeybees contribute to billions of dollars' worth of pollination services annually in the United States. While the U.S. Department of Agriculture projects the U.S. population to be between 2.5 million to 3 million honey-producing colonies, there have been ongoing concerns regarding population declines and colony collapse disorder (a condition where the majority of honeybees in a hive disappear without any apparent cause). Despite technologies designed to improve bee health, beekeepers are faced with numerous factors – pests, disease and loss of habitat – that can affect the health and well-being of their colonies. In particular, varroa mites and tracheal mites can be devastating to honeybee colonies by reducing the health of a colony, by transmitting pathogens or by causing additional stress to a hive.

In 2013, concern over the effects of pesticides on honeybees came to the forefront of pollinator research. At that time, neonicotinoid pesticides were the main focus of concern because they had recently been banned in Europe based on limited and inconclusive findings. However, the attention toward these particular insecticides had beekeepers concerned about pesticides in general. This provided entomology labs with an opportunity to evaluate the effects of pesticides on honeybee health and mortality. In the summer of 2013 a lab in the AgCenter Department of Entomology received EPA grant funding to evaluate the effects of public health pesticides on honeybees. This opportunity led to establishing a research partnership among the USDA Honeybee Breeding, Physiology and Genetics laboratory in Baton Rouge, local beekeepers, local mosquito control, USDA agricultural engineers and the LSU AgCenter. Involving both beekeepers and mosquito control in this research initiative provided an unbiased evaluation of the data.

In mosquito control, the amount of actual insecticide that gets sprayed is so small that it is like trying to spread a tablespoon of product over an entire football field. While most people are familiar with the visible cloud of product that comes out of a spray truck, these are actually ultra-low volume applications of product mixed with oil or water. The droplets themselves, which are microscopic in size, impinge on the mosquito, exposing it to extremely small concentrations of insecticide. As a result, large-bodied insects are generally not affected by such small doses.

The initial hypothesis was that if mosquito control is done correctly, it should have minimal effect on honeybees. This was based on the assumptions that (1) mosquito control is done at night when bees are in the hive and (2) mosquito control products break down within hours before bees would be foraging in the morning. While some bees may exhibit a behavior known as "bearding" during hot summer nights when bees congregate outside the hive to keep it from overheating, proper ventilation of hives can help reduce this behavior.

Overall findings of the study showed that when mosquito control is done

correctly, bees face minimal risk. It is important to note that mosquito control must always factor in protecting the health and well-being of the public. Therefore, AgCenter researchers strongly encourage beekeepers to increase communication with their local mosquito control programs.

Laboratory-based Studies

There is an old saying, based on a statement by Paracelsus, that "it is the dose that makes the poison." In toxicology, everything is toxic at a particular concentration. However, whether or not we are actually exposed to that concentration determines the actual risk. In the laboratory, researchers evaluated the relative toxicity of several different public health pesticides to honeybees. This included several pyrethroid and organophosphate pesticides that target adult mosquitoes.

While the researchers were able to determine the lethal concentrations of these pesticides, it is highly unlikely that bees would be exposed to these concentrations in the field. Mosquito control uses extremely small doses of a product designed to target mosquitoes, while having the smallest possible effect on other organisms. Most insects, including honeybees, are much larger than a mosquito and would not be affected by such low concentrations of insecticides.

Semi-field Cage Studies

In 2013 and 2014, AgCenter researchers conducted several semi-field cage studies in Baton Rouge to evaluate the effects of public health pesticides on honeybees. Each trial put out honeybees and mosquitoes at 50-foot intervals up to 300 feet away from the spray truck. At each distance, researchers put out cages of bees, cages of mosquitoes and devices to collect data on pesticide droplets and concentrations. While researchers were able to kill mosquitoes during this trial, they rarely saw any bee mortality.

Even at the closest distance to the spray truck, the trial was unable to kill honeybees with pyrethroid pesticides, which are most commonly used in truck-based applications. Mortality increased slightly with organophosphate pesticides. However, researchers only saw mortality when the highest possible label rate was used and when bees were located within 150 feet of the spray truck.

Additional studies indicate that positioning hives at least 200 feet from the road and orienting them away from the spray would greatly reduce exposure. Therefore, beekeepers should contact their local mosquito control programs to become more knowledgeable about the products used in their programs and how often they are applied.

Field Trials

In the summer of 2014, researchers collaborated with members of the Capital Area Beekeepers Association, who provided sentinel beehives as part of this study. Half the volunteer beekeepers were in areas that received frequent mosquito control, while the other half were in areas that received no mosquito control. As part of this study, researchers evaluated multiple health and mortality parameters in each of the participating bee colonies and found no difference between honeybee colonies within or outside mosquito control areas. In fact, many beehives were located close to roads, and researchers had many spray events during the study.

During the study, the mosquito control program had used both truck-based applications of pyrethroids and aerial applications of organophosphates. However, researchers did not see any increased mortality because of mosquito control. While this was only a single season of data collection, the results suggest that honeybees have minimal exposure to public health pesticides.

Vivek Pohkrel, Graduate Student, evaluates a sentinel beehive. Photo by Kristen Healy

Mosquito Control and Public Health Pesticides

Mosquito control programs are the best defense against transmission of mosquito-borne pathogens, such as West Nile virus, Zika virus and Eastern Equine encephalitis virus. Mosquito control involves Integrated Mosquito Management (IMM) techniques that employ strategies that have the greatest impact on mosquito populations while minimizing any effects on the environment.

While most people are familiar with mosquito control spray trucks, they are not aware of the many other management practices used to control mosquitoes. These include using biological control agents that target the immature mosquitoes, conducting surveillance for mosquito abundance and mosquito-borne virus activity, conducting water management projects that help improve the environment while reducing mosquitoes, and incorporating technologies that have the smallest potential carbon footprint. Mosquito control, when done correctly, does an amazing job at reducing mosquitoes and protecting the public from mosquito-borne diseases.

Before modern mosquito control, tens of thousands of individuals in Louisiana lost their lives to yellow fever and malaria, both of which are caused by mosquito-borne pathogens. Thankfully, Louisiana has many parishwide mosquito control districts conducting IMM. A loss of mosquito control programs performing IMM could result in dramatic increases in both nuisance and vector mosquito species. And with current threats from chikungunya and Zika viruses, mosquito control programs that use IMM are essential tools to protect the public, our family and friends, and our pets from mosquito-borne diseases.

Kristen Healy is an assistant professor in the Department of Entomology.

St. James Ag Day Promotes Food Literacy

Johnny Morgan

An idea that was born over 15 years ago has become a bi-annual teaching tool that shows students how food gets from the farm to their table.

Twice a year, the Fast Food Farm in St. James Parish prepares for nearly 1,000 area students to tour the facility and take home a message that will last a lifetime.

Denise Hymel, executive director of Fast Food Farm Inc., took an idea she got from a pizza garden in California and presented it to family and friends in St. James Parish. That started the process that led to Fast Food Farm.

"I came back from that American Farm Bureau meeting determined to do something to help the children understand the importance of agriculture and to recognize where their food comes from," Hymel said.

LSU AgCenter agent Ken Guidry said the site hosts two Ag Days each year for kindergarten through fourth-grade students. "Each fall, we bring over 900 Pre-K to second-grade students to the farm. And in the spring, we have a similar number of third- and fourth-grade students," he said.

"It's not that we promote fast food, but we want the kids to know where that fast food comes from," Hymel said.

The Ag Days and other events at Fast Food Farm are a collaborative effort among the Fast Food Farm board of directors, corporate sponsor Mosaic Louisiana, the St. James Public School System, St. James extension, parish 4-H Clubs, students at the St. James Career and Technology Center and other local business and industry.

"The Fast Food Farm has been developed into an outdoor classroom to teach young people about their favorite fast foods, as well as all food and how it makes its way to the table," Guidry said.

The farm is a hands-on, whole body experience for the youth to learn about foods, nutrition, science, math and a host of other important subject areas, he said. The all-volunteer work force plans and hosts these events, and each Ag Day has in excess of 150 volunteers giving at least eight hours of service.

St. James 4-H'ers and students in the ProStart culinary program and agriculture science serve as peer teachers for each of the Ag Day stations. Adult and youth volunteers set up all equipment along with teaching or assisting at each station, he said.

"Ag Day is funded by grants provided to the Fast Food Farm," AgCenter 4-H agent Tara Roussel said. "And this year we have a number of businesses and industries that are providing volunteers to help us make it a success."

The goal for the event is twofold, according to Roussel. "First, we want to teach the kids where their food comes from because some of them believe it comes from the grocery store," she said. "We also are teaching leadership skills to students in seventh through 12th grade, who are actually leading these activities – being peer teachers."

For her efforts in developing the Fast Food Farm and the St. James Parish Ag Day, Hymel will be travelling to Phoenix in June to receive the Ag in the Classroom Ag Advocate Award.

Johnny Morgan is a specialist in AgCenter Communications.

St. James Parish third and fourth grade students learn how to grow herbs during the St. James AgDay in Gramercy on April 21. The event is held during the spring and fall to teach students where their food comes from. Development of the Fast Food Farm began over 15 years ago. Photo by Johnny Morgan

Let Us Eat Lettuce

William Afton

With an array of beautiful colors and a variety of textures, lettuce has some of the widest ranges of selections within most of the vegetable crops grown today. We see lettuce all over our menus. Whether in a salad, an ingredient for sandwiches or even as a garnish for appetizers, lettuce has made its way into the lives of Louisianians.

Four different types of lettuce are grown throughout the world.

- The most common type, crisphead or iceberg, is described as dense head-forming plant, similar to that of a cabbage. It is the only type of lettuce that does not produce a red colored form.
- Butterhead or bibb lettuce also produces a head but not quite as dense. It produces soft, pliable leaves in various shades of green and red.
- Romaine lettuce produces a dense head but differs due to its elongation. This type of lettuce comes in several colors and is prized for its thick mid rib, which adds a desired crunchiness when eaten.
- Leaf lettuce types give us the most variability in physical characteristics. The plant itself is a loose rosette of leaves that form a mound more so than a head. Leaf lettuce varieties can have anywhere from coarse to very fine texture and come in multiple shades and combinations of red and green.

Days from planting to harvest can vary among the different types of lettuce. Leaf lettuce generally is harvested at 30 days and bibb lettuce at 30-55 days, while both romaine and crisphead lettuce generally require a longer interval of 60-65 days.

There are two seasons to plant and grow lettuce in Louisiana. Because it is a cool-season plant, gardeners get the best results planting lettuce in the fall and spring months. Fall lettuce can be planted anywhere between mid-September and the end of October, and a spring crop can be planted from the first of January through mid-March.

Gardeners should not plant lettuce during the long, hot days of summer because it can cause "bolting." Bolting is the term used to describe the lettuce flowering cycle, which produces a physiological change inside the plant and affects its flavor.

Lettuce is typically started by direct seeding because it has a short germination period, and experienced gardeners know that the best variety selection can be obtained through the use of seeds. The seeds are extremely small. To help with the seeding process, many companies offer pelletized seeds that are coated in clay, making them easier to handle. Lettuce transplants are becoming more popular with retail nurseries and garden centers. Customers are able to start out with a small plant and get a jumpstart to harvest by eliminating the germination phase.

In-ground gardens, raised beds and container gardens all accommodate growing lettuce. A routine soil sample analysis will provide gardeners with the tools needed to maintain proper soil fertility. The optimal soil acidity or pH range for lettuce is between 6 and 7. This can be adjusted using agricultural lime or elemental soil sulfur if needed. The analysis will also quantify levels of phosphorous and potassium, which will influence the type of fertilizer needed.

Lettuce, like all other vegetable crops, has a few insect and disease pests that can be a problem during the growing season. Aphids, armyworms, cutworms, cucumber beetles and whiteflies are all known pests that attack lettuce. Some of the diseases that occur on lettuce include alternaria leaf spot, downy mildew and rhizoctonia bottom rot. To help discourage these pest issues, it is recommended to plant during the right time of year, follow proper plant spacing requirements and use recommended varieties.

Plant spacing will depend on type of harvest. Plant every 12 inches to grow out heads of lettuce or broadcast seed onto planting are to harvest baby greens. The use of mulch in the garden will provide a physical barrier between the soil and the plant. This will not only help with preventing disease organisms from coming into contact with the plant but also will help keep the plants clean from excess soil deposits.

A simple survey of popular seed catalogs will provide you with over 250 different varieties of lettuce. Look for varieties adapted for hot, humid climates of the Southeast.

Red Sails, New Red Fire and Salad Bowl are well-suited varieties of leaf lettuce.

Some recommended varieties of romaine lettuce include Green Towers, Cimarron Red and Ideal.

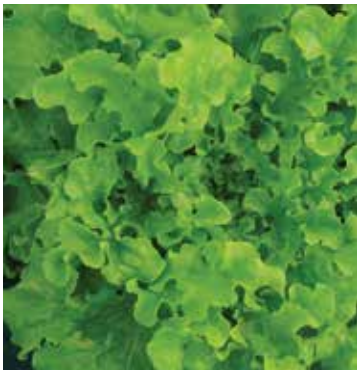
Skyphos, Harmony and Buttercrunch are excellent choices from the butterhead type.

For those looking to try growing crisphead varieties, look for Raider and Ithaca.

William Afton is a county agent in St. Tammany Parish.

Photos by William Afton

New Red Fire



Salad Bowl

Green Towers

Skyphos

Growing Great Home Garden Tomatoes

Kathryn Fontenot

Every backyard garden needs at least one tomato plant. Sneaking tomatoes into your garden or landscape is relatively easy if you follow LSU AgCenter recommended growing practices.

Soil Preparation

Before planting, loosen the soil at least 6 inches to 8 inches and add compost, aged manure or fertilizer. Routine soil tests will identify fertilizer needs and potential soil pH adjustments. Optimum soil pH for tomatoes is between 6.0 and 7.0. In clay soils, mounding soil into rows is encouraged to help provide drainage. In sandier soils, hipping or forming rows is not necessary.

Tomatoes grow well in containers. Canvas, clay, ceramic, plastic, wood or metal containers are all acceptable, provided they have drainage holes and are at least 5 gallons in size. Container size is important because tomatoes have extensive root systems. Tomato roots quickly outgrow small containers, leaving the gardener watering the plant both morning and night. Planting tomatoes in larger containers reduces irrigation frequency. An added bonus of reducing irrigation is the likelihood of less blossom end rot. Blossom end rot is a calcium deficiency in the plant and is exhibited by blossom end of the tomato rotting. Most native soils and potting mixes contain sufficient calcium, but overwatering leachs the calcium from the soil in container-grown plants.

Seasonality

Spring tomatoes are planted immediately after the last frost, typically March 15 in south Louisiana and April 1 in north Louisiana. Spring tomatoes are harvested through June and sometimes later if heat-set varieties were planted. The spring season is optimum for heirloom tomatoes, hybrids and non-heat-set types. Louisiana gardeners face a potential virus termed tomato spotted wilt virus (TSWV) in the spring. The virus is spread by thrips, a tiny insect that within 10 seconds of piercing into the foliage infect a plant. If the plant is infected prior to fruit set, it will not produce fruit. If fruit has already set, the skin will show yellow halos. Insecticides are not helpful against this virus. Therefore, planting a few tomato spotted wilt virus-resistant varieties in the spring is strongly recommended as "crop insurance" for spring-planted tomatoes.

Summer and fall tomatoes are planted mid-July to late August and are harvested until the first killing freeze. High nighttime temperatures result in poor pollen set and sometimes sterilization of pollen, resulting in poor fruit set. Because nighttime temperatures during this period are often greater than 75 degrees, gardeners plant heat-set varieties.

Variety Selection

There are literally hundreds of tomato varieties to choose from. However, good gardeners select varieties that perform well in the area where they live. The AgCenter regularly conducts spring tomato trials. All varieties in the trials were replicated at least three times with 10 to 15 plants per replication. The varieties were also randomly planted in the field using drip irrigation and plastic mulch. Tomatoes come in two types: Indeterminate tomatoes have apical meristems that terminate in a vegetative bud, allowing them to grow very tall. Determinate tomatoes are short, bushy types. Their apical meristems terminate in a flower bud.

Kathryn Fontenot is an assistant professor and extension specialist in the School of Plant, Environmental and Soil Sciences.

Tips for Tomato Success

1. Water consistently. Inconsistent water leads to blossom end rot, a disorder that causes the blossom end of a tomato to rot.
2. Give tomato plants extra nitrogen at the first and second bloom set. 1 teaspoon of calcium nitrate or other 15 percent nitrogen source per plant is adequate. Nitrogen is the first number of the three listed on a bag of fertilizer. The number 15 indicates that the bag contains a product with 15 percent nitrogen.
3. Mulch tomatoes heavily to prevent weeds from growing under the plant. Mulching heavily also prevents soil from splashing onto the lower foliage. Soil that contacts foliage may introduce new diseases to the plant.
4. Space tomatoes 18 inches apart.
5. Prune the lower suckers on tomato plants. On determinate bush types, prune all suckers up to the first flower cluster. On indeterminate vining types, prune all suckers from the ground up to the third flower cluster. Pruning helps increase fruit size and opens the foliage canopy.
6. Harvest orange to light red tomatoes before heavy rain especially, if you are a home gardener or small grower not using plastic mulch. Heavy rain will cause maturing fruit to split.
7. Early blight, a disease that affects tomato foliage, is almost a definite problem every year. Spray copper fungicide on the bottom of foliage for the first two to three weeks tomatoes are in the ground to help delay problems.
8. If you aren't growing tomatoes, you don't know what you are missing. Home-grown, Louisiana-grown are the best! Try at least one plant this year.

Variety trials and the top performers in each

2011 Home Garden Tomato Variety Trial

The 2011 home garden tomato trial was conducted at the LSU AgCenter Botanic Gardens at Burden in Baton Rouge. This trial was intended to look at disease-resistant varieties, but because of a greenhouse mishap, it ended up being a trial of the best tomatoes easily available for home garden use. The varieties were chosen from what was readily available in most garden centers and hardware stores. Seventeen varieties were evaluated; three were cherry tomatoes.

Sun Gold
Dark yellow-orange exterior and interior
Cherry
Indeterminate
98 percent of taste testers at the 2011 Houma Tomato Field Day said this heat-set tomato tasted better than Sweet Pea Current tomatoes and Sweet Million cherry tomatoes.

Creole (Source: Naylor's Hardware Source)
Red exterior and interior
Small
Indeterminate
Blemish-free, firm fruit. Top producer in 2011 trials and second top producer in the 2015 Creole tomato trials. Won taste test in both 2011 and 2015 at the Garden Fest at the Botanic Gardens.

Spring 2012 and 2013 Heirloom Tomato Trials

The 2012 spring season was excellent for heirloom tomato production. The spring weather warmed up early and did not get hot too quickly. Rainfall was average. The 2013 spring season started late because of cool temperatures well after the last frost date and warmed up to high temperatures quickly. This reduced fruit set on the heirloom plants to fewer than 10 fruit per 45 plants. Therefore, data were not collected in 2013. When planting heirlooms, expected yields are extremely weather-dependent. This trial was planted at the Botanic Gardens at Burden and replicated at Covey Rise Farm in Husser, Louisiana. Ten heirloom varieties were evaluated.

Thessaloniki
Red interior and exterior
Small
Indeterminate
Firm, blemish-free. Almost looks too perfect to be an heirloom. Top producer in terms of both total and marketable production.

Black from Tula
Maroon-colored tomato with green shoulders, burgundy interior color with a green jelly around the seeds
Small to Medium
Indeterminate
Many concentric cracks. Soft fruit. Do not stack these tomatoes. Second in total production.

Persimmon
Deep yellow to orange interior and exterior.
Extra Large
Indeterminate
Not top yielding but worth noting. Firm for an heirloom tomato. Large blossom end scar and radial cracks. Taste test winner at Covey Rise Farm in Husser.

Mortgage Lifter
Dark pink exterior and interior color
Extra Large
Indeterminate
Not Top Yielding but Worth Noting. Small blossom end scar. Tied for taste test winner at Covey Rise Farms in Husser.

Pink Brandywine
Dark pink exterior. Interior is pink but with white blotches
Extra Large
Indeterminate
Not Top Yielding but Worth Noting. Large blossom end scar and cat facing. Won taste test during Garden Fest at the Botanic Gardens.

Spring 2013 and 2014 Tomato Spotted Wilt Virus-Resistant Tomato Variety Trials

The 2013 and 2014 spring seasons were dedicated to evaluating tomato spotted wilt virus-resistant tomato varieties. Nine varieties were selected for evaluation. The trials were planted at the LSU AgCenter Botanic Gardens at Burden.

Tribute
Orange-red exterior color. Interior color is red.
Small to Medium
Determinate
Top producer in 2013 and second top producer in 2014.
Very firm, no cracks. 80% marketable fruit.

Tribeca
Orange-red exterior color. Interior color is red.
Small to Medium
Determinate
Second in production in 2013.
Very firm, no cracks. 80% marketable fruit. Taste test winner both years.

PSO1522935
Orange-red exterior color red interior color
Small to Medium
Determinate
Top producer in 2014 and third in production in 2013. This variety matures earlier than both Tribeca and Tribute Firm tomato; very few cracks. 82% marketable fruit.

Spring 2015 Creole Tomato Variety Trial

Are all Creole tomatoes created equally? That was the question of this trial. Eleven "Creole" tomatoes were sourced from varying seed companies, and the results were, as expected, varying in yields, time to production, plant growth and fruit size. Conducted at the LSU AgCenter Botanic Gardens at Burden

Creole (Source: Organic Direct)
Orange-red exterior, red interior.
Small
Indeterminate
Full ripening occurred later in the season (had green shoulder in early season)
Top yielding in trial. Very firm fruit. Minimal scars. First harvest occurred 55 days after planting.

Creole (Source: Naylor's Hardware Store in Baton Rouge)
Red exterior and interior. Full ripen throughout the season.
Small to Large
Indeterminate
Second in production in trial.
Taste test winner. Some radial cracking. First harvest occurred 71 days after planting.

Will the Real Creole Tomato Please Stand Up?

Kathryn Fontenot and Robert Williams

Louisianans have various definitions of what constitutes a "Creole" tomato. Traditionally, farmers in St. Bernard and Plaquemines parishes marketed their tomatoes as Creole. According to these producers, allowing the tomatoes to vine-ripen and grow in a rich alluvial soil created a unique flavor distinguishing their tomatoes from other Louisiana- and U.S.-produced tomatoes. St. Bernard and Plaquemines parish tomato producers did not plant only one variety. Saving tomato seed is a common practice among professional and home gardeners. As gardeners purchased Creole tomatoes, they saved the seed, grew it and passed the seed to other gardeners.

To add to the confusion, former LSU AgCenter researcher Teme Hernandez released a tomato variety named Creole in 1969. The variety Creole was not commonly grown in St. Bernard and Plaquemines parishes. Hernandez described Creole as a tomato with medium-sized, deep red fruit with some resistance to fusarium wilt. The AgCenter did not maintain seed stock of Creole. Today, Creole has become a marketing term for any tomato grown in Louisiana.

To demonstrate variation, LSU AgCenter researchers grew a demonstration plot of "Creole tomatoes" in spring 2015.

Materials and Methods

Creole tomato seed was sourced from 11 companies. Only seed named "Creole" or described as the 1969-released Creole was purchased (Table 1). Seed was sown on January 14, 2015. Seedlings were hardened off outdoors one week prior to transplanting. On March 24, 2015, the Creole tomato seedlings were planted at the AgCenter Botanic Gardens at Burden.

A pre-plant fertilizer rate of 600 pounds per acre of 13-13-13 was incorporated into rows. Drip irrigation was installed, and silver-coated mulch was laid. Seedlings were planted on 18-inch centers and trellised. Fertilizer was applied through the irrigation water starting at first bloom for four weeks, alternating 60 pounds of calcium nitrate per acre per week and 75 pounds of potassium nitrate per acre per week for four weeks. The plants were treated with fungicide at planting and later on a 10-to-14-day schedule during the growing season.

Harvest occurred at full ripe stage with data collected from May 18 to June 26, 2015. Data included germination rate, maturity dates, total yield, marketable yield, average fruit size and taste.

The taste test occurred on June 20, 2015, during the annual Garden Fest at Burden, where 192 people tasted the Creole tomato varieties. Sources were not identified.

Results

Germination

Germination percentages were conducted 22 days after seeding. T. Swift and CherryGal had less than 25 percent germination rate. Other sources had 100 percent germination rate (Table 1).

Maturity

Maturity dates are important because early tomatoes command a higher price at retail than those available later in the season. Figure 1 indicates the number of days between field planting and the first harvest. All tomatoes were medium-sized, with the exception of the T. Swift, which produced cherry-sized tomatoes. This size does not fit any typical Creole tomato description; therefore, data collection beyond germination rate and first harvest ceased.

Yield

Twenty plants of each tomato source were planted into the field with the exception of T. Swift and CherryGal. The plants continued to produce beyond July; however, data collection ended in late June in order to present information to the Louisiana Fruit and Vegetable Growers Association members at the annual field day. The top three producing Creole tomatoes were sourced from Organic Seeds Direct (Amazon), Naylor's Hardware in Baton Rouge and TomatoFest. Seed sources had 88 percent, 74 percent and 82 percent marketable yields, respectively. Marketable tomatoes were free from cracks, bruises and evidence of disease, insect or environmental injury. Individual fruit size ranged from 4.2- to 7.8-ounce fruit. Yield per plant was poor, ranging from three to six pounds (Table 2).

Taste

Ninety-five percent of taste test participants chose Naylor's Hardware Store "Creole" for best flavor.

Conclusions

All tomatoes labeled Creole are not equal. The poor production of these plants also provides speculation as to why the LSU-released "Creole" never became popular among commercial producers. An average production of three to six pounds per plant does not justify growing Creole tomatoes commercially because these yields will not result in a profit.

Kathryn Fontenot is an assistant professor and extension specialist and Robert Williams is an extension associate in the School of Plant, Environmental and Soil Sciences.

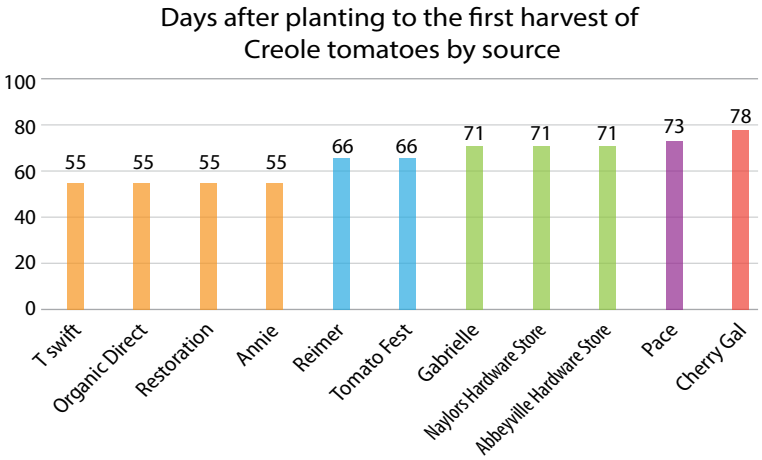


Figure 1. Days to harvest by source in the 2015 Creole tomato demonstration

Table 1. 2015 Creole Tomato Demonstration Seed Sources and Germination Rates

Creole Seed Source	Germination Rate	Number of Plants Transferred to the Field
Reimer Seeds | reimerseeds.com	100%	20
Restoration Seeds | restorationseeds.com	100%	20
Organic Seeds Direct | Amazon	100%	20
T. Swift | Amazon	25%	9
Pace Seeds | www.paseseeds.com	100%	20
CherryGal | cherrygal.com	22%	8*
Tomato Fest | tomatofest.com	100%	20
Gabrielle Gardens	100%	20
Annie's Heirloom | anniesheirloomseeds.com	100%	20
Thibodeaux's Town & Country 1124 N Lafitte Rd, Abbeville, LA 70510	100%	20
Naylor's True Value Hardware Store 14441 Old Hammond Hwy, Baton Rouge, LA 70816	100%	20

N = 36 for germination counts
*5 died after transplanting into the field

Table 2. Yield Data from the 2015 Creole Demonstration

Tomato Source	Total Pounds Harvested	Percent Marketable (Pounds)	Average pounds per plant	Average Tomato Size (oz.)
Thibodeaux Feed Store Abbeville, La.	73	78	4	6.1
Annie Heirloom Seeds	68	82	3	6.5
CherryGal	5	49	2	7.8
Gabrielle Acres	69	74	3	6.7
Naylor's Hardware Store Baton Rouge, La	105	74	5	5.4
Organic Seeds Direct (Amazon)	123	88	6	5.2
Pace Seeds	63	65	3	6.0
Reimer	68	89	3	5.4
Restoration Seeds	94	85	5	4.2
Tomato Fest	100	82	5	6.0

N = 20 except CherryGal N = 3

Retention pond and constructed wetland. Photo by Rick Bogren

Hammond Research Station Keeps Up with Changing Times

Rick Bogren

The landscape of south Louisiana has changed over the past century, and so has the mission of the LSU AgCenter Hammond Research Station.

The fourth LSU agricultural experiment station was established as the Fruit and Truck Experiment Station in January 1922 about 6 miles east of Hammond in Tangipahoa Parish. The parish police jury purchased the land with a special tax levy and then leased it for 100 years to LSU for the purpose of providing agriculture research.

Over time, agriculture in Tangipahoa and the other Florida parishes changed. By the turn of the 21st century, little fruit and vegetable production was left. But the research station, by then called the Hammond Research Station, was still providing research-based information to mostly strawberry, commercial vegetable and citrus growers.

By the time Regina Bracy, a horticulture researcher at the station, became resident coordinator in 2004, it was obvious agriculture in the area was changing. With landscape horticulture growing in the area and vegetable production declining, Bracy and LSU landscape design professor Neil Odenwald began developing a master plan for a new design.

Bracy said that visiting horticulture research facilities in other parts of the South convinced her that the Hammond station had to be more than rows of plants. So she and Odenwald collaborated to create an environment that broadened the scope of variety trials with landscape beds rather than rows of flowers.

"He laid out beds that curled and curved and envisioned walkways, water features and resting areas," Bracy said of Odenwald's design. "We wanted to duplicate the growing conditions experienced by homeowners and landscape professionals in their landscapes."

In 2008 the Hammond station dedicated new office and laboratory buildings to reflect the focus on serving the landscape and horticulture industry in Louisiana. The original station included several tracts of land that were not contiguous, Bracy said. One was across a road, another across a railroad and the third was landlocked within another farm.

In 2005, the Tangipahoa Parish Government transferred about 47 acres to the AgCenter with an agreement that the land would be sold with the income used for capital improvements at the station.

One of the initial landscape horticulture projects at the revamped station was the creation of the Margie Jenkins Azalea Garden, which was unveiled at a garden party to raise funds in 2006. The garden is named for Margie Jenkins, a legendary nurserywoman in Louisiana and owner of Jenkins Farm and Nursery in Amite. The results were beyond expectations as the event brought in more than $50,000 with donors from all across the United States, Bracy said.

The Louisiana Nursery and Landscape Association is supportive of the station and provided early funding, said Allen Owings, who replaced Bracy as resident coordinator when she moved to the position of AgCenter Southeast Region director.

The landscape industry in Louisiana has been growing, Owings said. With about 2,200 landscape horticulture professionals, 550 wholesale nurseries and numerous garden centers around the state, station research targets the broad diversity of the commercial landscape horticulture industry

"Commercial horticulture is our priority," Owings said. "We're helping growers,

retailers and landscapers, and we evaluate varieties for them."

In addition to the Louisiana industry, the station regularly receives landscape industry visitors from Mississippi, Alabama, Arkansas, Florida, Texas, Tennessee and Oklahoma as well as from across the country.

"This is the place people come to see," Bracy said. "We started with 10 landscape beds. Then it was 20. And now I'm not sure how many we have. We plant beds so people can see the plants in a natural setting. We include different varieties and types together in garden settings so people can see how they can combine different plants."

Research measures of plant performance are more visual and subjective than empirical, unlike agricultural crops, which can be measured by things like yield, Owings said. Evaluations can be short-term, such as one season for a bedding plant, or long-term, such as for shrubs and trees that may require three to five years before evaluations can begin.

The Hammond station has one of the largest herbaceous plant trials in the Southeast. "We generally plant 800 warm-season plant varieties and 300 to 400 cool-season plant varieties each year," he said. "This is complemented by regular additions of new trees and shrubs for evaluation. Almost every day new plants are going in and old plants are coming out."

"It's a landscape horticulture research and extension center," Bracy said of the transformation. "We're beyond the master plan now."

The station hosts an average of nearly two meetings every week, serving Master Gardeners, garden clubs, educational programs, government agencies and industry associations as well as school groups including Head Start and vocational agriculture classes.

"This is a place people come to and use," Bracy said. "It's a well-used facility."

The station is open from 8 a.m. to 4:30 p.m. every day, and a brochure for a self-guided walking tour is available online.

"All the plants, shrubs and trees are marked," Bracy said. "When I visit an arboretum or public garden, I want to know what I'm looking at."

Rick Bogren is a professor in AgCenter Communications.

What you'll see at the Hammond Research Station

Southern Homestead Planting
A two-story Southern house built in the late 1800s is surrounded by "homestead" plants, which duplicate 30 to 50-year-old landscapes found throughout the South.

Urban Forest
This area planted in 2005 includes 32 species of shade trees. Over time, these trees will provide research opportunities in suitability for urban uses and maintenance practices.

Sun Garden
Small "island" groupings of ornamental shrubs, annuals and perennials showcase some of the newer introductions in the plant world.

Margie Y. Jenkins Azalea Garden
This garden established in 2006 currently includes Robin Hill, Encore, Crimson and Southern Indica families of azaleas. Over 50 different species of native trees and shrubs can be found scattered among the azaleas.

Retention pond and constructed wetland
This water feature adds an aesthetic drama to the entry of the station and also serves as a demonstration and research area on landscape pollution mitigation and landscape pond management.

Heritage Live Oaks
Two 100-year-old oaks at the entrance to the station demonstrate protection and preservation of historic trees. The station has four centurion and eight junior live oak trees, of which seven are registered with the Live Oak Society.

W.F. "Hody" Wilson Camellia Garden
More than 600 camellia plants from the early work of W.F. "Hody" Wilson Jr. were planted in the early 1940s and 1950s and can be found nestled under a pine forest. A Camellia Stroll is hosted annually in February by the AgCenter and Tangipahoa Parish Master Gardeners.

Shade Garden
The performance of the new plants and new varieties of old plants are evaluated under shade provided by an old stand of spruce pine trees and oaks. Plants include caladiums, impatiens, torenia, begonias, hostas and gingers.

Piney Woods Garden
Located under a pine canopy, this five-acre garden of 40-plus landscape beds features plantings of native trees, Southern heritage shrubs, native azaleas, Japanese maples, yellow-flowering magnolias, dogwood species, heat-tolerant rhododendrons, hydrangeas, new shade tree selections and more.

Sun Garden. Photo by Rick Bogren

Pollinator Gardening

Dan Gill

You may have read or heard news reports about the declining populations of native pollinators, such as bees, butterflies, moths, hummingbirds and others. It appears that the problem is complex, and multiple factors are at work. But much of the decline in populations can be attributed to habitat loss, disease and parasites, pollution and pesticides.

Particularly dramatic have been losses in commercial hives of European honeybees. This non-native bee species plays a critical role in the production of many crops, such as peaches, pears, apples, citrus and almonds. Bees are important in many vegetable crops, both for production and to create the seeds needed to grow succeeding crops. Factors such as frequent transportation, agricultural pesticides, poor diet and issues with parasites have been identified in hive losses known as colony collapse disorder.

A home gardener can do little to affect the loss of commercial honeybee hives. We can, however, help support native pollinators by creating pollinator-friendly landscapes and pollinator gardens, as well as protecting wildlife habitat.

Pollination in plants occurs when pollen from the male parts of flowers is transferred to the female parts of flowers and fertilizes the eggs. This results in fruit containing seeds. The flowers of some plants are able to carry out this process without any help from pollinators. The structure of tomato flowers, for instance, allows them to be pollinated even if not visited by bees. Many trees and all of the grasses are wind pollinated and do not make use of pollinators. They release pollen into the air and allow the wind to carry it to the female parts of other flowers.

A large number of plants, however, rely on various animals to transfer pollen from flower to flower. Pollinators include many types of insects, particularly bees, butterflies, moths, beetles, wasps and even some flies. Hummingbirds also help carry out pollination of plants in Louisiana. In desert areas, bats play an important role in pollination, but not here in Louisiana. To ensure pollination, these plants produce showy flowers to attract pollinators to the blossoms and provide nectar to reward them. Some pollinators, notably bees, also collect some of the pollen for food.

The flowers of plants that use pollinators have evolved to attract and use particular pollinators. Flowers are structured to ensure pollination from the correct pollinator and may exclude others. Plants that produce long, tubular flowers are generally pollinated by hummingbirds, butterflies and moths, which are able to access the nectar with their long tongues. Open-faced flowers and those with short flower tubes make nectar available to short-tongued bees. Bees, however, will sometimes crawl to the base of a long-tubed flower and chew a hole in base of the tube to access the nectar without pollinating the flower.

If the flowers of plants are not pollinated, they will not produce seeds and fruit. In nature, this may prevent a species from properly reproducing and maintaining its population. Many native birds and mammals feed on the fruits and seeds that result from pollination. So food supplies for many native animals may be affected if low populations of pollinators prevent proper pollination.

We can use our landscapes to provide food and shelter for pollinators and help increase their populations in a variety of ways.

Plant Choice

When choosing landscape plants, such as trees, shrubs, ground covers, vines, perennials and bedding plants, keep pollinators in mind. Choose native species when you can, but do not overlook non-native species. Look at the time of blooming, and choose plants that bloom at various times of the year, from spring to fall and even in winter.

When it comes to selecting trees, many popular shade trees, such as oak, maple, elm and pine, are wind pollinated. Be sure to also include flowering trees such as native magnolias, dogwood, crape myrtle, native hollies, American fringe tree, redbud, black cherry, American persimmon and loquat.

Many flowering shrubs are also available, both native and non-native, that provide colorful flowers for our land-

Coral honeysuckle. Photo by Dan Gill

Loquat. Photo by Dan Gill

scapes. Choose a variety of shrubs that bloom at different times of the year. Avoid varieties that have highly double flowers with many petals. Rather, choose those with single or semi-double flowers because they provide more nectar and pollen.

Flowering vines also may be planted for pollinators. Vines like coral honeysuckle, cross vine, yellow jessamine, American wisteria and coral vine bloom at various times and are attractive to a variety of pollinators

Plant a Pollinator Garden

Beds in your landscape may be dedicated to planting perennials and bedding plants that provide food to pollinators. Pollinator gardens are generally attractive and colorful due to the use of abundantly flowering plants. Diversity is key when planting pollinator gardens. Choose a wide variety of plants that produce flowers of many different shapes, colors and sizes to attract the greatest diversity of pollinators. Also, choose perennials and bedding plants that bloom at different times of the years. Cool-season bedding plants, grown from October to May, will even provide flowers during winter, when bees and other pollinators may forage on mild days.

Gardeners have long created gardens for butterflies and hummingbirds. Many of the flowers fed on by butterflies and hummingbirds will attract bees and other insects. The many kinds of salvias so commonly used in butterfly and hummingbird gardens will also attract bees. When planting to attract more types of pollinators, also choose flowers that are easy for bees to feed on, such as the clovers (white and crimson) and members of the aster family, (daisies, sunflowers and zinnias).

Salvia. Photo by Dan Gill

You may also provide larval food plants for butterflies. Butterflies lay eggs only on certain plants, which vary depending on the species of butterfly. Monarch caterpillars will only feed on milkweed plants, and Gulf fritillary caterpillars prefer species of passion vines. The parsley worm, which grows up to be the Eastern black swallowtail, feeds on parsley, dill and fennel. Sulfur butterflies lay their eggs on cassias, while bean leaves are the preferred food of long-tailed skipper caterpillars.

If your property is large enough, you may dedicate an area to a wildflower meadow planting. A blend of native wildflower seeds, both annual and perennial types, may be planted in that area and allowed to grow to create a more natural habitat for pollinators.

Other Things to Consider

The use of pesticides is detrimental to pollinators and should be kept to an absolute minimum. Many landscape insect and disease outbreaks of trees and shrubs will clear up on their own without treatment with pesticides.

Learn to tolerate some damage to landscape plants. For example, leaf cutter bees will cut circular pieces of rose leaves about the size of a dime or nickel. Although unsightly, this damage does not greatly affect the health or blooming of the roses, and treating with an insecticide will kill this helpful pollinator.

More Information

A list of native plants attractive to pollinators is very helpful when considering what to plant. The Pollinator Partnership offers planting guides tailored to specific ecoregions. The Selecting Plants for Pollinators guides have excellent information on pollinators and provide extensive lists of native plants. To get the guide specific to where you garden, visit the Pollinator Partnership website at www.pollinator.org. Click on Plant Guides, and then enter your 5-digit zip code. The regional guide you see will have charts that list which native plants grow best in your area so that you can plant them to attract more pollinators to your gardens.

Monarch butterfly on Mexican milkweed. Photo by Kathy Kramer

Monarch caterpillar feed on Mexican milkweed leaves. Photo by Kathy Kramer

Gulf fritillary adult butterfly feeds on nectar from lantana flowers. Photo by Kathy Kramer

Dan Gill is a consumer horticulture specialist in the School of Plant, Environmental and Soil Sciences.

Chilli Thrips Control, Identification and Management

Yan Chen, Steven Arthurs and Dennis Ring

Chilli thrips, *Scirtothrips dorsalis,* is native to south Asia and has become a worldwide pest in countries having horticulture commodities. It attacks more than 100 plant species, including chili peppers, tea, strawberries, tomatoes and many other vegetable, fruit and ornamental crops. In the U.S., it was first reported in Hawaii in 1987 and then established in Florida in 2005. It is now widespread throughout the Southeast.

In Louisiana, chilli thrips damage has been reported in landscapes and in production nurseries in many ornamental plants, such as Knock Out roses, cleyera, Indian hawthorn, duranta, ligustrum, viburnum, camellia and bottle brush, and herbaceous plants such as begonia, coleus, snapdragon, zinnia, coreopsis and verbena.

Chilli thrips feeds on stem terminals, young leaves, developing flower buds and fruits with a rasping-sucking mouthpart. This type of feeding causes bronzed, curled and distorted leaves, which may look like herbicide burn or leaf rust (Photo 1). Severe infestation can defoliate or slow plant growth.

Photo 1. Chilli thrips damage on Knock Out roses. Photo by Sheldon Johnson

Detecting and managing chilli thrips is difficult because they are very small, only 0.016 to 0.024 inch in length. Compared with the more common western flower thrips, chilli thrips are about one-quarter of the size, with a more bulged abdomen (Photo 2). All thrips inhabit secluded areas on plants, such as unopened flower and terminal buds, which reduces exposure to insecticide applications. They also superficially resemble some other thrips species that, if mistaken, may result in poor control because the insecticides selected may not be efficient against chilli thrips.

Since 2013, a team of horticulturists and entomologists from the LSU AgCenter and the University of Florida has worked on management options to keep the chilli thrips at bay in both production nurseries and landscapes. The team started with monitoring this pest in gardens and nurseries and evaluated critical questions such as at what pest level insecticides are needed to prevent the thrips from causing crop damage and what biorational pesticides that are "soft" on beneficial arthropods can be used to reduce the use of conventional insecticides.

Because chilli thrips prefers to feed on tender plant tissue, more infestation cases in landscapes, especially with roses, have been reported in mid-May and in September to early October. These are the time periods many landscape plants will have their new growth. In production nurseries, because plants are routinely pruned to promote branching and new growth, chilli thrips can be problematic throughout the growing season. Therefore, it is important for landscape managers or home

Photo 2. Chilli thrips (lower left) is a tiny insect, which is about one-quarter the size of the western flower thrips (upper right). The latter is more commonly seen in garden plants and prefers pollen and nectar. Photo by Yan Chen

gardeners to periodically check plants during the seasons when chilli thrips are active and for nursery growers to be familiar with early damaging symptoms of this pest.

Detecting and treating pests before a high population builds up are key actions. Early injury symptoms – leaf curl and distortion – need to be monitored weekly. Tapping foliar terminals over a sheet of white paper will dislodge thrips that can be examined with a hand lens. In nurseries, thrips can be monitored with yellow or blue sticky cards situated next to the susceptible plants (Photo 3).

Because this thrips may overwinter as adults in leaf litter or weeds, cleaning up debris from infested plants and removing weeds are important activities to reduce the overwinter population. This is especially critical for nurseries that have had chilli thrips infestations in the past. At the beginning of a local outbreak in

Photo 3. For production nurseries, sticky cards placed on sensitive hosts (such as cleyera) is an efficient way to detect this pest early and treat before damage occurs. Photo by Yan Chen

the landscape, severely infested branches should be cut and bagged for disposal.

The research team also found that high nitrogen and phosphorus contents in plant leaves contribute to higher numbers of chilli thrips on Knock Out roses. Applying fertilizer lightly, such as a split application at the recommended rate, may avoid promoting chilli thrips reproduction.

The use of pyrethroids, organophosphates or other broad-spectrum insecticides is not recommended for controlling chilli thrips in landscape plants because of their potential effects on beneficial species, including minute pirate bugs (*Orius* spp.), lacewings and predatory mites or spiders that help prevent outbreaks of chilli thrips as well as other pests. However, natural enemies alone may not provide satisfactory control on plants preferred by chilli thrips.

AgCenter research showed that a rotation between spinosad and the biological control fungi Metarhizium brunneum (Met52) and Beauveria bassiana (BotaniGard 22WP), or insect growth regulator (azadirachtin, Molt-X), and horticultural oils (such as the ultra-fine oil or SuffOil-X) reduced chilli thrips populations by 88 percent to 95 percent. These products are considered "soft" on beneficial arthropods and are available to commercial landscape professionals. For home gardeners, insecticides containing spinosad, such as Conserve, can be rotated with ultra-fine oil or soapy water to treat infested plants during thrips active seasons.

For nursery growers, insecticides containing abamectin (Avid), acephate (Orthene), chlorfenapyr (Pylon, greenhouse only), flonicamid (Aria), imidacloprid (i.e., Marathon), spinetoram (XXpire), spiromesifen (JUDO) and spinosad (Conserve) can help control chilli thrips. Rotation among different classes and modes of actions is recommended to reduce the risks of developing insecticide resistance and the outbreaks of secondary pests.

Yan Chen is an associate professor at the Hammond Research Station in Hammond; Steven Arthurs is an assistant professor in the Entomology and Nematology Department, University of Florida; and Dennis Ring is a professor and entomology extension specialist in the Department of Entomology.

Crape Myrtle Bark Scale Threatens Summer's Most Popular Tree

Yan Chen and Rodrigo Diaz

With showy summer flowers, attractive bark color and brilliant fall foliage, crape myrtles are the most widely planted summer landscape tree in the South (Photo 1). New varieties with improved cold hardiness, dwarf growth habits, and new foliage and flower colors are being released, including several series of burgundy- and black-foliaged varieties (Delta, Black Diamond, Ebony and Magic). More importantly, this year-round garden performer is relatively low maintenance. Common pests include aphids and late-summer leaf spots, which do not need treatments in most cases.

Photo 1. The popular Delta Jazz crape myrtle is one of the dark-foliage varieties released in recent years. Photo by Allen Owings

Over the past few years, the crape myrtle bark scale, *Eriococcus lagerstroemiae*, has become a new threat to the future of crape myrtles across the Southeast. After the first report from the Crape Myrtle Trails World Collection Park in McKinnery, Texas, in 2004, this pest has quickly spread to 96 counties in 11 states: Alabama, Arkansas, Georgia, Louisiana, Mississippi, New Mexico, South Carolina, Tennessee, Texas, Virginia and Washington. In Louisiana, infestations have been found in Shreveport, Bossier City, Minden and Monroe in 2012, Rayville and New Orleans in 2013, Hammond and Houma in 2014, and Baton Rouge in 2015.

The scale is easy to identify because it is the only known bark scale that feeds on crape myrtles. Branches and trunks are often covered with felt-like scales and

Photo 2. Trunk of a crape myrtle tree infested with the crape myrtle bark scale. Photo by Yan Chen

turn black from the sooty mold fungus grown on the sugary exudes of the scales (Photo 2). Stem dieback, decreased number and size of blooms, and slow decline (reduced vigor) of trees have been observed. Bark scale prefers feeding on pruning cuts and is attracted to the excessive bark growth around the wounds of improperly pruned trees (Photo 3). Removing the top canopy of the tree, aka "crape murder," may worsen bark scale infestation.

Eggs of bark scale are protected inside the felt-like ovisacs. The young scales, called crawlers, and their more mature

Photo 3. Inappropriate pruning worsen the bark scale infestation on crape myrtle trees because excessive bark growth attracts scale to feed. Photo by Yan Chen

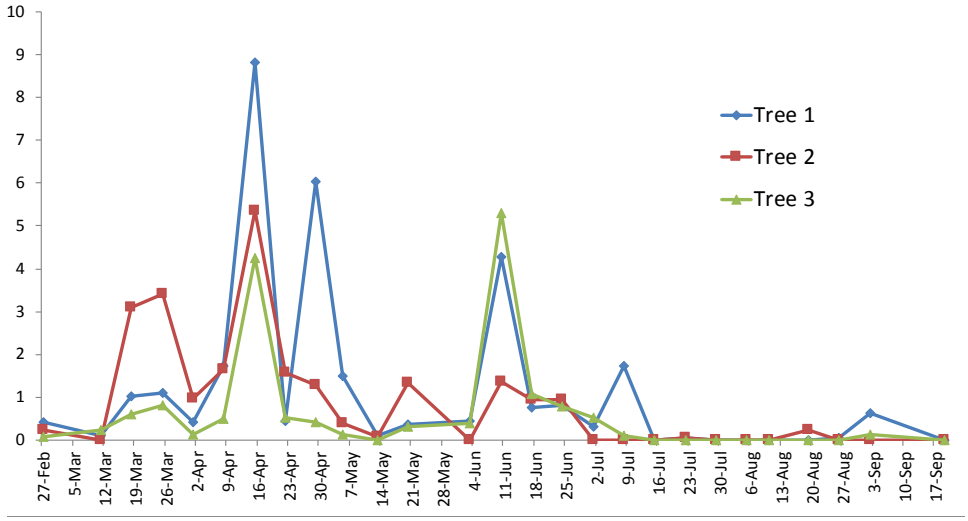


Figure 2. Number of crawlers per square inch of double-sided Scotch tape collected from three infested trees from February 27 to September 17, 2015, in Shreveport.

nymph stage feed on tissue beneath the bark, and both are susceptible to chemical treatments (Figure 1). Nymphs either develop into winged males or become females enclosed in ovisacs. These life stages are hard to manage with traditional insecticides. However, beneficial insects such as the twice-stabbed lady beetle (*Chilocorus stigma*) and the lady beetles in the Hyperaspis genus can rupture ovisacs and feed on eggs. Further research on using these predators and other natural enemies may provide long-term management solutions.

Gardeners, landscapers and crape myrtle growers are concerned because of the speed at which bark scale is spreading and the limited information available on its control. Since 2014, LSU AgCenter horticulturists and entomologists have been working with scientists from other institutions in the region to develop management recommendations for this exotic pest.

With assistance from northwest Louisiana Master Gardeners, AgCenter personnel monitored the crawler population on infested trees in Shreveport during 2015 and found two or three crawler population peaks. The first peak appeared around mid-April, which correlates with the budding of leaf buds in these trees (Figure 2). Ultra-pure horticulture oil and insect growth regulators such as pyriproxyfen (Distance) and buprofezin (Talus) can be applied at this first crawler peak. They are more efficient on crawlers, and the use of these products is less harmful to beneficial arthropods and pollinators compared to long-lasting systemic insecticides. Additional research on crape myrtle phenology, which is the timing of bud break, first bloom and full bloom, if proven to be correlated to scale activities, will also help time the application on crawlers.

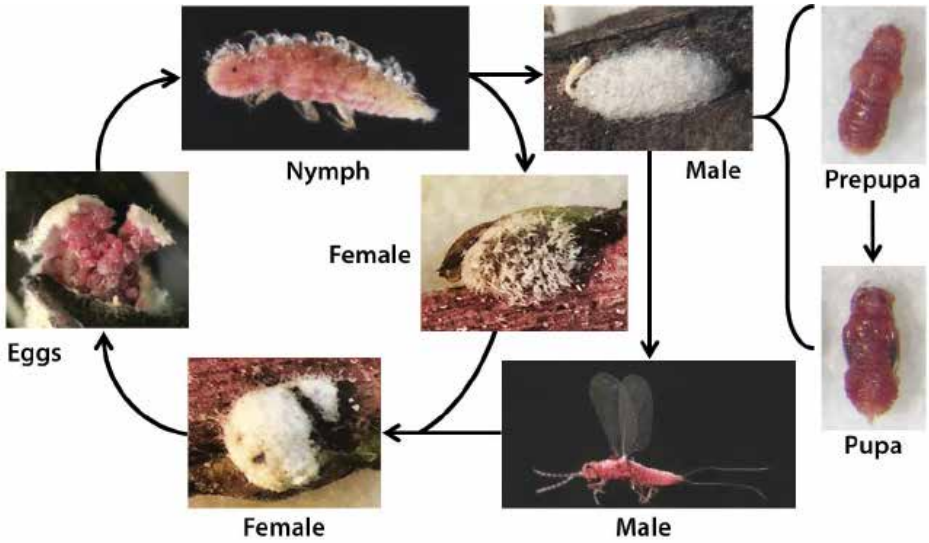


Figure 1. Life cycle of the crape myrtle bark scale includes egg, nymph (crawler), pupae, male and female. Photos by Zinan Wang

Crape myrtle flowers do not have nectar, but their "feeder pollens" are an important food source for bees in the summer. To manage bark scale with reduced impact on bees, AgCenter researchers recommend using systemic insecticides as a basal soil drench after the full bloom to avoid direct or indirect impact on bees. Products such as imidacloprid (Merit or Bayer Advanced Garden Tree and Shrub Insect Control), dinotefuran (Zylam, Safari, Transtect and Greenlight Tree and Shrub Insect Control with Safari) and thiomethoxam (Meridian) have shown control effects in field trials. Foliar application of systemic insecticides is prohibited by label during full bloom to avoid acute impact on pollinators.

If a decision is made to remove the infested plant, AgCenter researchers suggest trimming and carefully bagging all debris to avoid spreading the infestation. It will take efforts from homeowners, landscape professionals, nursery growers and retail garden centers to contain and mitigate this potential threat from bark scale to crape myrtles, an iconic landscape plant in the South.

Acknowledgment: We thank LSU AgCenter Northwest Region horticulture agent Jennifer Williams, Terrebonne Parish horticulture agent Bennett Joffrion, research associate Joey Quebedeaux and research assistant Zinan Wang for their assistance to this project. This project is funded by the USDA National Institute of Food and Agriculture Crop Protection and Pest Management grant program.

Yan Chen is an associate professor at the LSU AgCenter Hammond Research Station in Hammond, and Rodrigo Diaz is an assistant professor in the Department of Entomology.

Louisiana Super Plants New Selections for 2016

Allen Owings

The LSU AgCenter Louisiana Super Plants program is now five years old. With the announcement of two new varieties for spring and one for fall 2016, the program has now named exceptional landscape plants that perform well in Louisiana and would be great selections for home gardens. Some of these are new varieties, and some are older varieties with a proven track record.

The LSU AgCenter and Louisiana's nursery and landscape industry, through the Louisiana Nursery and Landscape Association, identified the need for a state-based program that uses university research to identify and promote exceptional plants. The Hammond Research Station, along with the School of Plant, Environmental and Soil Sciences, leads the program.

Each Super Plant must have at least two years of rigorous evaluations and a proven track record under north and south Louisiana growing conditions. Louisiana Super Plants must prove hardy across the state and must be easily produced and available for all nursery and landscape industry wholesalers and retailers to market and sell.

Louisiana Super Plants are selected a year or two in advance of a public announcement. The selection process includes LSU AgCenter horticulture faculty and members of the Louisiana nursery and landscape industry. The program results in home gardeners having an increased awareness of better-performing landscape plants.

Three new Louisiana Super Plants have been named for 2016 – the Evolution series salvia and Serenita Raspberry angelonia for spring, and Mrs. Schiller's Delight viburnum for fall.

Evolution salvia

A salvia that is not necessarily new but is lesser known is the Salvia farinacea series Evolution. Both the Evolution White and the Evolution Violet are propagated from seed. In the landscape, plant these varieties in a full to mostly sun location in a well-drained landscape bed 14 inches to 16 inches apart. Container

Evolution Violet salvia. Photo by Allen Owings

growing is also an option. Plants of the white-flowering variety grow to 10-12 inches tall while the violet-blooming variety will grow to 14 inches tall. Flowers are abundant on the tight foliage canopy from late spring through first killing frost. Pollinators love these plants. When spring planted and growing in a well-drained bed, plants can be perennial after winters of only light frosts and freezes. Removing spent flowers by deadheading will keep plants blooming more prolifically. Lower growth, blooms spring through fall and compact habits make these two varieties super.

Serenita Raspberry angelonia

Angelonia, also called summer snapdragon, has become one of the more popular summer bedding plants. These are generally considered annuals and work in full sun and dry landscapes – a common problem with angelonias is over-irrigation. The Serenita series is the smaller-growing version of the Serena variety, which was named a Louisiana Super Plant in 2011. The raspberry-blooming Serenita Raspberry was chosen because of its unique flower color. Raspberry blooms are not available in any other seeded-type angelonias. Plant angelonias in late April to early May. Serenita Raspberry is a compact grower in the landscape reaching about 12 inches to 14 inches tall compared to the 16-inch Serenas. Space plants 10 inches to 12 inches apart.

Serenita Raspberry angelonia. Photo courtesy Ball Seed

Mrs. Schiller's Delight viburnum

Mrs. Schiller's Delight viburnum. Photo by Allen Owings

A native shrub deserving of more use in Louisiana is the Mrs. Schiller's Delight Viburnum obovatum, or Walter's dwarf viburnum. This could be a great substitute for Indian hawthorn, dwarf yaupon, dwarf hollies and similar popular evergreen foundation shrubs. This viburnum is maintainable at 3 feet to 4 feet tall and grows to a height of 5 feet. Space plants 4 feet to 5 feet apart in full sun, part sun or part shade in a well-prepared landscape bed. Small clusters of white flowers cover the canopy in midspring for four weeks. These plants make a nice addition to woodland, filtered-shade native gardens. This viburnum is known for its landscape toughness. Prune if needed in spring after flowering is completed. Irrigation is needed only during periods when rainfall is absent for two to three weeks.

Louisiana Super Plants are "university tested and industry approved." The three 2016 selections and all the past selections can be chosen to make great colorful warm-season and cool-season Louisiana landscapes.

Allen Owings is a professor and resident coordinator at the Hammond Research Station.

Cool-season flowers

Amazon dianthus
Swan columbine
Diamonds Blue delphinium
Redbor kale
Sorbet violas
Camelot foxglove

Camelot foxglove

Amazon dianthus

Swan columbine

Diamonds Blue delphinium

Sorbet violas

Redbor kale

Warm-season flowers

BabyWing begonias
Bandana lantanas
Butterfly pentas
Little Ruby alternanthera
(Joseph's coat)
Senorita Rosalita cleome
Serena angelonia
Luna hibiscus (rose mallow)
Kauai torenia (wishbone flower)
Mesa gaillardia
Henna coleus
Fireworks fountain grass
Homestead Purple verbena

Henna coleus

Bandana lantana

Senorita Rosalita cleome

Homestead Purple verbena

Luna hibiscus (rose mallow)

Butterfly pentas

Mesa gaillardia

Fireworks fountain grass

Shrubs

Aphrodite althea (rose of Sharon)
Belinda's Dream rose
Conversation Piece azalea
Drift roses
Frostproof gardenia
Penny Mac hydrangea
ShiShi Gashira camellia
Leslie Ann camellia
Flutterby Petite Tutti Fruitti Pink buddleia (butterfly bush)
Rabbiteye blueberries

Belinda's Dream rose

Leslie Ann camellia

Drift rose

Penny Mac hydrangea

Flutterby Petite Tutti Fruitti Pink buddleia (butterfly bush)

Frostproof gardenia

ShiShi Gashira Camellia

Aphrodite althea (rose of Sharon)

Conversation Piece azalea

Rabbiteye blueberries

Trees

Shoal Creek vitex
Southern sugar maple
Willow oak
Evergreen sweetbay magnolia

Shoal Creek vitex

Southern sugar maple

Willow oak

Evergreen sweetbay magnolia

Virginia Buttonweed:
No. 1 Weed Problem of Southern Lawns

Ron Strahan

Virginia buttonweed is widely considered the most invasive weed infesting turfgrass in the South. The plant is extremely prolific and has multiple ways to reproduce, including heavy seed production that occurs both above and below the ground from self-pollinating flowers, rooting stem fragments and tap roots that allow plants to survive through winter. Mowers set at even the lowest blade height do not interfere with growth or seed production of this plant.

Because of the potential for stem fragments to root, mowing may actually aid in the spread of buttonweed. Turning the mower deck discharge toward landscape beds could even start populations of buttonweed in flower beds.

Virginia buttonweed control

Virginia buttonweed is tolerant of most selective herbicides used for weed control in turf, especially when plants harden off in late summer. Managing the weed should start early in spring as perennial plants emerge from winter dormancy.

April and May are good months to begin spraying buttonweed in spot applications. Perennial plants that went dormant after the first frost will begin emerging in early April. Seedling plants germinate around the perennial "mother" plants as temperatures warm in spring. During this early growing season, perennial plants are tender with new growth. It is at this time that the perennial plants are most susceptible to herbicide uptake. Additionally, herbicide applications during spring will easily kill germinating seedling plants and reduce the overall buttonweed population significantly.

The worst thing to do is to wait until late July or August to make the first herbicide application. By late summer, heavy Virginia buttonweed populations can form a dense mat that can kill large areas of the lawn. Single herbicide applications, especially late-season, have not been effective on mature Virginia buttonweed. Multiple applications throughout the summer are needed after the initial spring applications to get buttonweed under control.

A program approach works best to control buttonweed. According to research trials conducted by the LSU AgCenter, herbicides that contain the active ingredients 2,4-D, dicamba, mecoprop and carfentrazone (Speed Zone Southern, Weed Free Zone, Weed B Gon) have been effective in suppressing emerging perennial plants and killing the first flush of buttonweed seedlings when applied in early spring. Once temperatures exceed 85 degrees, herbicides containing 2,4-D cause too much injury to St. Augustinegrass and centipedegrass.

In the hot summertime, metsulfuron (MSM, Mansion) or Celsius herbicides should be applied. Always repeat metsulfuron or Celsius applications four to six weeks after the initial application. Both Celsius and metsulfuron have performed well in research trials, and these herbicides seem to be tolerated pretty well by St. Augustinegrass even in hot weather.

Ron Strahan is a weed scientist and associate professor in the School of Plant, Environmental and Soil Sciences

Virginia Buttonweed Control Program for Louisiana Lawns

Herbicide	Timing	Comments	Sources
Speed Zone Southern, Weed Free Zone, Weed B Gon (2,4-D + dicamba +, mecoprop + carfentrazone)	Apply in early spring as perennial plants break dormancy and seedling buttonweed emerges	Labeled for all Southern turfgrass. Expect injury on St. Augustinegrass and centipedegrass when temperatures exceed 85 degrees.	Turf chemical distributors, retail nurseries, big-box retail centers, online sources
MSM Turf, Mansion (metsulfuron)	Apply in summer when temperatures exceed 85 degrees.	Labeled for all Southern turfgrass. Kills bahiagrass.	Turf chemical distributors, retail nurseries, online sources
Celsius (iodosulfuron + thiencarbazone + dicamba)	Apply in summer when temperatures exceed 85 degrees.	Safest herbicide to use in hot weather. Do not apply to bahiagrass or carpetgrass.	Turf chemical distributors and online sources

Flowering buttonweed. Photo by Ron Strahan

Virginia buttonweed. Photo by Ron Strahan

Seedling buttonweed. Photo by Ron Strahn

Chamberbitter: Invasive and Difficult to Control

Ron Strahan

Chamberbitter (Phyllanthus urinaria), also called gripeweed or leaf flower, is a highly invasive summer annual broadleaf that has become a serious weed of nurseries and landscape beds in Louisiana over the past 15 years. It is believed that the weed originated in tropical Asia, but it has become problematic across the southeastern United States from Virginia to Texas.

The weed is characterized by leaves arranged in two rows on alternate branchlets, superficially resembling mimosa seedlings. However, the most common distinguishing feature is fruit attached directly to the underneath sides of branches. Reproduction is by seeds, which explode outward from maturing fruit onto surrounding areas. Seeds require soil temperatures above 75 degrees to germinate, and plants persist into late fall until a killing frost. Chamberbitter grows 1 to 2 feet in height and produces thousands of seeds. The weed is unsightly in flower beds and is costly to control in nurseries.

Chamberbitter control in landscape beds and nurseries

Because few selective postemergence options are available for controlling broadleaves infesting ornamentals, preemergence herbicides are the backbone of weed management in flower beds and nurseries. Unfortunately, chamberbitter responds erratically to most preemergence herbicides labeled for ornamentals. However, a few preemergence herbicides provide at least suppression of the weed. Herbicides that contain oxyfluorfen (Rout, OH2 and others), flumioxazin (Sure Guard and Broadstar) and isoxaben (Snapshot, Gallery) are useful in reducing chamberbitter populations in perennial groundcovers and woody plants. Dimethenamid-containing herbicides (Free Hand and Tower) can be moderately effective in bedding plants. Always follow product labels and precautions when using herbicides in and around ornamentals.

With all preemergence herbicides, it is important to apply them before weeds germinate.

Chamberbitter is a tropical plant that starts germinating as temperatures warm in the springtime, usually late April, so apply preemergence herbicides accordingly. Re-apply as directed by the product label. In landscape beds, a good thick mulch will also help suppress chamberbitter emergence, especially when used in conjunction with an effective preemergence herbicide.

Since chamberbitter is a prolific seed producer, it is extremely important to not allow emerged plants to produce seed and add more seed to the soil weed seed bank. Either hand-remove the weed or apply a non-selective herbicide such as glyphosate to destroy populations before they have a chance to produce seeds.

Chamberbitter is an extremely difficult weed to manage in ornamental settings. It will take an integrated management approach that includes mulch and preemergence herbicides along with frequent hand weeding and glyphosate applications to reduce populations in nurseries and landscape beds.

Ron Strahan is a weed scientist and associate professor in the School of Plant, Environmental and Soil Sciences.

Chamberbitter seed capsules are located on the underside of leaves. Photo by Ron Strahan

Fruit on chamberbitter. Photo by Ron Strahan

Revealing the Hidden Half: Development of a Low-Cost Aeroponics Growth System as a Tool for Sweet Potato Root Research

Arthur Villordon

The sweet potato has a system of roots that allow it not only to obtain soil-based resources like water and nutrients but also store food reserves. This storage capacity is unique to the sweet potato and represents the most economically important biological activity of the crop. Lateral or branch roots, the main determinants of root architecture, enable plant root systems to perform these functions. The onset of this specialized function is referred to as storage root formation. Roots that fail to undergo storage root formation become lignified, or woody, and do not contribute to productivity. Hence, the knowledge of the intrinsic and environmental factors that favor storage root formation is important in developing and testing management practices that contribute to improved agricultural yields.

New research has uncovered a fundamental association between lateral root branching and the ability of sweet potatoes to form storage roots. In roots with restricted branching, swelling is delayed or reduced. Thus, understanding the factors that control root branching will lead to developing and testing methods that promote optimum use of soil resources and consistent productivity. However, the study of plant roots has traditionally lagged behind studying stems, leaves, flowers or fruits.

Traditional methods for measuring roots grown in soil, such as washing and root tracing, are destructive and time consuming. Alternative approaches such as the use of underground observation windows typically underestimate some root growth factors. Recent advances in imaging technologies have enabled the non-destructive measurement of root development but are currently cost prohibitive and generally inaccessible to the broader scientific community. Another method is the use of a technique called aeroponics, where plant roots are fully accessible through the growth cycle and can be fully recovered for harvesting. LSU AgCenter researchers are developing an inexpensive aeroponics growth system as a tool for sweet potato research.

Growth system requirements

The principle of aeroponics is to grow plants with their root systems exposed to a nutrient mist. Plants show optimal growth in aeroponics systems because of an unimpeded oxygen supply to the root system. Unlike roots that are 100 percent immersed in nutrient solutions, roots grown in aeroponics systems typically show optimum lateral root development, an important consideration for root architecture research.

At minimum, the system is composed of a root chamber in which the mist is intermittently sprayed. The nutrient mist can be produced by mechanical foggers, venturi-type sprayers, ultrasonic foggers or pressurized solutions delivered through nozzles. The duration of the spray interval has an important effect on the development of the root system and should be adjusted for each plant species. Infrequent spraying might cause water stress, whereas too frequent or continuous misting may lead to leaching essential nutrients from the root system.

The nutrient solution is typically collected at the base of the chamber or in an external container and recirculated. Regulating the nutrient solution temperature, composition, concentration and pH can be either automated or performed manually at specified time intervals.

Materials and methods

One of the principal goals of the work was to develop a low-tech system that simulates the timing of storage root formation by field-grown plants. Another requirement was simplicity in operation to avoid complex machinery. The use of off-the-shelf components helped ensure flexibility and adaptability in many environments, including resource-limited locations. Figure 1 shows the basic components of the growth system: a plastic container (A) was used as a misting chamber while an air pump (B) was used in conjunction with a venturi mister (C) to propel the nutrient spray to the root system. The nutrient solution is self-contained within the plastic container and refilled when necessary. Sweet potato cuttings were inserted through openings on the plastic lids and secured using commercially available foam collars. A commercially available timer was used to determine the spray intervals after initially evaluating different interval settings.

Results and discussion

The multiyear experiments were conducted at the Sweet Potato Research Station. The initial hypothesis was that manipulating nutrient availability over time contributed to storage root formation and enlargement. This was based on

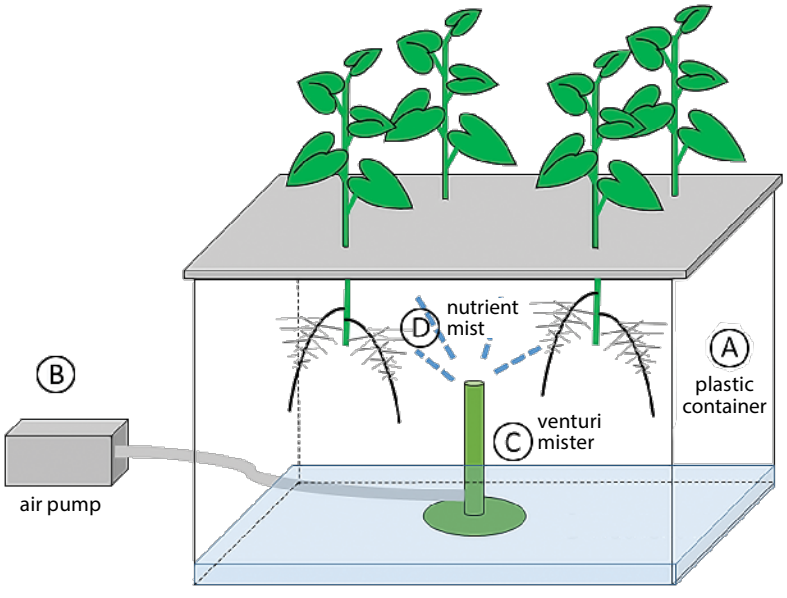


Figure 1. Diagrammatic cutaway view of the aeroponics growth system.

Figure 2. View looking into the aeroponics misting chamber, showing the developing root system of sweet potato plants at five days after planting.

Figure 3. View of swollen storage roots of sweet potato variety Bayou Belle grown in an aeroponics growing system at 57 days after planting.

measurements from earlier experiments that showed root swelling was accompanied by the reduction of nitrogen in the growth medium. In addition, studies were conducted in order to synchronize the timing of storage root formation in the aeroponics culture as close as possible with field conditions. Thus, the initial experiments consisted of an initial growth phase (Figure 2) using a nutrient solution with complete macronutrients and micronutrients followed by a storage root formation phase characterized by removing nitrogen from the nutrient solution.

It was determined that root swelling was more consistent when the initial phase was at least 20 days before the imposition of the nitrogen-deprivation treatment. One of the initial responses that were observed following the removal of nitrogen was the pigmentation of roots as early as three to four days. Around this time, the roots also increased in diameter by as much as 25 percent to 50 percent. These observations would not have been possible if the plants were grown on soil or in pots.

Swollen roots were clearly visible after 35 days, a time frame similar to field-grown roots (Figure 3). At the same time, shoots showed nutrient-deficiency symptoms, indicating that nutrients were diverted from the leaves to support enlarging the storage roots. On the other hand, plants grown in a continuous complete nutrient solution did not manifest root pigmentation, and root swelling was minimal. Long-term evaluation of the system showed that the timing of storage root formation also was influenced by variety and non-uniformity of nutrient availability in root systems during advanced stages of development. In particular, it was determined that the sweet potato variety Bayou Belle formed storage roots without the nutrient solution having been changed when the developing root system restricted the access of some roots to the nutrient mist.

These findings demonstrate the advantage of the aeroponics system in facilitating non-destructive, real-time observations of developing root systems compared with roots grown in soil or artificial growth media. In particular, the marked increase in root pigmentation in response to nutrient deprivation would have been easily missed in root systems grown in soil or an artificial growth substrate.

Conclusions and prospects

It has been demonstrated that sweet potato plants can be manipulated to form storage roots in an aeroponics growth system developed from relatively inexpensive, off-the-shelf components. Results from ongoing work will increase the understanding of how nutritional cues influence sweet potato root system development and storage root formation. Such knowledge has potential direct agricultural applications through the identification and evaluation of management practices that optimize fertilizer recommendations.

Other potential research applications include mineral nutrition, disease research, temperature effects, screening for desirable root mutants and root exudates. Root exudates are compounds excreted by root systems in response to stress stimuli in the soil environment and represent an important knowledge gap in sweet potato research. The aeroponics system is a convenient method to study the effects of nutrient deficiency on storage root formation and associated physiological and molecular processes. The nutrient delivery system enables the targeted removal of a specific nutrient without interference from biotic and abiotic variables that are found in agricultural soils.

Arthur Villordon is a professor at the Sweet Potato Research Station at Chase.

Photos by Arthur Villordon

Aeroponics growth system in greenhouse.

Inside:

Popular garden flowers throughout the United States, roses require special consideration in the Louisiana climate. *See page 10*

The AgCenter Hammond Research Station has developed into an important source of information for specialty crop growers and homeowners alike. *See page 22*

We can use our landscapes to provide food and shelter for pollinators and help increase their populations in many ways. *See page 24*

Sweet potato researchers are looking at how roots develop to increase their understanding of how to manage the crop in the field. *See page 34*

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Mrs. Schiller's Delight viburnum
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For more information, contact your
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