

LOUISIANA Agriculture

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Published since 1957

Assuring Our Future Through Scientific Research and Education

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100 years of 4-H
Rural Web access
China awes ag leaders



China Connection

Ag Leadership Program broadens knowledge

Cathleen C. Williams

As a graduate of Class 10 of the LSU AgCenter's Leadership Development Program, I have gained so many valuable experiences. On the local level, the program provided us with the opportunity to advance our knowledge of the diverse agricultural industries in the great state of Louisiana. We experienced agriculture not only from a production standpoint but from economics and politics as well.

Our leadership experiences didn't stop at the state's borders. We traveled to our nation's capital in 2006 to learn more about domestic agricultural policy. In 2007, we traveled to Santa Barbara County, Calif., to see large-scale agriculture with crops such as lettuce, strawberries, avocados, grapes, flowers and lemons – just to name a few. We also learned about many issues facing the farmers in California, including environmental impact and water-resource limitations.

I learned more than I ever imagined I would from the state and national experiences. However, the international study tour to China, the last trip of the two-year program, was amazing. On Jan. 18, 2008, our class of 25 members – along with spouses, alumni and AgCenter faculty – set out on a two-week adventure to learn about agriculture from a global perspective.

Beijing was our first stop. We toured the major historical sites including the Forbidden City, Tiananmen Square and, of course, the Great Wall. Learning more about the history of China added greatly to the experience. Understanding the cultural diversity among nations is an important component of leadership development. We also toured a swine farm and feed mill, where we saw firsthand the differences in American and Chinese production practices. For example, the Chinese have land-use rights instead of actual ownership.

An impressive part of our time in Beijing was a visit to the U.S. Embassy, where we visited with the Minister-Counselor for Agricultural Affairs along with four other agri-

(Continued on page 31)



Cathleen C. Williams participated in the trip to China in February 2008, as part of the LSU AgCenter's Ag Leadership Program. The group went to the Great Wall. Williams is a professor in the School of Animal Sciences.

Cathleen C. Williams, Gerald A. Simmons Professor of Dairy Science and Associate Professor of Dairy Nutrition, School of Animal Sciences, LSU AgCenter, Baton Rouge, La.

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ON THE COVER: This canna is one of thousands of flowers at the LSU AgCenter's Burden Center in Baton Rouge. Allen Owings, horticulturist, says canna popularity is growing across the South. Read more on AgCenter flower research on pages 24-27. Photo by John Wozniak.

What's New?

4-H teens get jobs in new Bienville Parish program

Fourteen Bienville Parish 4-H'ers learned about the world of work in professional jobs this summer in a new program that's a joint venture between the LSU AgCenter and the Bienville Parish Police Jury.

Called Jurors Empowering Teens, or JET, the six-week program was an experiment to see if investing in young people would pay off. And because both partners agreed it did, they will expand the program to include more teens next summer, according to Diane Uzzle, LSU AgCenter 4-H agent, who was in charge.

"The program wouldn't have happened without the support of the police jury," Uzzle said. "They budgeted \$26,500 for JET to pay each participant minimum wage."

One JET member, Darrell Johnson, said he was glad to be in the program because he was "not sitting at the house wasting time." He worked in the clerk of court's office.

Some teens worked at the library. Anna Lathan, branch manager, said their duties included helping at the circulation desk, checking books in and out, shelving and cleaning DVDs.

"They were an asset to us. It freed me to work on reports. We've enjoyed them; it

gives them good job experience. They know how to deal with the public," Lathan said.

Another JET member, Jeffrey McNear, who is headed to Northwestern State University to study electrical engineering in the fall, worked at the extension office "cleaning out files that are older than me," he said.

"I did skills assessment of the group and tried to pair the young person with an employer who would help in their career choice," Uzzle said.

One teen who wants to be a teacher went to work at the school board office. And another member of the group who wants to be a nurse went to work at the local clinic.

"The administrators told me this was exactly the kind of employees they're looking for," Uzzle said.

4-H membership was a requirement for selection into JET. The program not only provided employment experience, but also focused on the development of financial management skills and workforce ethics. During two weeks of the program, Uzzle had the young people in class learning about workforce preparation and character education. The two field trips were to LSU-Shreveport and the Louisiana Technical College in Shreveport.

"Bienville Parish police jurors were forward thinking enough to realize the impact this program could have on the youth of the parish," said Allen Nipper, LSU AgCenter North Central regional director.

"The Bienville Parish Police Jury is to be

commended for its proactive response to work force development, support of the local youth and for pioneering a program that can have potential around the state," Nipper said. ■ **Mary Ann Van Osdell**

Williams appointed weed specialist for Northeast Louisiana

Bill Williams, formerly an associate professor at the LSU AgCenter's Northeast Research Station in St. Joseph, has assumed a 75 percent appointment as extension weed scientist with a 25 percent research appointment. His office has moved to the Scott Research and Extension Center in Winnsboro. He has statewide extension responsibilities for developing, coordinating and conducting weed management education programs in agricultural crops, including cotton, soybean, corn, small grains and forages. His research focus will include weed management in rice, corn, grain sorghum and other agronomic crops as needed.

Williams received his Ph.D. in 1996 and his M.S. in 1994 in agronomy with an emphasis on weed science from the University of Wisconsin. He was awarded his bachelor's degree from Oklahoma State University-Stillwater in 1991. He has served the AgCenter as the project leader for corn, rice, grain sorghum and small grains weed management research at the Northeast Station since December 1996. ■

Mary Ann Van Osdell

Colyer takes over Northwest Region

Patrick Colyer is first to be the second regional director in the LSU AgCenter administration. Colyer, a plant pathologist at the Red River Research Station in Bossier City for 25 years, became director of the Northwest Region, one of the AgCenter's seven regions in March 2008.

The region includes the parishes of Bossier, Caddo, Desoto, Sabine, Natchitoches, Red River and Webster. Colyer has responsibility for all the research and extension programs and reports directly to the chancellor of the LSU AgCenter.

Colyer took over from Jere McBride, who retired in February 2008. McBride was one of eight named regional director when the AgCenter reorganized its administrative structure in 2001. Since then, two regions were combined making a total of seven regions.

Photo by Mary Ann Van Osdell



4-H'ers Jody Swain and Trey Loyd started their Jurors Empowering Teens rotation at the library in Bienville Parish.

"My goals are to make sure our programs address the needs of our clientele and that we adapt to change as our clientele's needs change," Colyer said, adding, "The biggest changes are in technology."

Colyer has been with the AgCenter since Jan. 15, 1984, when he was hired as an assistant professor and researcher at the Red River Research Station in Bossier City.

His research focus was production-limiting diseases of the major row crops in Northwest Louisiana. He was promoted to associate professor in 1989 and professor in 1996.

Colyer received his Ph.D. in plant pathology in 1983 from the University of Massachusetts at Amherst. After receiving a B.S. in biology from Edinboro State College in Pennsylvania in 1978, he went straight through to the Ph.D. degree at U Mass-Amherst.

Because his father was in the military, his family lived in several places across the country. He was born in Virginia.

Read the story about McBride on page 30. ■ **Linda Foster Benedict**

Rust keeps threatening Louisiana sugarcane

ST. MARTINVILLE – New sugarcane varieties are increasing yields, but diseases pose a constant threat, farmers were told by LSU AgCenter researchers at a July 18 sugarcane field day here.

Researchers told farmers that developing new varieties is an ongoing effort.

"Trying to stay one step ahead of rust is getting to be quite an ordeal," said Kenneth Gravois, LSU AgCenter sugarcane breeder.

The excellent stubbling ability of the variety LCP 85-384 has not been duplicated in many of the newer lines and varieties, Gravois said. A new variety, L 01-283, with good stubbling ability is being released during 2008.

Jeff Hoy, LSU AgCenter pathologist, said serious brown rust problems could develop with the variety HoCP96-540, currently grown in more than half the state's acreage. He said rust outbreaks became significant when acreage of LCP 85-384 reached that level.

Hoy said fungicides may be helpful against brown rust, and a Section 18 Emergency Use label was granted for the fungicide Headline for use during the spring.

"I think over time we are going to have a continuing, cyclical problem with rust, and fungicides will help reduce losses during those times," he said.

Orange rust, another rust disease af-



LSU AgCenter entomologist Gene Regan, second from left, discusses insecticides for treating sugarcane borers during the St. Martin Parish Sugarcane Field Day on July 18. Jeff Hoy, plant pathologist, is at left.

fecting sugarcane, was found in Florida cane fields during 2007, Hoy said, so that means Louisiana growers could be finding it soon. "We are anticipating it is going to show up this year or the next," Hoy said.

Hoy said preliminary variety resistance evaluations are being conducted for orange rust in Florida.

Gene Reagan, LSU AgCenter entomologist, said the Mexican rice borer has been found in Chambers County, Texas, near the Louisiana-Texas state line.

Meanwhile, the sugarcane borer continues to be a pest of Louisiana cane growers, Reagan said, and research is showing that early planting could make sugarcane more susceptible to the insect. ■ **Bruce Schultz**

Sweet sorghum shows promise as alternative crop

Sugarcane farmers heard about alternative crops and cane varieties under development during field days July 24 and 25 in Iberia Parish.

On July 24, farmers met at the Iberia Research Station to see test plots of new cane varieties and sweet sorghum. Sonny Viator, station director, is participating in a study of sweet sorghum at LSU AgCenter research facilities across the state for its potential as an energy crop.

As fuel prices increase and corn prices remain high, the potential for sweet sorghum

to produce ethanol is economically feasible, Viator said. Earlier research had produced 250 gallons of ethanol per acre from sweet sorghum, but a more recent test at Houma resulted in 500 gallons per acre. Sorghum has potential as a rotational crop with cane and rice.

"I think it is going to be very much a complementary crop," Viator said.

The varieties Theis, M81-E and Topper were grown this year at the Iberia Station, but new varieties are expected. Several things have to be learned, including the best planting times and which herbicides can be used for the crop, he said.

Ben Legendre, LSU AgCenter sugarcane specialist, said a substitute for glyphosate as a ripener on sugarcane will have to be found if Roundup Ready sugarcane is released in a few years.

He said the chemical Palisade, a plant growth regulator, shows promise as an alternative ripener, and the manufacturer, Syngenta, wants more research from the LSU AgCenter.

On July 25, sugarcane farmers met at the farm of Lane Blanchard to hear about soybeans as a rotational crop.

Kurt Guidry, AgCenter economist, said soybean prices have fallen recently for several reasons, including a stronger dollar that has decreased exports and an 11-million acre increase in soybeans from 2007. Prices of \$16-\$17 a bushel from a few weeks ago have dipped and could get to \$11. Wheat prices also have fallen. ■ **Bruce Schultz**



Seaman A. Knapp family in Lake Charles in 1897. His vision for youth involvement in the transfer of knowledge from agricultural research to farmers was the beginning of 4-H.



4-H club members at an achievement day in the 1930s.

Photos from the LSU AgCenter archive



The first Boys' Corn Club at Moreauville High School in Avoyelles Parish in 1908.



A 4-H club at the Holly Grove Elementary School in Franklin Parish from 1954.



Desoto Parish Corn Club member in the early 1900s displays the fruits of his labor.



Genetic lines were spread throughout Louisiana and the United States through the use of livestock "chains," such as the Sears Roebuck Pig Chain. This is an agent with 4-H club members and their pigs in Avoyelles Parish in 1937.

Louisiana 4-H Celebrates 100 Years in 2008

Paul Coreil and Mark Tassin

Once rooted in rural America, 4-H has significantly diversified over its 100 years of existence. Although 4-H has changed as society has changed, much of its success can be traced to its roots and original mission.

The 4-H movement was born out of corn clubs of the early 1900s. These clubs were originally created by the Louisiana Agricultural Experiment Station to help Louisiana farmers grow corn more successfully in Louisiana. Later, the clubs evolved into 4-H clubs administered by the Louisiana Cooperative Extension Service under a U.S. Department of Agriculture partnership.

The vision of the founder of the Extension Service, Seaman A. Knapp, was to teach new and improved agricultural practices to youth, who would in turn transfer these skills to their parents and increase adoption of research-based knowledge.

4-H played a significant role in the early adoption of practices and variety selection in corn and other crops. Corn clubs fostered the creation of other crop-linked clubs including cotton. Livestock production improvements were also born out of the 4-H movement. Through livestock contests, shows and competition, youth learned selection, genetics, nutrition and animal health. Genetic lines were spread throughout Louisiana and the United States through the use of livestock “chains” such as the Sears Roebuck Pig Chain. 4-H youth would receive a gilt, which was subsequently bred, with the expectation that when the litter was weaned, the 4-H’er would place a certain number of pigs back into the chain and provide animals to new 4-Her’s.

Horticulture improvements were also advanced through tomato clubs and other vegetable-related projects. Events and activities such as “victory gardens” during World War II helped provide food during the war while promoting new and improved horticultural practices.

As the 4-H movement began to spread, the agriculture-related offerings began to expand. Contests and competition such as soil judging, crop judging, weed identification, meat identification and other competitive events increased youth knowledge of agronomic and food production practices. Livestock shows, live animal judging evaluation and livestock workshops taught basic animal science principles. These principles were brought back to the family farm and improved animal agriculture production in Louisiana and throughout rural America.



This photo is of unknown origin. Note the uniforms.

Even though it initially developed with an agriculture focus, 4-H has diversified to capture the needs of the youth in the 21st century. As the population in America and Louisiana became more suburban and urban, the interest of youth changed – but the same principles and practices of youth development still exist. For example, young people learn new technological mapping skills such as Global Positioning Systems (GPS) and Geographic Information Systems (GIS) and transfer those skills to their parents and other adults.

As the youth development educational field has expanded so has the mission of 4-H. The 4-H program in Louisiana recognizes the importance of providing young people with the opportunity to develop into productive, contributing members of their community through four main essential elements: belonging, independence, generosity and mastery. Louisiana 4-H promotes a sense of belonging by offering young



Attendees from Louisiana pose in front of the Washington Memorial at the first National 4-H Club Camp in 1927. Delegates slept in tents on the national mall in front of the U.S. Department of Agriculture building.

Paul Coreil, Vice Chancellor and Director of Louisiana Cooperative Extension Service, and Mark Tassin, Director of 4-H and Youth, LSU AgCenter, Baton Rouge, La.



A 4-H club member competes in poultry at the Southern University Livestock Show in 1948.

people the chance to develop a relationship with a caring adult and conducting activities and programs in a safe environment. They also become part of a team and group through 4-H clubs, project clubs, summer camps and many other programs. Youth develop independence through activities that enhance life skills such as decision making and responsibility. Many Louisiana 4-H youth are instrumental in making decisions concerning statewide programs and conferences through the practice of giving youth a voice in 4-H programs and projects. They plan and implement teen leadership conferences, service-learning projects and statewide competitive events. They are participants on every state level advisory council. 4-H youth master skills in a variety of project areas that range from livestock to electricity to computer technology. They master skills through hands-on learning, including shows, contests, demonstrations, workshops, record keeping and many other experiential activities. Youth compete against peers, compete as a team in cooperative events, and compete against knowledge standards. Through noncompetitive experiences, they learn teamwork, leadership, citizenship and consensus building. The essential element of generosity is learned and experienced through community service and service-learning projects that offer youth the opportunity to give back to the school, community, their state and the nation. Now more than ever, youth are volunteering to contribute to their communities in a multitude of projects.

The 4-H program in the 21st century continues to drive young people toward projects and activities in three major areas: science, engineering and technology; healthy living; and citizenship and leadership.

These three areas align well with their school-linked competencies and further help retain and expand 4-H's partnership with parish school boards and systems. Even though agriculture is still considered a cornerstone to 4-H and youth development, 4-H has expanded into new skill development areas such as character education and leadership as a major theme in all youth development initiatives.

As we look back to the beginnings of 4-H, it is apparent that Seamann A. Knapp had great vision about the importance of youth programs in the development of a great nation. The original corn clubs promoted a sense of belonging by being involved in a club, promoting team learning, and tying directly to a caring adult. These clubs helped young people gain knowledge to improve varieties and cultural practices that promoted mastery. The decisions made regarding crop production, including varietal selection, fertilization and other cultural practices, required youth to practice independence. The clubs also

taught the valuable skill of responsibility through growing a crop independent of their parents.

The uniqueness, popularity and long-standing history of 4-H can be linked to the hands-on learning, informal approach to education and the interaction with adults in a manner different from formal education in a school setting. 4-H has thrived for the last 100 years in large part because we have never lost sight of the child and what it takes to build community. As we continue to adapt, 4-H will continue to thrive if we put the child first and see our programs through the children's eyes. Youth voice is an important part of 4-H. When we give youth a voice, they take ownership and do not relegate themselves to just being participants. The following quote from one 4-H record book is an indicator of what 4-H can accomplish for young people:

This quote from Coach Vince Lombardi applies to my career in 4-H: 'The only place that success comes before work is in the dictionary. Hard work is the price we must pay for success. I think you can accomplish anything if you are willing to pay the price.' During my 4-H career, I have realized that it takes a lot of hard work to accomplish something that you want. ■



This photo of unknown origin was taken at Short Course and shows the use of caps as part of the 4-H uniform.

PLANTING kicks off Baton Rouge high school students' summer farming experience

Photo by Tobie Blanchard

"Who likes squash?" asked Emily Neustrom, a project coordinator with the LSU AgCenter. She was holding up a packet of seeds and speaking to students at Baton Rouge's McKinley High School.

Only one youngster raised his hand.

Despite the group's distaste for squash, they were eager to plant squash seeds, along with cucumber and zinnia seeds and pepper transplants.

The students make up the McKinley Farmers of Tomorrow, and they were planting an acre of crops at the LSU AgCenter's Burden Center in Baton Rouge. Later in the summer, the vegetables and flowers will end up at the group's neighborhood farmer's market.

"The market serves a need in the community," Neustrom said. "There is no grocery store here, and the community loves seeing the kids out on the street selling the vegetables."

The students live in the Old South Baton Rouge neighborhood – a struggling community in inner-city Baton Rouge where many residents live at or below the poverty level. Minister Fahmee Sabree, director of the Islamic Complex in Baton Rouge, organized the group three years ago as a safe summer activity for the students. They earn a stipend and learn about leadership, running a business, nutrition and selling a product.

"They are not just planting peppers," he said, looking at the students working in the field. "They are learning teamwork. It is hard to walk those long rows by yourself. But when you work together, it is easier."

For most of these Baton Rouge youth, it was their first time planting anything.

"I want to learn how to plant things and to have fun," said Kenneth Heard.

Some students are thinking beyond this summer. "You get to learn and have fun, and this will look nice for college," said Heather Smith.

Regineka Johnson and Keanna Jarmon participated in the program last year and have returned as student leaders.



Students at McKinley High School in Baton Rouge learn leadership, running a business, gardening and nutrition as part of a service-learning project.

"I came back because I wanted to teach others about planting," Johnson said.

"I like it because I get to meet new people, talk to people and negotiate and learn how to work a business," Jarmon added.

As part of the experience, the students also attend classes in nutrition, cooking and landscape architecture.

The hot peppers they grow become the main ingredient in a hot sauce they will bottle and sell at the market – Old South Baton Rouge Hot Stuff.

"We really wanted to give them the full experience of planting, harvesting, selling and making a product," Neustrom said.

LSU AgCenter horticulture professor Dr. Carl Motsenbocker teaches classes at LSU that contain a service-learning component.

Motsenbocker and his classes work with the McKinley group.

Motsenbocker hopes to expand the program to a year-round job for the students involved.

"I want to develop a community garden in the neighborhood that the kids can work with after school," Motsenbocker said.

He described the community as a food desert and would like to see the market be more than just a seasonal market. The morning the students planted the vegetables was a warm one.

"If they can come together under this hot sun and work hard and laugh together, they can be successful," Sabree said. ■

Tobie Blanchard



Chinese tallow trees

a potential bioenergy crop for Louisiana

Gary A. Breitenbeck

The Chinese tallow tree is a familiar sight growing in yards and along fence rows throughout Louisiana, though some may not recognize this name. In southern Louisiana, it is commonly called “chicken” or “chicken-foot” tree, presumably because its seeds hang in clusters that offer some resemblance to a chicken’s foot. Other common names include popcorn tree, candleberry tree, white wax berry and Florida aspen. In Cajun French, it’s called boire, possibly because of its preference for wet soils. The U.S. Department of Agriculture prefers the scientific name *Triadica sebifera*, though an earlier classification *Sapium sebiferum* remains in frequent use.

“Sebifera” and “sebiferum” mean “wax-bearing” and refer to the thick layer of vegetable tallow that coats the seeds. Because of the prolific production of these vegetable-oil-bearing seeds, the tallow tree promises to become the second or third most productive source

of vegetable oil for biodiesel, after oil palm and possibly algae. This tree can be grown on marginal land and therefore would not compete with food production for limited cropland. Currently, naturalized stands of the tallow tree occupy tens of thousands of acres throughout Loui-

siana. Converting these lands to commercial production of the tallow tree as a feedstock for biodiesel production offers many potential benefits.

Perhaps the greatest deterrent to commercialization of the tallow tree lies in its potential for invasiveness. The tallow tree has both strong supporters and detractors, and discussion of its possible use as a bioenergy crop can quickly lead to heated debate. For the past decade and more, it has been fashionable to vilify the tallow tree in both the popular and scientific literature with uncommon intensity. Supporters of the tallow tree argue this beautiful and useful tree has not received a fair hearing. While they admit some environmental concerns are valid, they contend that others are exaggerated and some are complete nonsense.

Without question, the tallow tree can rapidly colonize poorly managed pastures, fence rows, clear-cut forests and other areas that offer adequate sunlight. The principal natural habitat at risk appears to be coastal prairies in Texas and southwestern Louisiana, though these areas face a more formidable enemy in rising sea levels. Because of its short stature and limited tolerance of shade, the tallow tree is less able to dominate in established woodlands where it generally

Photos by Gary A. Breitenbeck



Newly matured seed is bright, white and waxy because of an outer coating of saturated fats. For centuries this wax has been used for making candles and soap.

Gary Breitenbeck, Professor, School of Plant, Environmental & Soil Sciences, LSU AgCenter, Baton Rouge, La.

remains a secondary tree in the understory. Claims that the tallow tree is allelopathic – that is, it exudes chemicals that inhibit growth of other plant species – appear to be without foundation.

While the occasional landowner becomes enraged when these trees rapidly take over idle land, many homeowners value their beautiful tallow trees, and some cattle producers view them as a source of quick shade for their animals. The animals do not graze the leaves and immature fruit in the summer because they contain a mildly toxic latex. When the sap descends in autumn, this toxicity apparently disappears, and seed are foraged by many animals. A host of songbirds rely on this seed during winter months. The tallow tree is an excellent honey plant that results in a good quality honey with a slight tang prized by some and discounted by others. Rumors persist that beekeepers have played a principal role in spreading the tallow tree in eastern Texas and western Louisiana. As a source of vegetable oil for the production of high-quality biodiesel, the tallow tree has few peers.

Biodiesel, an alternative to petroleum diesel, is derived from natural fats and oils. This alternative fuel can be used directly in tractors, pumps and other equipment with diesel engines. Biodiesel often is produced in large refineries, but its production is sufficiently simple and safe to allow on-farm production using commercially available processors. Farmers are well-aware that in the past few years the price of diesel has risen more rapidly than that of gasoline, and this increase is a major contributor to rising crop production and food costs. In 2006, Louisiana farmers used 57.1 million gallons of diesel. Nationwide, 3.62 billion gallons were used to produce our crops. The principal limitation for on-farm production of biodiesel lies



During the summer the seed develops within a three-lobed fruit capsule, which turns brown in the fall.

in the availability of suitable fat and oil feedstocks.

In many respects, the tallow tree offers the ideal energy crop for biodiesel production along the gulf coast. It thrives in wet areas that cannot be farmed profitably with conventional crops. It has few insect pests and diseases and is tolerant of salt, prolonged flooding and occasional freezing temperatures. It has low nutrient and other management requirements. These characteristics as well as the tallow tree's exceptional ability to produce high-quality vegetable oil underscore its commercial potential as a low-input, high-return biodiesel crop for Louisiana.

Cultivation of the tallow tree is not new. It has been grown in China for at least 1,500 years, partly for its vegetable wax used for soap and candles and partly for coloring silk with a black dye produced by boiling its leaves in alum. In 1772, Benjamin Franklin sent a few seeds to Dr. Noble Wimberly Jones of the Georgia colony with the brief com-

ment, "Tis a most useful plant." Since Franklin's time, the tallow tree has been repeatedly introduced as an ornamental, an oil crop for making soap and lighting oil, and for erosion control along stream banks. At one time the tallow tree was widely distributed commercially as a landscape plant for yards and along highways because of its brilliant fall foliage and the novel appearance of its blooms and seeds. It is now naturalized along the Eastern Seaboard from North Carolina to Florida and extends west into eastern Texas and northwestern Arkansas. Because of its invasive nature, commercial distribution is now discouraged, though planting remains legal in most Southern states.

Tallow seeds contain 45-60 percent vegetable oil, about two to three times the amount found in an equivalent weight of soybeans. Commercial plantations in other countries typically contain about 160 trees per acre, trimmed low for hand harvesting. Yields average 12,500 pounds of seeds per acre containing 2,300 pounds of stillingia oil, 2,500 pounds of wax, 1,400 pounds of protein concentrate, 982 pounds of fibrous coat and 4,000 pounds of shell (endocarp). Per acre, these oil yields are 15 times more than soybeans, 10 times more than sunflower or safflower, seven times more than peanuts and five times more than rape seed. Annual commercial production averages about 645 gallons – the equivalent of 15.4 barrels of oil per acre. Some experts cite figures as high as 970



The size of the oval-shaped seeds varies among trees. The waxy outer layer coats a hard, woody endocarp protecting the actual seed.



Wax recovered from the outer layer of tallow seed is used not only in soap and candles but also for cooking and cosmetics.



Conversion to biodiesel (transesterification) results in a liquid fuel.



In dense stands, most tallow trees produce few seeds because of competition for light, water and nutrients. Occasionally, a tree growing within these stands produces a heavy seed crop, suggesting genetics is a key factor influencing yield.

gallons or 23.1 barrels of oil per acre. The light-colored, brittle wood of the tallow tree appears to have limited value as lumber or even firewood, though extracts of bark, leaves and seed are used in traditional and modern Chinese medicine.

Naturalized trees currently exist in a “wild” state where both seed yields and oil composition vary greatly among trees due to both genetic and environmental factors. Cultivars with superior characteristics for bioenergy production are not yet available. Researchers in the LSU AgCenter seek to bring this aggressive tree into useful cultivation while minimizing potential adverse impacts on endangered ecosystems. Research is under way to address several areas critical to successful commercialization of the tallow tree as a bioenergy crop:

- 1) Selection from that naturalized population of “elite” trees capable of high yields of vegetable oil with superior characteristics for biodiesel production.
- 2) Development of tissue culture and conventional propagation techniques to provide commercial quantities of superior trees.
- 3) Development of management practices, including optimal spacing, pruning and fertilization.
- 4) Development of practical methods of mechanical harvesting, storage and processing of seed.

In the event that “invasiveness” remains a critical issue, AgCenter researchers also are exploring the introduction of “termination technology,” a genetic technique patented by the USDA to prevent seed germination.

Although hand harvesting is used in China and other countries where the tallow tree is cultivated, a practical method of mechanical harvesting is essen-

tial to commercial development in the United States. The size of the trees and its uneven maturity are two challenges to successful mechanical harvesting. In naturalized stands, maturity occurs over several weeks. By completion, the earliest seed has fallen or begun to decay on the tree. Attempts to thresh immature fruit rapidly results in clogged equipment. Fortunately, when young branches are cut from the tree and allowed to dry on the ground, the fruit uniformly matures within a few days. The AgCenter is exploring a promising technique that involves using a boom-mounted sickle bar to prune branches of ripening fruit from trees growing in rows. Fruit is allowed to mature on pruned branches, and then the seed is harvested with a combine modified to accommodate the wax-covered seed, which is slightly larger than soybean seed.

The invasive potential of the tallow tree merits serious consideration. So does the opportunity to restore economic prosperity to many of the most impoverished areas of Louisiana by converting many thousands of acres of marginal land currently colonized by the tallow tree to a highly profitable, low-input bioenergy crop. Because of the ability of the tallow tree to flourish on marginal land, it can be produced without adversely affecting our ability to produce food. This perennial oilseed crop does not require routine cultivation of the soil and therefore also can serve to prevent soil erosion and reduce pollution of surface waters while sequestering atmospheric CO₂ in its biomass. Harvesting the fruit before it is fully mature can serve to reduce, rather than enhance its spread by birds and other means from areas now heavily colonized with the tallow tree. ■

Economical

During the past 20 years, interest has increased in dietary effects of omega-3 fatty acids because they play a major role in human health. Natural fish oils are thought to help maintain heart and vascular health in humans. Producing and purifying oil from catfish for the growing fish oil market can benefit the Louisiana catfish industry.

Internal organs – or viscera – from channel catfish (*Ictalurus punctatus*) are an abundant and underused byproduct that can be a unique source of edible oil. The four major commercial U.S. catfish-producing states – Alabama, Arkansas, Louisiana and Mississippi – in 2005 produced more than 300,000 tons of catfish with a stable monthly production of about 25,000 tons. The byproducts of catfish processing consist of heads, bones, skin and viscera, which often end up in landfills or rendering plants. A processed catfish yields around 45 percent whole fillets and about 55 percent waste. The average weight of viscera is about 9.35 ounces, which is about 10 percent of live weight.

Much of the oil in catfish is in the viscera, which contain approximately 33 percent fats – or lipids – which could be converted into edible oil or biodiesel products. With a growing world market demand for fish oil, the catfish industry could handle the byproducts from fish-processing operations with care and be able to sell these as raw materials for producing fish meal and oil.

Small fish-oil processors and entrepreneurs may be interested in a small-scale, cost-effective oil extraction, clarification and stabilization process for potential human consumption. Fish oil can be extracted using a number of methods, including rendering, enzymatic hydrolysis, chemical extraction, mechanical pressing and centrifugal force.

methods to extract and purify catfish oil

Subramaniam Sathivel, Huaixia Yin,
Witoon Prinyawiwatkul, Joan King
and Zhimin Xu

The conventional method of extracting oil from fish is by rendering, a process in which high heat is used to extract fat or oil mainly from animal tissues. Almost all animal fats are recovered by rendering, whereas vegetable fats are obtained by crushing or solvent extraction or both. In general, rendering can be wet or dry. Wet rendering is carried out with large amounts of water. The fat cell walls are broken down by steam under pressure until they are partially liquefied and the released fat floats to the surface of the water. Separated fat may be removed by skimming or by centrifugal methods.

Fish oil's current high value in the marketplace is due primarily to its long-chain, polyunsaturated, omega-3 fatty acids. These fatty acids are very sensitive to oxidation, especially caused by heat. LSU AgCenter researchers have developed a low-temperature fish oil-extraction process that will minimize fatty acid oxidation and purification costs.

Unpurified fish oil contains free fatty acids – primary oxidation products, minerals, pigments, moisture, phospholipids and insoluble impurities – that reduce oil quality. The amount of these impurities present in the oil may depend on the extraction techniques. The longer these components remain in the oil, the greater their negative effect on oil quality; therefore, these components need to be removed before the oil will be acceptable in many markets. Conventional fish oil refining steps are degumming, neutralizing, bleaching and deodorizing. Degumming removes phospholipids, proteins and other some compounds; neutralization removes free fatty acids, which are precipitated as soaps; bleaching uses clays to adsorb pigments; and deodorization removes oxidized components.

LSU AgCenter researchers have developed a low-cost adsorption process to remove non-

triglyceride materials. Chitosan from crawfish and shrimp, activated carbon from agricultural byproducts, fish bones or other low-cost materials can be used as adsorbents to remove the non-triglycerides. Compared with conventional refining methods, adsorption technology offers lower refining losses, less lipid oxidation and less flavor reversion in the refined oil. Adsorption technology can potentially provide a simplified process for refining catfish oil for human consumption.

The number of food products that are fortified with long-chain omega-3 fatty acids is growing dramatically. However, attempts to incorporate fish oil into food formulations has had limited success because of “fishy” flavors in the finished products – the main problem of food enrichment with omega-3 acids. One technology for overcoming these problems and also reducing oxidation of omega-3 fatty acids is microencapsulation of fish oil. The microencapsulation process makes it possible to transform the oil into a powder in which small droplets of oil are surrounded by a “shell” of proteins and/or carbohydrate. The result is small, dry granules that have powder-like flow characteristics. The microencapsulation process improves the oxidative stability of fish oil and extends its shelf life to 12-24 months when stored in a dry cool environment.

Microencapsulation of fish oil can provide many benefits, such as an oxygen barrier that extends shelf life, a taste profile barrier that eliminated fish-oil taste and odor, and high nutritional density and nutritional availability. The

process also provides a protective barrier when oils are incorporated into food products.

Microencapsulated fish oil powders are commercially available and used in baked goods, beverages and milk products. Microencapsulated catfish oil also could be used as an enrichment in a wide assortment of foods such as milk, bakery products, salad dressings, juice drinks and other nutraceutical products. In addition, microencapsulated fish oil powders may have appeal to broader groups of consumers when used in snack foods, breads, cookies, pizza toppings, chicken nuggets and sausages. Pet foods can be another lucrative market for owners who may want the health benefits of long-chain omega-3 fatty acids for their pets.

Extracting and making use of oil from catfish viscera could bring more revenue to catfish processors in Louisiana. Incorporating adsorption technology for fish-oil refining could provide a simple, cost-effective technology for purifying catfish oil for use as a food ingredient. Microencapsulation can add value to oil produced from catfish by-products and benefit the Louisiana economy. ■

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Novel insecticidal proteins for managing cotton pests

P. L. Bommireddy and B. Rogers Leonard

Transgenic plants that express insecticidal proteins from the soil bacterium *Bacillus thuringiensis* (Bt) have become standard for managing many caterpillar pests in cotton. Three Bt cotton technologies currently available in commercial cotton cultivars are Bollgard, Bollgard II and WideStrike. These plants express single or multiple crystal – or Cry – proteins produced by Bt. When insects eat these, Cry proteins become toxic to the target pests. Bt is environmentally friendly and is practically nontoxic to vertebrate organisms including birds, fish, and humans.

The addition of a second Cry protein in Bollgard II and WideStrike plants has improved overall efficacy and also expanded the target pest spectrum that is now successfully managed with Bollgard.

The current commercial Bt cotton cultivars have been widely accepted by



A bollworm larva feeding on a non-Bt cotton square.

producers and are planted on more than 90 percent of Louisiana's cotton acreage. However, there are concerns about the similarity in structure and activity of these specific Cry proteins and the potential for target pests to develop resistance to Bt.

Syngenta Crop Protection is developing genetically engineered cotton plants that express a novel vegetative insecticidal protein, Vip3A, from Bt. Commercial lines that express Vip3A will also contain an additional Cry (1Ab) protein. This unique combination of a Vip and a Cry protein in cotton plants has been labeled as VipCot technology. VipCot has the potential to be another effective tool for integrated pest management

in cotton with the additional benefit of Bt resistance management. Before VipCot can be fully integrated into a cotton pest management system, however, the consistency of performance against primary target pests must be documented.

LSU AgCenter researchers conducted a series of field studies at the LSU AgCenter's Macon Ridge Research Station near Winnsboro, La., during 2005-2007 to evaluate the performance of transgenic cotton lines expressing the Vip3A insecticidal protein against two primary caterpillar pests – the bollworm and the tobacco budworm. A non-Bt cotton line, Coker 312, and a VipCot cotton line expressing the Vip3A + Cry1Ab proteins were sampled throughout each

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Bollworm or tobacco budworm larvae were infested in individual white flowers of Bt and non-Bt plants.

Photos by Latha Bommireddy

When insects eat these, Cry proteins become toxic to the target pests.

Figure 1. Cumulative insect damaged reproductive structures on non-Bt (Coker 312) and transgenic Bt cotton (VipCot).

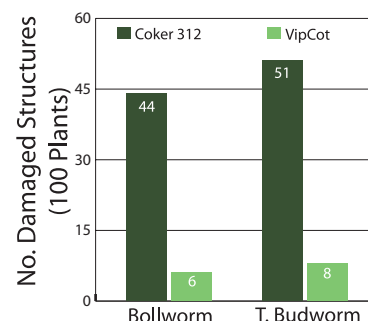
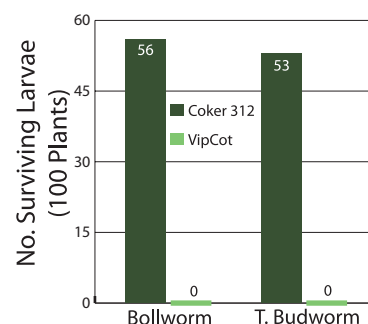


Figure 2. Cumulative surviving larvae recovered on non-Bt (Coker 312) and transgenic Bt cotton (VipCot).



season for larval injury to reproductive structures – flower buds (or squares), flowers and bolls – and surviving larvae. In addition, isolated Coker 312 and VipCot plants in field plots were artificially inoculated with bollworm or tobacco budworm caterpillars. The infested plants were visually inspected every two to three days after infestation for damage to the reproductive structures and for the presence of surviving larvae until larvae were no longer detected.

In the field trial against native infestations, significantly fewer damaged reproductive structures and surviving larvae were found on the VipCot plants compared with the Coker 312 plants (Table 1). On plants inoculated with insects, bollworm larvae injured a cumulative total of 44 reproductive structures on Coker 312 plants compared with six on VipCot plants (Figure 1). Tobacco budworm larvae injured 51 reproductive structures on Coker 312 plants and eight reproductive structures on VipCot plants. In addition, fewer surviving larvae of both target

pests were recorded on VipCot plants compared with Coker 312 plants (Figure 2). Within seven days after inoculation, no bollworm or tobacco budworm larvae were recorded on VipCot plants, but more than 50 larvae of each pest were recorded on Coker 312 plants.

These results suggest that both target pests were susceptible to the combination of proteins in the VipCot technology. None of the larvae for either species produced significant injury to reproductive structures in the field trials. In addition, none of the larvae were capable of completing larval development on the VipCot line. The results from these trials support the continued development of the VipCot technology as an additional tool for managing caterpillar pests in Louisiana cotton fields. ■

Table 1. Reproductive structures (flower buds, flowers and bolls) damaged by bollworm and tobacco budworm and infested with surviving larvae on non-Bt (Coker 312) and transgenic Bt cotton (VipCot) in Louisiana field trials.

Cotton lines	Seasonal Percent (average)	
	Damaged structures	Surviving larvae
Coker 312	14.15	4.61
VipCot	<1.00	<1.00



Student worker Abbey Luckett conducts whole-plant inspections, which were performed at specific time intervals post infestation.

Comparing Single-Row, Twin-Row Configurations

for Louisiana Crop Production

Henry J. “Rick” Mascagni, Ernie Clawson, David Lanclos, Don Boquet and Rob Ferguson

The use of the twin-drill (twin-row) configuration on 36- to 40-inch-wide beds is of interest to Midsouth producers, but as yet it is unproven as a yield enhancement practice for most agronomic crops. The feasibility of this production system has increased with the advent of planters that have the capability of planting twin rows 7.5 to 10 inches apart. A common practice is to center twin rows 9.5 inches apart on 40-inch-wide beds, with 30.5-inch spacing between adjacent beds. For cotton production, however, closer row spacing of 7.5 to 8 inches is needed for picker efficiency. With twin rows, growers can reduce row spacing and, at the same time, have the advantages of raised beds, permitting the use of furrow irrigation. Another advantage is that harvesting equipment – such as corn headers and cotton pickers – does not have to be replaced or modified for this planting system.

Field experiments were conducted from 2004 to 2007 at the Northeast Research Station near St. Joseph, the Macon Ridge Research Station near Winnsboro, and Dean Lee Research Station near Alexandria to evaluate, single- versus twin-row configurations. Details of the experiments are presented in Table 1. This report focuses on the comparison of single and twin rows. In corn trials at the Northeast station, yields for the row configuration treatments were averaged across other variables of seeding and nitrogen rate treatments. The corn hybrid Dekalb DKC697, which was planted the first year, has similar genetics to Dekalb DKC69-71, except DKC69-71 has herbicide- and insect-resistant traits (Table 1). Multiple varieties of cotton were evaluated at the Macon Ridge station and soybeans were evaluated at the Dean Lee station and the Northeast station.

Single rows were planted with conventional vacuum-type planters and twin rows were planted with a Monosem planter. Spacing on the twin rows ranged from 9 to 9.5 inches. Recommended LSU AgCenter cultural practices for commercial production were followed for all trials, and in each trial equivalent seeding rates were used to compare single and twin rows, except for the soybean trial at the Northeast station (experiment 4). In experiment 4, average plant populations were 86,000

Table 1. Description of row configuration experiments, single versus twin rows, conducted from 2004 to 2007 at three LSU AgCenter research stations.

Exp. no.	Crop	Location	Year	Hybrid/Variety
1	Corn	Northeast	2004	Dekalb DKC697
2		Research	2005	Dekalb DKC69-71
3		Station	2006	Dekalb DKC69-71
4	Soybeans	Northeast	2004	Pioneer 94B73
		Research		Southern States
		Station		SSRT4902
				Delta King 4461
5	Soybeans	Dean Lee	2007	Terral TV46R15RR
6		Research	2007	Dekalb DK46S1RR
		Station		
7	Cotton	Macon Ridge	2004	Deltapine DP 491
		Research		Phytogen PSC 355
8		Station	2005	Deltapine DP 491
				Phytogen PSC 355

plants per acre for single rows and 139,000 plants per acre for twin rows.

Corn yield was significantly higher for the twin-row production system in only one of the three experiments (Table 2). When averaged across the three corn trials, grain yield differences were very small – 145.2 bushels per acre for single-row and 148.7 bushels per acre for twin-row treatments. Recent research in Mississippi found a larger yield benefit from the use of twin rows. In those studies, yields were extremely high (250 to 300 bushels per acre), and the most consistent responses occurred in hybrids with fixed or determinate ear type. Fixed-ear hybrids generally are expected to respond to varying plant and row spacing more than “flex” or indeterminate ear types.

Table 2. Influence of row configuration, single versus twin rows, on yield of corn (Experiment Numbers 1-3), soybeans (Experiment Numbers 4-6) and cotton (Experiment Numbers 7-8).

Row configuration	Exp. no. Corn			Exp. no. Soybeans			Exp. no. Cotton	
	1	2	3	4	5	6	7	8
	bu/acre			bu/acre			lb lint/acre	
Single row	114.5	193.7	127.5	46	55.5	58.1	1,634	1,489
Twin row	119.4	194.8	131.9	47	62.5	65.7	1,491	1,462

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Soybean yields increased in twin row plantings in two of three trials (Table 2). Soybean yields were 12.6 and 13.1 percent higher in twin-row tests compared with single-row tests in experiments 5 and 6. Planting in twin rows, however, did not increase the yield of any of the four Group IV varieties in experiment 4. Soybean varieties vary from year to year, and some varieties may respond differently than others to row configurations.

Cotton's response to twin rows was evaluated in experiments 7 and 8 (Table 2). There were no differences in yield between row spacing in either of the two experiments. Cotton plants have great capacity to compensate for available space. A large body of research in Louisiana and elsewhere has found that yields are usually similar across a wide range of plant and row spacing, so these results are consistent with previous find-

ings. Twin-row cotton requires spacing of 7.5 to 8 inches because of harvester constraints.

The yield response to single-row vs. twin-row planting was inconsistent across crops and years at all three locations. Soybeans had the largest response to twin rows, with significant yield increases in two of three experiments. Corn had a small-but-significant yield increase in one of three experiments. Cotton yielded the same in single- and twin-row configurations. As a result of crop prices, corn and soybean rotations will probably become more common in future years. These crops, along with grain sorghum, may be adaptable to the twin-row configuration. Additional research is being done to evaluate fixed-ear corn hybrids that may be more responsive to twin rows. Research also is needed to further define soybean cultural practices that enhance yield and profitability. ■

Flowers, students both blossom at Baton Rouge elementary school

Photo by Tobie Blanchard

When asked "How does your garden grow?" students at a Baton Rouge elementary school have a plethora of plants to list.

LSU AgCenter Master Gardeners and Kids Hope volunteers have helped transform a once dull courtyard at University Terrace Elementary school into a flowering oasis. The garden has become a science project, a vocabulary lesson, a cultural experiment, a meeting room and a place to relax and enjoy nature.

Teacher and coach Tom Talley started the garden 10 years ago.

"Some nurseries in town donated some plants to me," Talley said. "I wanted to start an herb garden and a butterfly, hummingbird garden. But I just kept planting."

With the help of volunteers and students, the garden, which the school calls the International Garden, has grown. It's brimming with native Louisiana plants, tropical plants, herbs and vegetables from all over the world.

"This garden is really a metaphor for what happens here every day, where teachers and administrators are working to plant seeds and grow student achievement and the garden symbolizes what they are doing," said Judy Weaver, a member of the East Baton Rouge Parish Master Gardeners, who has been a volunteer with the garden for two years.

"I tell my friends that it is really fun to grow the plants," said fifth-grader Monawar Chabayta. "It's weird how they start small and then grow really big."

University Terrace has a diverse student population. Chabayta's family is from Lebanon, and students come from more than 35 different countries.

"Our plants are from all the different countries that are represented by the kids," said Linda Daniel, principal at University Terrace Elementary. "So there is a connection with the students and their actual countries."

Many teachers use the garden as an outdoor classroom. Paul Coreil, LSU AgCenter vice chancellor for extension, said the garden can be incorporated naturally into science lessons.

"There is no better way to teach elementary students about



4-H'ers give visitors tours in the butterfly garden at University Terrace Elementary School in Baton Rouge. Students at the school come from 35 different countries.

science and their environment than through a garden that the students plant and care for themselves," he said.

The names of the many plants provide a unique way to present spelling and vocabulary lessons.

"The garden presents so many teachable moments," Daniel said.

Master gardeners around the state are involved in community service projects like this one.

"Partnering with schools to develop gardens gives students the opportunity to till the soil, see plants germinate and grow and finally harvest the fruits of their labor," Coreil said. "This experience enhances the learning in the classroom." ■ **Tobie Blanchard**

Late-fall/early-winter herbicide application

A new approach to managing winter weeds in Louisiana

Donnie K. Miller and Bill J. Williams

Many row crops in Louisiana are produced using some type of conservation tillage system. In these systems fields are allowed to remain undisturbed through the winter and spring until planting. In the absence of spring tillage, herbicide programs are required before planting to successfully manage the weeds that emerged over the winter and early spring.

Control of weeds in the spring before planting has most often relied on programs including glyphosate or paraquat as the primary herbicide with tank mix partners such as 2,4-D, Goal or Harmony Extra. The tank mixes expand the spectrum of weeds controlled and prevent future weed germination. In addition, paraquat applications at planting are often made following a glyphosate tank mix treatment to ensure weed-free conditions for the emerging crop.

Although not always directly related to herbicide effects or competition, win-

ter weeds present in the spring before planting may negatively affect crops because they may serve as hosts for insect and disease organisms.

The LSU AgCenter recommends that herbicides be applied six to eight weeks before planting to remove winter vegetation and eliminate problems with insects migrating from weeds to emerging crops. However, rain and wind often make it difficult to achieve this interval treatment. Delays in spring herbicide applications not only lead to increased insect problems but to reduced herbicide efficacy. As weeds grow larger, they are less susceptible to herbicides.

Overreliance on widely used herbicides, such as glyphosate, has led to an increased incidence of weed resistance in other states. In Louisiana, weeds such as marestail, henbit and ryegrass often require a tank mixture of as many as three different herbicides, once optimum herbicide application timing is missed. Even then these weeds are not always adequately controlled, and cost is definitely increased. Furthermore, previous research by LSU AgCenter weed scientists has shown winter weeds to be competitive in corn if not adequately controlled before planting.

Off-target drift is another problem with spring herbicide applications. Her-

bicides applied later in the spring on cotton and soybean fields can lead to situations of off-target drift that can negatively affect emerged crops that are planted earlier, such as corn and wheat, or home gardens or flower beds. A possible alternative to spring application of herbicides is a late fall/early winter application to eliminate or reduce the amount of weeds that germinate in winter and are present in the spring before planting. In addition, there is an opportunity to use herbicides with different modes of action than glyphosate or paraquat, which will aid in resistance management.

Research conducted with late fall/early winter herbicide applications by LSU AgCenter weed scientists has primarily focused on weed control efficacy with the herbicides Valor, Goal, Reflex, Dual Magnum, Envoke, Resolve, Python, Firstrate and Grasp. Herbicide applications have been evaluated in late November to late December in most trials, but earlier applications in September or early November have been evaluated on a limited basis.

In general, soil activity during winter months following herbicide application has been very good (85 percent to 100 percent control) on some of the more common winter weeds including henbit, chickweed, shepherds' purse, an-

Donnie K. Miller and Bill J. Williams, Associate Professors, Northeast Research Station, St. Joseph, La.

Photos by Donnie K. Miller



111 days after a Nov. 28 application of Firstrate at 0.6 ounces per acre



143 days after a Nov. 28 application of Goal 2XL at 16 ounces per acre



90 days after a Dec. 19 application of Valor at 2 ounces plus Gramoxone Inteon



Bill Williams, standing, at the LSU AgCenter's Northeast Research Station field day in June 2008

nual bluegrass, swinecress and cutleaf eveningprimrose. Research conducted in neighboring states has also observed excellent control of the glyphosate-resistant weed marestail with Valor and Envoke.

On some occasions, research plots have remained weed-free until planting, with no additional spring herbicide application necessary. On other occasions, a follow-up spring herbicide application is necessary, however, for smaller weeds at lower populations that are more easily controlled in spring.

On occasion weeds have emerged in research plots approximately 120 days after herbicide application. Limited research in 2008 indicated that herbicide applications in September or early November are less effective than applications made in late November or December. The reason may be that soil microorganisms remain highly active before the onset of lower temperatures and break down the effectiveness of the herbicide.

The majority of the herbicides being studied either have strictly soil activity or

exhibit primarily broadleaf activity when applied to emerged weeds, with limited control of emerged grass species. In cases where winter grasses have emerged before application, the addition of paraquat or glyphosate has enhanced control.

One concern regarding fall/winter herbicide applications is that with native winter vegetation removed, soil is left bare to be exposed to rainfall during winter months, which may affect row integrity for planting in spring. In addition, conservation programs may require a certain amount of vegetation to avoid erosion on certain soils. Because a majority of the herbicides evaluated have little or no activity on winter grass species once emerged, future research will concentrate on identifying programs that remove common broadleaf winter weeds but maintain some winter vegetation, primarily annual bluegrass, which is easier to control in the spring.

Conclusions to this research are that to obtain maximum effectiveness of fall/winter herbicide programs, applications should be timed to emergence of winter weeds preferably once temperatures have cooled in late November or December. Producers are cautioned that although effective through winter months, these programs may not eliminate the need for a follow-up treatment before or at planting. Therefore, the cost of these programs must be factored in to management decisions. In addition, producers should always confirm whether the use of fall/winter programs and removal of winter vegetation would affect their compliance with participating conservation programs. ■



122 days after a Dec. 19 application of Envoke at 0.1 ounce per acre plus Salvo at 13 ounces per acre

Scientists tackle weeds, insect pests, nematodes

A "gorilla" of a barnyardgrass and a "tough critter" nematode are two of the problems being tackled by LSU AgCenter researchers as reported at the June 24, 2008, field day at the Northeast Research Station in St. Joseph.

Daniel Stephenson, LSU AgCenter weed scientist, told farmers that barnyardgrass "is setting up shop" in the neighboring area of the station, and glyphosate, the chief herbicide used to control it, may no longer be working.

"We need to switch modes of action for control of these weeds," he said. "We need to get residual herbicides out there to control these weeds."

He told farmers if their weeds are not dying, they need to contact someone in the AgCenter to help determine if the problem is with application procedure or resistance.

Charles Overstreet, LSU AgCenter extension nematologist, said the reniform nematode is becoming more widespread. This "tough critter" can survive in soil a long time and without a host.

Overstreet suggested treating zones or areas in a field that have extremely high levels of reniform nematodes with one nematicide (a fumigant) and treat lightly infested areas with another (seed treatment or at-planting nematicide).

"Nationwide, we lose \$100 million a year to reniform nematode. This is a not a lightweight issue," he said. "It's not likely that you will ever eliminate it. All you can do is manage it. Don't let it be a big factor hurting you on yield."

Jeff Davis, LSU AgCenter entomologist, called the red-banded stink bug the new pest of soybeans.

"It is the predominate species out there," he said, adding that Arkansas and Texas are also seeing more of the pest.

Davis said the red-banded stink bug is more tolerant of pesticides used to control stink bugs. Studies are monitoring the stink bug complex at six AgCenter sites, including St. Joseph.

Davis said scientists will be able to tell growers the appropriate applications in the future so they will only have to spray that section of the field affected by the bug and not kill beneficial insects. ■

Mary Ann Van Osdel

FUNGICIDE DEPOSITION

depends on method, volume of application

Roberto N. Barbosa, James L. Griffin and Clayton Hollier

Farmers must rely on fungicides to protect their crops from certain diseases. One of the most serious of these diseases is Asian soybean rust, which is spread by the fungus *Phakopsora pachyrhizi*. Were it not for fungicides, this disease might severely damage Louisiana's soybean crop. Because of their high cost, fungicides must be applied judiciously and effectively. This requires correct timing and placement. Some of the recommended fungicides are protective instead of curative, such as the fungicides to ward off Asian soybean rust. They must be applied to the crop before the infection takes hold. If the fungicide is not there to protect the plant, either because it was not applied at the right time or because the application did not yield a good coverage, there won't be much control.

Volume of application and method of application, aerial or ground, play important roles in the distribution of the fungicide throughout the soybean canopy. Reaching the lower parts of the plant is critical to providing protection against diseases that often start from the ground up, such as Asian soybean rust. Proper application volume depends on spray droplet size and nozzle type.

LSU AgCenter researchers are investigating spray coverage quality when using aerial or ground application and

Photos by Roberto N. Barbosa



Figure 1. Hydraulic nozzles with single jet technology distribute all liquid through a single orifice. They can form spray angles of 80 or 110 degrees.



Figure 2. Dual jet nozzles distribute all liquid through two orifices spaced 60 degrees apart.

how much water to use to ensure good fungicide distribution. During the 2007 growing season, several trials in Louisiana analyzed the effects of different volumes and methods of application in the spray deposition in the soybean canopy. In field trials, a harmless tracer known as tartrazine was added to the spray in lieu of the fungicide. The amount of tracer applied per acre was held constant, even though volume of application changed. Small cards, measuring 2 by 3 inches, were distributed throughout the plant. Deposits of tartrazine in the cards were detected in the laboratory using colorimetry. Because the amount of tracer collected in cards depends on how the spray was applied to the crop and how much water was used in the application, researchers can determine the efficiency of the application process by analyzing tracer concentration.

Results in Ground Application

Application rates of 5, 10 and 15 gallons per acre were tested using different ground sprayers – a tractor-mounted experimental unit and a high clearance self-propelled unit. The amount of tracer used was 21 ounces per acre. Hydraulic nozzles with single or dual spray technologies (twin) were tested for deposition efficiency (Figures 1, 2). System pressure was varied between treatments to accommodate specific application rates in question.

The results show that increasing application rates increases tracer deposition in the canopy as measured by the colorimetry method. However, statistical tests do not differentiate between 10 and 15 gallons per acre. Canopy penetration was expressed by percent spray of total volume that reached the bottom, middle and

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top of the canopy. Reaching the bottom canopy was not improved by increasing the volume of application. There were no differences in deposition from single or dual spray nozzles at any volume of application. Single spray nozzles deposited 68 percent of the total tracer amount in the top of the canopy, on average. Dual spray nozzles deposited 62 percent. The influence of droplet size in aiding canopy penetration was also analyzed. For dual spray nozzles, it is beneficial to choose a nozzle that produces medium-sized droplets because it will aid in the deposition, regardless of the chosen volume of application. More research is needed concerning single spray nozzles.

Results in Aerial Application

Application rates of 3, 5, 7 and 10 gallons per acre were tested using an agricultural aircraft model Air Tractor AT-602. The aircraft is equipped with 82 flat fan nozzles pointed straight back with no deflection. Pressure was kept around 30 PSI, and the application's swath width was calculated at 65 feet. The results for aerial application also show that higher application rates yielded higher deposits of tracer in the canopy. However, no statistical differences were found between 3 and 5 gallons per acre, or between 7 and 10 gallons per acre. Canopy penetration



During spraying season, sprayers should be kept clean and nozzles should be checked, cleaned and replaced when worn.

as expressed by percent spray (of total volume) reaching middle and bottom canopy was not consistently improved by increasing volume of application. Of note is that 5 gallons per acre yielded

the best tracer distribution in the canopy among all volumes tested.

Increasing application rates to increase product deposition in the soybean canopy, especially in the middle and lower portions of the canopy, is a strategy that may yield good results, regardless if done by air or ground. Higher application rates, however, are not a "silver bullet" and will not compensate for poorly maintained sprayers, clogged nozzles and low quality water used during spray. Higher application rates can also affect operation efficiency and ultimately add to the cost of production. Changes in any process have to be well-planned and well-executed to be successful.

During spraying season, sprayers should be kept clean and nozzles should be checked, cleaned and replaced when worn. Calibration procedures should be performed several times during the season. Aerial applicators should also keep their aircrafts in order. The LSU AgCenter offers calibration clinics for aerial applicators. These clinics help them to ensure their equipment's top performance. Weather conditions are important to success, and farmers are to spray only when favorable conditions are met. ■



Small cards, measuring 2 by 3 inches, were distributed throughout the plant. Deposits of tartrazine in the cards were detected in the laboratory using colorimetry.

RESPONSE of WEEDS to Zinc-Glyphosate Mixtures

Derek M. Scroggs, Alexander "Sandy" M. Stewart, Donnie K. Miller,
B. Rogers Leonard, James L. Griffin and David C. Blouin

Production input expenses for crop producers continue to rise. To reduce these costs, particularly fuel and labor, growers can co-apply multiple pesticides and eliminate trips across fields. However, co-application strategies must recognize the concurrent need to control multiple pests. For optimum performance of all products, the pest problems must occur simultaneously, and the treatment timings should coincide with the need to control multiple pests.

With many of Louisiana's crops tolerant to post-emergence applications of the herbicide glyphosate (Roundup Ready), the potential exists for glyphosate to become the primary herbicide in a co-application strategy for pest management. Products such as insecticides and plant growth regulators have been evaluated as co-application partners with glyphosate. In those trials, most products did not negatively affect weed control, and most proved to be beneficial when applied with glyphosate.

Limited research has evaluated the potential for plant nutrients to be co-applied with glyphosate. Past research has suggested no negative effects on weed control when boron, nitrogen or sulfur were co-applied with glyphosate. However, when manganese was co-applied with glyphosate, weed control was negatively affected. The plant micronutrient zinc had not been evaluated as a tank-mix partner with glyphosate.

Value of zinc

Zinc is important to plants as an enzyme activator and is involved in such plant processes as transporting carbon dioxide in photosynthesis, protein synthesis, starch formation and nitrogen uptake. Zinc deficiencies can occur in high pH soils, fields that recently have been leveled or areas with low organic matter. Symptoms of zinc deficiency can include yellowing of

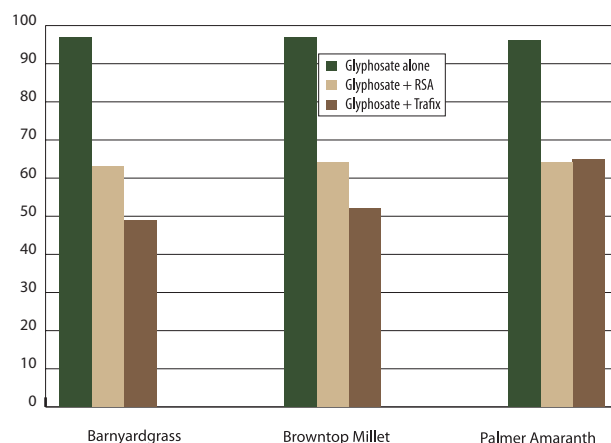
the leaves between the veins, reduced shoot growth (or stunting) and reduced leaf size. To overcome or even prevent zinc deficiencies from occurring, zinc sulfate or chelated zinc can be applied to the soil or to the plant foliage.

Because both glyphosate for weed control and foliar zinc could be used at the same time during the growing season, foliar zinc and glyphosate could be co-applied. The objective of this research was to observe and quantify glyphosate efficacy on selected weed species when co-applied with two commonly used zinc sulfate products.

Field trials

Field trials were conducted on cotton in 2006 and 2007 at the LSU AgCenter's Dean Lee Research and Extension Center in Alexandria. Three glyphosate products – Cornerstone Plus, Roundup WeatherMax and Touchdown Total – were each applied alone, co-applied with a 7 percent zinc sulfate product (RSA) or co-applied with a 10 percent zinc sulfate product (TraFix Zn). The three glyphosate formulations were applied at the rates of 32, 22 and 24 ounces per acre, respectively, and the zinc products were applied at the rate of 2 quarts per acre. Weeds evaluated were barnyardgrass, browntop millet and

Figure 1. Visual weed control 14 days after treatment in the 2006 field study averaged across glyphosate products.



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Palmer amaranth (pigweed). Weed control was evaluated at 7, 14 and 28 days after treatment (DAT) using a scale of 0-100, with 0 = no control and 100 = total weed death.

In 2006, when glyphosate was applied alone, control of barnyard grass was 97 percent, browntop millet was 96 percent at 14 DAT (Figure 1). When RSA was included with glyphosate, weed control decreased to 63 percent for barnyardgrass, 64 percent for browntop millet and 64 percent for Palmer amaranth. Similar results were observed when TraFix was applied with glyphosate. Weed control decreased to 49 percent for barnyardgrass, 52 percent for browntop millet and 65 percent for Palmer amaranth.

The 2007 tests produced similar results. At 14 DAT glyphosate alone averaged 96 percent control of all weeds evaluated, but weed control was reduced by approximately 74 percent across all target weeds when the zinc products were included with glyphosate.



Weeds were grown in trade-gallon nursery containers planted three per pot and thinned to one per pot before treatment.

Pot study

A pot study was conducted twice in 2007 at the Dean Lee Center. All treatments were identical to those used in the field study. The target weeds consisted of barnyardgrass, browntop millet, johnsongrass, ivyleaf morningglory and redroot pigweed. Weeds were grown in trade-gallon nursery containers planted three per pot and thinned to one plant per pot before treatment. Applications were made to weeds when the plants were 3 to 6 inches tall and had 3 to 5 leaves. Visual weed control was estimated at 7 and 14 DAT using a scale of 0-100, with 0 = no control and 100 = total weed death. Additionally, all



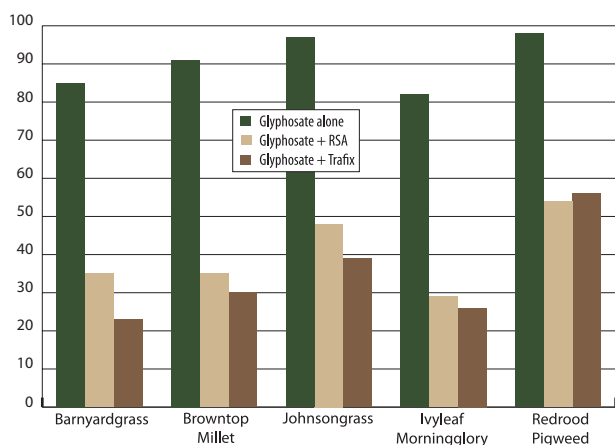
Roundup WeatherMax at 22 ounces per acre applied alone at 14 days after treatment.

plants were harvested and weighed. Biomass from each plant was compared with the non-treated control plants. Therefore, plants with the least biomass were controlled the most by the treatment they received.

When glyphosate was applied alone, weed control for all weeds evaluated ranged from 82 to 98 percent (Figure 2), but weed control was reduced between 43 and 59 percent when zinc was added to glyphosate. Additionally, the greatest reduction in biomass (88 to 96 percent) occurred when glyphosate was applied alone. In co-applications of zinc with glyphosate, biomass was reduced by an average of only 41 percent.

Results of these studies suggest that glyphosate efficacy is negatively affected in co-applications with the foliar formulations and rates of the zinc products evaluated. These antagonistic effects were consistent across all glyphosate formulations and suggest weed control problems could exist with other plant nutrient products as well. None of the glyphosate labels used in this study suggest detrimental weed control effects from co-applications with micronutrients such as zinc. Therefore, growers should be aware of this potential for antagonism, and these co-applications should be avoided. ■

Figure 2. Visual weed control 14 days after treatment in the 2007 pot study averaged across glyphosate products.



Roundup WeatherMax at 22 ounces per acre plus TraFix Zn at 2 quarts per acre at 14 days after treatment.

Landscape Performance of New Herbaceous Ornamentals

Allen Owings, C. Allen Broyles, Yan Chen, Regina Bracy and Ann Gray

The LSU AgCenter conducts greenhouse and landscape research on many new bedding plants each year to determine production practices to assist growers and observe performance in the landscape to provide garden centers, landscape professionals and home gardeners information on how these plants will perform under Louisiana's growing conditions. These trials are conducted at the Ornamental and Turfgrass Research and Extension Facility located at Burden Center in Baton Rouge and at the Hammond Research Station in Hammond.

Efforts over the last couple years have evaluated sun coleus, new lantana series, cannas, perennial verbena, vinca, numerous petunias, phlox, daylilies, violas, pansies, African and French marigolds, ornamental sweet potatoes, zinnias, dianthus, garden mums, angelonias and much more. A brief summary of selected results and observations are included in this article.



Ornamental Sweet Potatoes

Ornamental sweet potatoes continue to be very popular choices for adding foliage color to the landscape. The newest in this exciting group of plants are the Sweet Caroline varieties. There is the Sweet Caroline and the Sweet Caroline Sweetheart groups. Foliage colors in the Sweet Carolines are green and yellow, red, light green bronze and purple. Foliage colors in the Sweet-

hearts (heart shaped leaves) are light green, red and purple. The newest thing in the Sweet Caroline ornamental sweet potatoes that you do not have in other sweet potatoes are the red and bronze foliated varieties and late summer through fall flowering on the Sweet Caroline purple. Another new variety belonging to this group is Bewitched – it has maple shaped, blackish-purple foliage.

Coleus

The LSU AgCenter has been evaluating coleus from Proven Winners the last couple years. The best landscape performers include Life Lime, Big Red Judy, Coco Loco, Dappled Apple, Fishnet Stockings, Glennis, Pistachio Nightmare, Mer-

lot, and Twist and Twirl. Most new coleus now are for sun plantings although some of the new coleus, such as Chocolate Mint and the Kong series from PanAmerican Seed, are best for shade plantings. Coleus hybrids from Proven Winners that performed well in south Louisiana landscapes during 2007 were Royal Glissade, Zen Moment and Quarterback.



Petunias

Petunias being used currently by landscape professionals and being sold in significant numbers at garden centers are the Waves. This groups of petunias includes the following series – Wave, Easy Wave, Tidal Wave and Shock Wave. All of the cultivars in these series have been trialed in LSU AgCenter landscape studies over the last couple years. Colors available in the Wave petunias are purple, pink, rose, lavender, misty lilac and blue. The best performers of these are pink, rose, lavender and misty lilac. Easy Wave colors include blue, coral reef, mystic pink, rosy dawn, red, shell pink, and white. Tidal Waves are available in hot pink, cherry, purple and silver with silver being the best landscape performer followed by hot pink and cherry. Shock Wave is the newest and smallest growing of the Wave petunias. Flower colors are pink shades, ivory, rose, pink vein and purple.



Profusion Zinnias

The Profusion series of zinnias have been around for 10 years now and new color additions are being continually added to the series. Orange, white and cherry were the first three colors of the Profusion zinnias. Profusion Orange has been the best performer of these three. Next came fire and apricot. These have done exceptionally well in AgCenter landscape trials.

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Profusion Zinnias

Profusion Knee High Cherry and Profusion Knee High White are taller growing varieties. New varieties of Profusion zinnias currently being evaluated at the Hammond Research Station are deep apricot, coral pink, double cherry, double fire, double gold and double white.

Vinca

The newest vincas (also called periwinkle; *Catharanthus roseus*) on the market the last few years have been the Titan, Nirvana and Cora series. The Titan series is seed propagated and produces some of the largest flowers in available vinca varieties. There are 8 colors and a mix available in the Titan vinca from PanAmerican Seed. The Nirvana vinca has new DNA engineering that makes it genetically resistant to *Phytophthora* (root rot, stem rot, aerial blight). It is vegetatively propagated. Nirvana vinca are from Fischer USA and are available in 18 cultivars (9 upright, 9 cascading) featuring a wide range of colors. The newest vinca series is the seed propagated Cora series from Goldsmith Seeds. The Cora vincas have the same *Phytophthora* resistance as the Nirvana series. Titan and Nirvana vincas have been good performers in LSU AgCenter landscape evaluation trials. Evaluation of all varieties in the Cora series is currently underway at the Hammond Research Station.



Vinca

For success with vinca in the landscape:

- plant in acid soil (pH of 5.0-5.5)
- planting location needs to be in full sun
- avoid over-mulching and planting too deep
- plant late April through May after the soil temperature has warmed up
- dramatically limit irrigation
- rotate vinca with other plants in landscape beds

Perilla

A popular substitute for coleus are the new perillas. Magilla perilla debuted first followed by Vanilla perilla. The Magilla variety has reddish purple foliage while the Vanilla variety has green and white variegated foliage.



Perilla

While most sun coleus start to flower in late spring to early summer, both of these perillas are very slow to flower in the landscape – first flower is in October. This late flowering eliminates the need to dead-head. Perillas are great foliage plants for a full sun landscape.



Marigolds

Marigolds

Moonstruck is the newest variety in the African group of marigolds. They have performed equally to other established varieties, such as the Incas and Antiguas. The Safari and Durango series of French marigolds have been favorable performers in landscape trials in 2006 and 2007. ■

Fertilize herbaceous perennials *wisely, lightly*

Yan Chen and Regina P. Bracy

Herbaceous perennials are winter hardy ornamental plants that reappear each spring from their crowns or root systems. Many species can be used as groundcovers or landscape plantings to provide color for extended seasons. Some major species in production and landscape use are daylily, lantana, verbenas, purple coneflower and black-eyed Susan.

When good cultural practices are followed, herbaceous perennials can establish themselves quickly and create color in the landscape. Once established, they have relatively low requirements for maintenance. However, nutrient require-



Herbaceous perennials such as the purple coneflower are increasingly popular in landscapes.

Photo by Yan Chen

ments during their establishment are unknown for many species in this group. Because fertilizer is the least expensive input for maximum plant growth, landscape contractors and homeowners tend to achieve fast establishment by over applying fertilizer at planting. This is inefficient and often results in increased environmental risks such as water contamination by nitrate leaching and runoff from excess fertilizer.

Over the past two years, researchers at LSU AgCenter's Hammond Research

Station have conducted field studies to determine the effects of nitrogen fertilizer by type (tablet versus granular), application rate (0 to 4 pounds per 1,000 square feet) and application timing (single or split) on the establishment of seven herbaceous perennials in a full-sun landscape.

The experiment was conducted in a landscape research area that had not been fertilized for several years. Soil in this area is a sandy loam with one percent organic matter. About 4 inches of pine bark were incorporated into the top 6 inches of soil to make raised plots with a 2-foot alley between plots to avoid roots intruding into other plots. Seven perennial species: cigar plant, daylily Stella d'Oro, guara Siskiyow Pink, Mexican heather, lantana New Gold, purple coneflower and black-eyed Susan Goldstrum were planted and treated with different fertilizer regimes.

Two types of fertilizer – OsmocotePlus 16-8-12 tablet (0.26 ounces, 3 - 4 months) and OsmocotePlus 15-9-12 granular (5 - 6 months) – were studied in combination with different application methods (Table 1). At planting, granular treatments were applied broadcast and incorporated into the top 4 inches of soil; tablet treatments were applied by dropping the tablet next to the plant root ball.

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Table 1. Plant quality of seven herbaceous perennials fertilized with two types of controlled release fertilizer in combination with different application methods.

Treatment	Cigar Plant	Daylily	Guara	Mexican Heather	Lantana	Purple Coneflower	Black-eyed Susan
Unfertilized	3.8	7.6	4.1	4.0	3.1	4.0	4.6
Two tablets	8.6	8.3	9.3	9.6	9.4	8.5	9.3
1 lb N/ 1,000 ft ² granular	8.9	8.0	8.9	8.3	7.9	7.0	8.6
2 lbs N/ 1,000 ft ² granular	9.6	7.9	9.1	9.2	9.6	8.5	9.3
4 lbs N/ 1,000 ft ² granular	9.0	9.1	9.8	9.8	9.4	9.3	9.6
2 lbs N/ 1,000 ft ² at planting and repeated in July	8.4	7.4	8.9	8.1	8.1	7.1	7.6
1 tablet at planting and 1 lb N/ 1,000 ft ² in July	7.2	8.3	8.0	8.9	8.6	7.3	8.7

Tablet formula: OsmocotePlus 16-8-12 tablet 0.26 ounce, 3 - 4 months
Granular formula: OsmocotePlus 15-9-12 granular, 5 - 6 months

Plant response to increasing fertilizer rates: When plants were not fertilized, nitrogen deficiency and poor growth were observed in all species except daylily. When fertilized, all species, except daylily, responded positively to increasing fertilizer rates, and four pounds of nitrogen per 1,000 square feet produced in largest plants. However, because large-size plants often lack compactness and require more pruning, they received quality ratings lower than plants that were in lush growth but also were compact and had better flower display.

Comparison of fertilizer types: Better plant quality was observed in cigar plant, lantana and Mexican heather when two tablets per plant or two pounds of nitrogen per 1,000 square feet were used. These two treatments also resulted in better flower display in purple coneflower and black-eyed Susan. The high fertilizer rate – four pounds of nitrogen per 1,000 square feet – produced more flowers, but plant quality ratings were lower because of their large size and lack of compactness. As a result, applying two tablets per plant or two pounds of nitrogen per 1,000 square feet resulted in optimum quality of most plants in May (Table 1). When compared with two pounds of nitrogen per 1,000 square feet, two tablets per plant provided similar season-long nutrients with reduced total fertilizer use.

Overwinter survival rate: Daylily and lantana plants overwintered well regardless of fertilizer regimes. These plants need only minimum fertilizer to establish. Two tablets per plant resulted in higher survival rate (75 percent) in black-eyed Susan, cigar plant and Mexican heather. A single application of two tablets in guara produced results similar to a split application of one tablet at planting plus one pound of nitrogen per 1,000 square feet in July.

Based on these results, we recommend two tablets (0.26 ounce each) per plant at planting to establish most medium- to large-size herbaceous perennials such as lantana, black-eyed Susan, Mexican heather and purple coneflower. The LSU AgCenter recommends a low fertilizer rate at one pound of nitrogen per 1,000 square feet for daylilies. ■

New virus causing disease in Japanese holly fern

Rodrigo A. Valverde and Sead Sabanadzovic

Japanese holly fern (*Cyrtomium falcatum*) is a popular fern in the southeastern United States. This plant is native to Japan. It forms a rounded mound that can be up to 3 feet wide and 1 1/2 feet tall. The foliage is glossy and very dark green. The individual leaflets are leathery and serrated with sharp points resembling holly leaves, thus the common name. Japanese holly fern is evergreen in frost-free areas but loses its fronds in colder climates. It is normally grown outside in part shade as filler with impatiens, caladiums or other ferns as a contrast in color and texture. This fern makes an attractive border around large trees or shrub beds. Until now, this plant was considered to have little disease or pest problems.

During the past five years, a viral-like disease on Japanese holly fern has increased in occurrence in Louisiana and Mississippi. Plants showing symptoms of yellow-mottled leaves have been observed in home gardens, public landscapes and local nurseries in Louisiana and Mississippi. Diseased plants also exhibited reduced growth and premature leaf death. Homeowners in Louisiana and Mississippi have noticed the symptoms and pointed out the problem to plant disease clinics. On the LSU campus in Baton Rouge where Japanese holly fern is common landscape plant, approximately 90 percent of the plants show the virus symptoms (Figure 1).

Since early 2006, researchers from the LSU AgCenter and Mississippi State University have been conducting a collaborative research project on this problem. The main objective is to identify and characterize the causal agent, as well as to study ways the disease is dispersed.

Analyses of double-stranded RNA (dsRNA) extracted from infected Japanese holly fern plants revealed several dsRNAs. These dsRNAs were not present in healthy plants, supporting the belief a virus is the likely cause of the disease. The dsRNAs from infected plants were used to construct a cDNA library, and preliminary information indicates that the fern virus belongs to a new viral species. A procedure was developed to detect the virus, and it was found in foliar tissues (both showing symptoms and with no obvious symptoms) of infected Japanese holly ferns.

Attempts to transmit the virus by mechanical inoculations to several plant species – including ferns – failed. Graft transmission experiments therefore were conducted by grafting tissue from infected plants onto healthy plants. Symptoms developed in the grafted plants three to five weeks after grafting.

The disease caused by this virus appears to be distributed throughout the South. Japanese holly ferns showing viral symptoms have been observed in public landscapes in Alabama, Arkansas, Texas and Tennessee. Testing these plants confirmed the presence of the same virus isolated in Louisiana and Mississippi. Researchers have observed an increase in the number of infected plants in various locations, suggesting a natural vector exists for the virus.

Homeowners and landscape professionals are advised to purchase plants that don't exhibit foliar yellowing symptoms and to destroy diseased plants, particularly when they are next to healthy plants.

Further research is being conducted to learn more about the biology of this virus and to determine the means of natural spread of this emerging viral disease. ■



Figure 1. Infected plants on the LSU campus.

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Broadband access to the Internet and economic development in Northeast Louisiana

James Barnes, Dora Ann Hatch and Glenn Dixon

Access to broadband technology in rural areas remains limited. In the United States, broadband refers to the set of technologies that provide a connection to the Internet, such as phone lines, satellite, fixed and mobile wireless and cable. The February 2006 Pew/Internet and American Life Project reported that only 24 percent of rural Americans have a broadband connection at home compared to 39 percent of urban and suburban residents. Further, adoption of broadband technology in rural areas continues to lag. Between 2001 and 2005, U.S. home adoption of broadband services in urban and suburban areas grew by 30 percent. However, adoption in rural areas grew by only 21 percent. Less access to and lower adoption of broadband inhibit significant economic opportunities for rural Americans. Unfortunately, these same trends hold true for rural Louisiana.

Rural-Urban Gap

Gathering information about broadband Internet infrastructure in the United States remains, at best, a work in progress. The Federal Communications Commission (FCC) requires Internet providers to submit data on customers served, technologies available and other aspects of broadband coverage by zip code twice a year.

In a March 2008 report, the FCC reported a positive relationship between consumers living in zip codes with high

median household income and subscription to high-speed broadband services. Broadband technology adoption is higher in zip codes where income is high and lower in zip codes where income is low. Although high-speed subscribers were present in 99 percent of the top one-tenth of zip codes ranked by median household income and 92 percent of zip codes with the lowest median household income, the gap could be significantly wider. The FCC reports service to a county or parish as available if one subscriber in the county or parish has high-speed service; that is, if one resident has high-speed broadband service in West Carroll, then the service area of West Carroll Parish will be denoted as having broadband services available for the entire parish. This could be misleading. Access for one does not necessarily mean access for all.

Besides household income, other economic incentives affect the gap in service between rural and urban subscribers. According to the Government Accounting Office (GAO), the cost of providing rural service is prohibitive because of too few rural customers. Fewer customers raise the cost of running the provider business, and this dilutes provider incentives to service rural areas. Providers have a stronger incentive to invest resources in serving larger, urban markets rather than rural markets.

The GAO reported that information about existing provider services does not provide an accurate landscape of the broadband infrastructure. Zip code data provided by the FCC reveals some aspects of service but more data are needed. Providers do not have reliable information on the number of potential customers in rural areas. This gap encourages providers to continue to invest their limited resources in larger, urban markets in which economies of scale in marketing and advertising can be achieved.

Broadband Infrastructure

In rural Louisiana, the task of identifying broadband service gaps remains a significant challenge, one shared with other rural areas across the United States. Access to broadband service is difficult to assess, according to a July 2005 report by the State of Louisiana Broadband Advisory Council. One reason cited was companies submitted different types of spatial data regarding broadband capability. The report produced maps of service areas in Louisiana based on telephone, cable and satellite providers. Other technologies such as wireless and broadband over power lines were not examined in the report.

The key technology mapped for telephone companies was broadband service capability for asymmetric digital subscriber line (ADSL). Digital subscriber line (DSL) is a family of technologies that transmits data over the wires of a local telephone network. ADSL is a form of DSL that transmits data faster over copper telephone lines. Asymmetric means uploading data is slower than downloading; symmetrical DSL or SDSL means upload and download speeds are equal. Download speed is usually given in kilobits per second.

Service capability means these providers have infrastructure (phone and cable lines) that could be or currently are being used to supply ADSL service. However, the report does not discuss if any investments in infrastructure need to be made to upgrade the delivery of higher speeds of broadband service. Also, service capability does not necessarily mean consumers have adopted broadband services. At best, the report identifies areas where infrastructure is in place, but subscriber adoption rates across the state were not identified.

For satellite coverage in rural Louisiana, the report concluded that virtually the entire state has coverage because

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an unobstructed view of the southern horizon is accessible. However, because the broadband advisory council did not receive data from wireless companies for its report, the exact nature of tower locations and range of wireless signals and their associated strengths were not identified.

A total of 38 cable providers submitted data via the Louisiana Cable and Telecommunications Association (LCTA). LCTA membership provided capability data based on zip codes served.

Twelve telephone companies submitted data to the broadband advisory council. They included BellSouth and independent phone companies (ICOs). According to the council's report, among the 12 telephone providers that submitted data, BellSouth submitted data that most accurately reflected ADSL service. ISOs reported ADSL service per zip code. Since ICOs and cable providers submitted data based on zip codes, broadband coverage estimates must be interpreted with caution.

Louisiana Delta Perspective

Data from the broadband advisory council's July 2005 report are not publicly available. However, the analysis in Table 1 attempts to quantify some of the broadband coverage implied by the report for northeast Louisiana, including the parishes of West Carroll, East Carroll, Madison, Tensas and Franklin. These parishes are among the persistently poverty-stricken parishes in Louisiana and frequently referred to as the Louisiana delta region.

Based on a comparison of average household income and estimated service

capability per provider, there appears to be some support for the idea that as household income increases so too does access to a more capable broadband infrastructure (Table 1). For example, West Carroll and Tensas parishes have the highest average household income at \$38,109 and \$42,183, respectively. Both parishes have access to a more capable broadband infrastructure compared to Franklin, the parish in this region with the lowest household income at \$21,263. The same comparison holds true for the other lower household income parishes as well, such as East Carroll.

The idea that a rural-urban gap in broadband service availability and adoption exists seems well-established by many studies. Based on this analysis, it's also possible that even among mostly rural, persistently poverty-stricken parishes in Louisiana, access to broadband infrastructure varies with household income.

Moving Rural Louisiana Forward

Not much is known about the broadband infrastructure in the United States, urban and rural areas alike, and especially when comparing phone, cable and other technologies such as wireless. In Louisiana, much work lies ahead to identify the real gaps in service and move beyond using zip code data to do so. The bright spot is Louisiana, and particularly rural Louisiana, can learn from other initiatives and approaches to expand broadband deployment in other states. For example, rural Kentucky was able to expand broadband deployment from 25 percent to 95 percent with the help of a nonprofit organization called ConnectedNation (<http://www.connectednation.com>). This nonprofit gathered the broad-

band coverage data from all providers, then provided coordination of the mapping project using an e-community team. The team worked with communities to develop a strategic plan for broadband deployment, including matching potential rural customers with existing access points in the broadband infrastructure. The ConnectedNation organization initially worked in Kentucky to help connect rural areas and now has also worked in Ohio, West Virginia and Tennessee.

Future Plans

According to a recent study entitled "Blue Print for the Rural South: Discovering New Ideas, Applying New Strategies" by the Southern Rural Development Center, the economic foundation of rural America has experienced dramatic changes over the past two decades making it increasingly important for rural businesses to use e-commerce strategies to strengthen their economic health and stability, improve their market share and catapult the efficiency of their products and services. However, encouraging the creation of new, rural-based e-businesses will require an effective and efficient broadband infrastructure. But until the state of Louisiana can develop a reliable grid of existing broadband infrastructure in rural areas, rural e-business growth will be slow.

The LSU AgCenter has begun responding to the infrastructure issues related to broadband in two ways. First, the LSU AgCenter has hosted two meetings whereby ConnectedNation officials visited with local government officials, broadband providers and elected officials in Louisiana. Initial discussions hinged on discussing success stories and discussing the same approach used by the ConnectedNation model to assess the broadband infrastructure in Louisiana. Second, LSU AgCenter faculty at the Delta Rural Development Center in Oak Grove have begun a broadband infrastructure project called Connect Carroll. The purpose is to develop a map of broadband coverage for East and West Carroll parishes, including the identification of cable, telephone, satellite and wireless capabilities. The next step will be to bring together private and public resources to improve the infrastructure.

Improving the broadband infrastructure in rural Louisiana will require collaboration among local governments, private corporations, institutions and economic development organizations to make e-business growth a viable economic development strategy for rural Louisiana. ■

Table 1. Broadband Infrastructure and Demographics for Northeast Louisiana

Parish	Average Household Income	Population	Type of Broadband Provider	Estimated Service Capability ³
Franklin	\$21,263	40,095	Telephone ¹	25
			Cable ²	60
East Carroll	\$32,747	9,421	Telephone	25
			Cable	60
Madison	\$33,661	13,728	Telephone	50
			Cable	60
West Carroll	\$38,109	12,314	Telephone	50
			Cable	90
Tensas	\$42,183	6,618	Telephone	50
			Cable	75

¹ Service capability for BellSouth; Independent Phone Companies (ISOs) excluded.

² Represents cable high speed solutions (HSD) broadband.

³ Represents the percentage service capability across the parish based on review of geographical information system (GIS) from the Louisiana Broadband Advisory Report, July 2005.

Source: GIS & Mapping Initial Report on Broadband Infrastructure, State of Louisiana Broadband Advisory Council Infrastructure Committee Report. Prepared by David Gisclair and the Broadband Infrastructure Committee, July 2005. Available at: <http://louisianasiteselection.com/SelectParish.aspx>.

Jere McBride's AgCenter legacy: Pecans, tomatoes, energetic leadership

When Jere McBride was hired, he was the youngest administrator in the LSU AgCenter at age 36.

At 70, when he retired in 2008, he was the oldest.

"I doubt anybody has more memories working for the AgCenter than I do," said McBride, who retired as director of the Northwest Region.

McBride began his AgCenter career as director of the Pecan Research and Extension Station in Shreveport in 1973 and, coincidentally, finished his career there at his last official meeting on Feb. 28, 2008.

"The Pecan Station was in ill-repair and quite honestly, an eyesore," said David Boethel, LSU AgCenter vice chancellor for research and director of the Louisiana Agricultural Experiment Station. Boethel, then an entomology researcher, was one of the first faculty members hired by McBride when he assumed the leadership of the station. The U.S. Department of Agriculture had transferred the station to the LSU AgCenter.

McBride recalls his mother wondering why he accepted a job at such a muddy, run-down place layered with poison ivy and little equipment.

"Within a year, through Dr. McBride's leadership, the station began to look like a research facility," Boethel said. "To me, this represents an adaptability that is characteristic of a leader. The research stations he has led always looked professional and well-kept. They reflect favorably on the AgCenter."

During his tenure, McBride worked under seven experiment station directors, including Boethel, four extension directors and four chancellors.

He secured the first doctoral faculty at the Pecan Station and it quickly became one of the leading single-commodity state research stations in the nation. Sales of pecans, which generated significant income for more research, increased yearly, but more importantly, introduced people to the AgCenter, McBride said.

In 1979, he moved to the Red River Research Station in Bossier City to become director. His leadership goals were to enhance research efforts on agronomic and livestock enterprises in Northwest Louisiana, and he did that.

In 1996, the Pecan Station again was added to his administrative responsibilities.

In 2001, when the LSU AgCenter reorganized into eight regions (there are now seven),

McBride was named director for the AgCenter's Northwest Region. In this capacity, he not only oversaw the two research stations but also the extension operation in seven parishes. All together, he supervised approximately 100 people.

"He has always been so supportive of everything we do," said Joan Almond, parish chair for Webster and Claiborne parishes. "I quickly found out that if we needed something to make our job performance better, I could depend on Dr. McBride to help us get it. He truly cared about our staff and tried to help us get the job done."

"His record of service and dedication demonstrates the loyalty and sense of duty that Dr. McBride has shown to the AgCenter," Boethel said. "He has served admirably in every assignment asked of him. When you consider the 10 years he worked for Shell in their agricultural division, he has given 44 years to agriculture. This is a significant accomplishment and worthy of our recognition."

McBride joined Shell Agricultural Chemical Co. in 1963 just before receiving his Ph.D. in January 1964 from LSU in plant pathology. He received his M.S. in plant pathology from LSU in 1961, and his undergraduate work was at Louisiana Tech University in wildlife conservation and game management.

McBride's Shell assignments were in New Orleans, then New York City, Little Rock, Dallas and Atlanta.

"Those last seven years, I bought four houses and sold three," he said. In contrast, he resided in one house in Shreveport for his 34 years with the AgCenter.

His work for Shell began during scrutiny of pesticides brought about by the release of Rachel Carson's *Silent Spring*. This book, about widespread ecological degradation, touched off an environmental awareness that still exists.

At Shell, McBride investigated a large bird kill south of Miami in 1972, isolating the cause as misapplication and saving one of Shell's products, an event that made national headlines. He recalls this being the first time the U.S. Environmental Protection Agency held a hearing on the fate of a pesticide.

McBride worked in various research and development capacities with Shell – development of products, product uses and environmental issues and studies. He conducted research to resolve product problems and label expansion and provided an advanced level of technical support to marketing districts. He maintained close cooperative working relationships with researchers at land-grant universities and regulatory officials.

Photo by Mary Ann Van Osdell



Jere McBride at the Pecan Research and Extension Station, which he turned into a national showcase.

In fact, he learned of the resident director position at the Pecan Station through one of the LSU contacts he had made.

McBride says he has always operated with the philosophy of providing support to those he supervises. "I'll only be successful if they're successful," McBride said.

"Challenges stimulate me and keep my interest high," he said. "I find a challenge in everything I do." He called paperwork the dull part of his job and says his greatest disappointment was not being able to convince the AgCenter administration to acquire more land to put the Red River Station even closer to the Red River. The station is the closest to the Red (one mile) of all land-grant research facilities in four states.

"I think his influence will be a positive part of the northwest region for at least as long as any of us are around," said Randy Sanderlin, plant pathologist at the Pecan Station. "He has always shown a willingness to try different things to help the local agricultural economy."

McBride initiated a commercial vegetable program in 1991 at the Red River Station. H.Y. Hanna, a tomato researcher, transferred to the Red River Station from the AgCenter's Citrus Research Station in Port Sulphur, and together they started the greenhouse tomato program in 1996. Hanna's current research is directed toward production systems and the evaluation of greenhouse tomato varieties.

In McBride's spare time, he enjoyed community activities and served as president of the Downtown Shreveport Optimist Club in 1986-87. He was instrumental in the establishment of the Research Center Administrators Society in the early 1980s, serving as president in 1987.

McBride won't drift far from his former workplace and activities, remaining in Shreveport with his wife Brenda.

Despite all his successes during his career, he calls his proudest accomplishment his family. He has two sons, Dr. Jere W. McBride, an associate professor at the University of Texas Medical Center in Galveston, and Brian, a landscape architect and associate with RVK Architects in San Antonio.

McBride says he'll take care of family business, move into a new house, travel and see his three grandchildren, Will, 9; Reagan, 5; and Michael, 4.

He'll miss his co-workers but will be available to help anyway he can, including the fight to change the route of Interstate 69, which is proposed to run through the Pecan Station.

And he'll continue to be a customer of the Red River Station's greenhouse tomatoes.

■ **Mary Ann Van Osdell**

China Connection

(Continued from page 2)

cultural attachés who work with food safety, horticulture and grain. The panel briefed us on political, economic and agricultural issues in China and U.S. interaction with China and Taiwan.

Our next stop was Xian. There we saw one of the most impressive historical sites in the world – the Terra Cotta Museum with the warrior statues made from terra cotta. Their discovery is rooted in agriculture. A farmer was digging a well and found parts of what appeared to be clay soldiers. The museum is composed of four buildings and houses more than 7,000 terra cotta soldiers. During the trip we also learned about local farm practices and differences in the rights between urban residents and rural farm families. The government requires urban residents to rent apartments while farmers are allowed to build houses. Also, farmers are allowed to have two children, whereas urban couples may have only one child.

Our next stop took us to Suzhou, commonly referred to as the "land of rice and fish" and also "the capital of silk sericulture." This area is rich in agricultural industries, including aquaculture, silk, textiles and gardening. Our tours included a visit to the Wuxi Fisheries College, where we visited with several faculty to learn more about their aquaculture research. We also visited several silk factories and were able to see all stages of silk production including cocoon grading and sorting, silk reeling and production of fabric. This is one of China's biggest agricultural industries, and being able to experience this firsthand was one of the highlights of the tour.

Also near Suzhou we toured the Heilan Textile Mill. This was an amalgam of clothing manufacturing, employee management and futuristic planning. The facility resembled a corporate business complex outside. Inside there were hundreds of employees stationed at their sewing machines making famous name-brand men's suits. The design of the administration buildings and textile mill enables the facility to redirect to another type of business should there be a decline in profitability for textile production.

Our final city of the adventure was Shanghai – the most western and progressive city we visited. A city of more than 18 million people, Shanghai has many skyscrapers, and the street scene was frenzied. The city is preparing for the 2010 World Expo, and much construction is taking place. While in Shanghai, our class toured the Shanghai Sunqiao Agricultural Zone, a premier research facility with the latest technology for growing and packaging fruits and vegetables. Greenhouse space is available for lease by companies who can produce and market their produce. The facility is located on 120 acres, with production of tomatoes, peppers, eggplants, mushrooms, orchids and many other crops. It was quite an experience seeing such large-scale production in greenhouses on so few acres of land.

We toured a pearl market and were given a demonstration on pearl harvest from oysters. These oysters were huge compared to our Louisiana oysters – probably three or four times larger!

Our final day of technical visits in Shanghai included a trip to the Shanghai Flower Port, a facility with large-scale tulip production as well as other types of flowers. We visited the American Trade Organization office and were given an overview of the Shanghai agricultural markets. After the meeting with the ATO, we toured the Shanghai Dongchen Grain and Oil Company. This company is located on the Huangpu River, where soybeans are brought in on barges for oil extraction and crushing for use in livestock feeds. China imports more than 9 million tons of soybeans per year and is the No. 1 importer of soybeans annually. China is home to the world's largest poultry, swine and aquaculture industries. This provides strong opportunities for increased soy inclusion rates resulting in growth in commercial feed use there.

The international study tour was an opportunity of a lifetime. Experiencing the history and culture of China combined with learning about the vast agricultural industry in the country made me aware of China's growing power in international agriculture. The strong work ethic and production efficiencies were impressive, and the facilities we toured were only a small portion of the agricultural production taking place there. It certainly is not surprising that "Made in China" appears on so many goods in the United States and throughout the world. ■



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