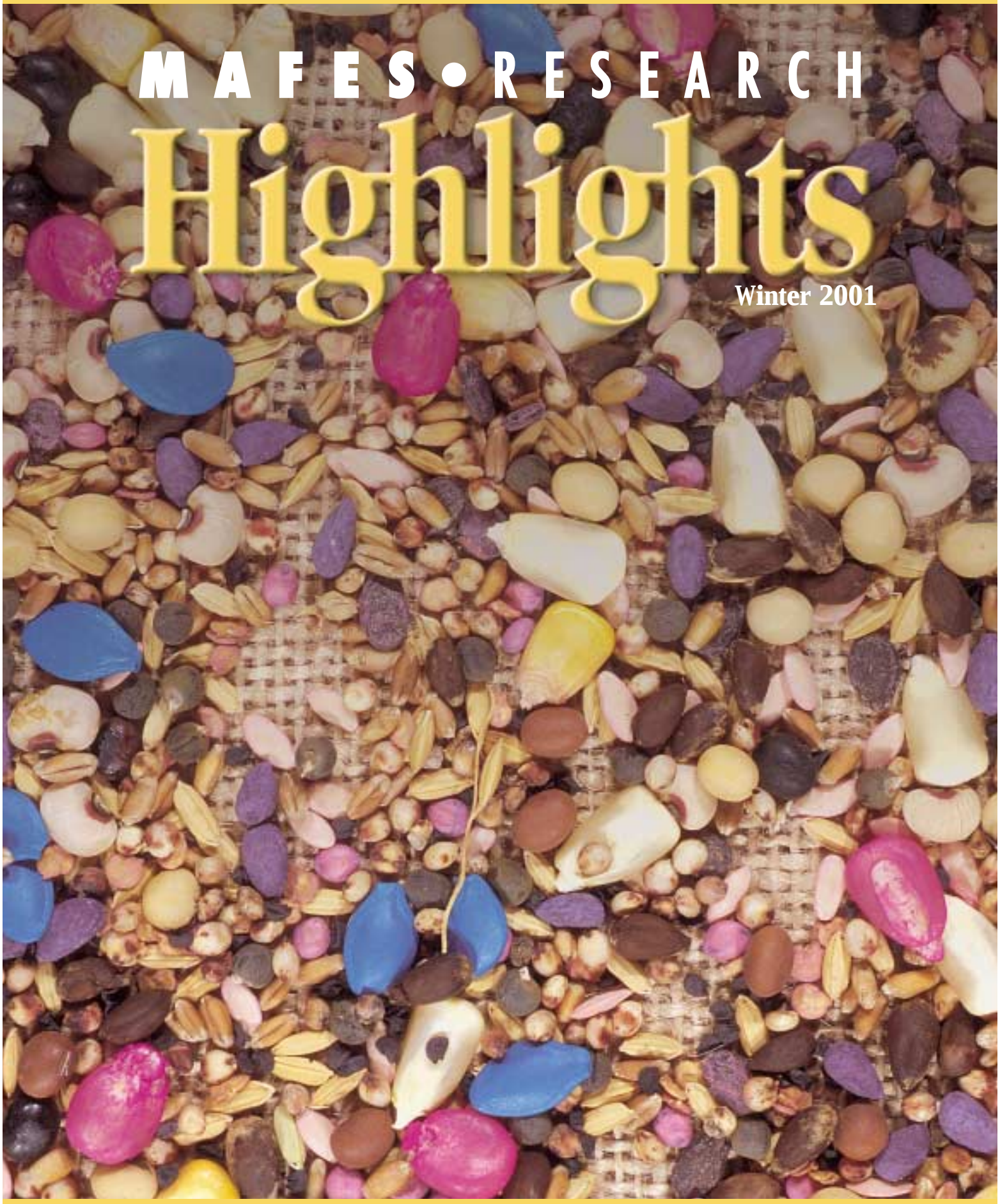

MAFES • RESEARCH Highlights

Winter 2001

MISSISSIPPI AGRICULTURAL AND FORESTRY EXPERIMENT STATION

CONTENTS

FRONT COVER: While the soil lies dormant in the winter, farmers decide what crops to grow in the new planting season. Seeds from crops important to Mississippi agriculture, including cotton, rice and soybean, are shown.

EDITOR'S NOTE: A mistake was made in the story on rice irrigation (Fall 2000, p. 9). The sentence "Precision-leveled fields typically have a one-percent slope, or a one-foot drop for every 100 lateral feet" should have read "Precision-leveled fields typically have a 0.1 percent slope, or a one-foot drop for every 1,000 lateral feet."

from the DIRECTOR

When tillage begins, the other arts follow. The farmers, therefore, are the founders of human civilization.

Daniel Webster, 1840

For almost 300 years, the agrarian idea that the culture of soil is the best and most sensitive of vocations has been deeply planted in the South.

Based on an economic system of plantations and small farms, the South focused on producing "King Cotton," rice, sugar and tobacco. Laborious production practices included tilling, plowing, hoeing, weeding, chopping and picking. Today, much of the backbreaking work is done by machinery, and Mississippi agricultural production has adapted and benefitted from many new technological developments.

Research at the Mississippi Agricultural and Forestry Experiment Station has contributed to improving agricultural practices and has helped keep Mississippi at the forefront of the farm industry.

On page 4, read about the partnership between MAFES and the University of Mississippi that has the potential to yield a new cash crop for Mississippi farmers. The leaves of the common mayapple contain podophyllotoxin, an anticancer compound, which MAFES and Ole Miss scientists will develop into a commercial source of cancer-fighting drugs.

In 1999, Mississippi farmers exported 50 percent of the state's soybean crop, 33 percent of cotton, 10 percent of poultry, 85 percent of rice, and 10 percent of meat and livestock animals to international markets. The impact of international trade policy on state producers is discussed on page 6.

The corn cultivated today was developed over several thousands of years from a wild grass. Today, MAFES and U.S. Department of Agriculture scientists are finding new ways to make corn more resistant to insects and diseases (page 8).

The fungus responsible for charcoal rot lurks in soil and rotting plant residue. Learn about the research that MAFES scientists are conducting to control this destructive pathogen (page 10).

The Mississippi poultry industry has grown rapidly in the past 15 years. One of the problems facing poultry producers is what to do with the increase in waste generated. MAFES research designed to solve this problem is described beginning on page 14.

For the last four years, MAFES and the Mississippi State University Extension Service have provided weather data to cotton and rice growers in the Delta. Find out more on page 16.

Here at the Experiment Station, we are committed to providing support for our farmers. With this commitment in mind, MAFES research will continue to evolve with the changing needs of Mississippi agriculture.

Vance H. Watson
Director

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Highlights

MISSISSIPPI AGRICULTURAL AND FORESTRY EXPERIMENT STATION

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Landmark

Ole Miss, MSU Collaboration

Could Benefit Both Cancer Patients & Mississippi Farmers

By Mitchell Diggs,
University of Mississippi

When Mississippi State University and the University of Mississippi meet in the annual Egg Bowl, only one team will emerge victorious. But the two institutions are meeting for friendlier purposes on a small plot of farmland in Verona, Miss., and the cooperative effort could produce a winner for the entire state.

Scientists from the two universities are working together to develop the common mayapple into a commercial source of potent anticancer drugs. Besides providing a stable source of the drugs, the work could yield a profitable new crop for Mississippi farmers.

The institutions have signed a Memorandum of Understanding between the Ole Miss-based National Center for Natural Products Research (NCNPR) and MSU-based Mississippi Agricultural and Forestry Experiment Station for the project.

"This is another example of our state universities working together to solve problems of state, regional and national significance," said Dr. Ronald F. Borne, vice chancellor for research at Ole Miss. "We look forward to more collaborations with all the institutions of higher learning in the state."

The collaboration is significant because it blends areas of particular expertise for both schools, said Dr. J. Charles Lee, vice president for agriculture, forestry and veterinary medicine at MSU.

"We are pleased that the strengths of our agricultural scientists can be joined with the pharmaceutical scientists of the University of Mississippi to develop new products and production systems that have the potential to enhance human health and the Mississippi economy," Lee said.

Mayapple (*Podophyllum peltatum*) is a natural source of podophyllotoxin, a compound from which the anticancer drugs etoposide (lung and testicular cancers) and teniposide (certain types of leukemia) are derived. Used in chemotherapy, these drugs block the division of cancer cells and help prevent the spread of the disease.

For years, podophyllotoxin could be obtained only from a rare species of mayapple native to India. But Ole Miss and U.S. Department of Agriculture researchers at NCNPR discovered that a species growing wild across much of the Southeast may be a better source.

"The basic work we have done indicates that it can

JIM LYTLE

Postdoctoral research assistant Mohammad Maqbool compares mayapple plants grown under different planting schedules and with different mulching techniques.

JIM LYTLE

> The collaboration is significant because it blends areas of particular expertise for both schools.
>
> — Dr. Charles Lee

be cultivated as a cash crop," said Dr. Rita Moraes, an Ole Miss research scientist who has spent five years studying the plant's commercial potential. "The drug is found in the leaves – not just in the rhizomes, as it is in the plant in India – so you don't have to pull up the whole plant. You just pull the leaves, and the plant will come back next year."

Moraes has worked mainly with container plantings of mayapple, and the next step is for MAFES researchers to cultivate field plantings. Workers from both universities recently harvested rhizomes from mayapple colonies in Oxford and transferred them to beds at the North Mississippi Research and Extension Center in Verona.

"Our main objective is to investigate the economic feasibility and potential economies of scale – what does it take to field-establish mayapple as a crop," said Dr. Kent Cushman, horticulturist at the center. "This is exciting to me as an agronomist because it is the establishment of a totally new crop."

Cushman and Dr. Muhammad Maqbool, a postdoctoral research assistant with the center's medicinal herbs project, are using the initial plantings to compare mulching and propagation techniques. They also are studying planting schedules, nutrient requirements, harvesting and pest control.

The cooperative effort is a critical step in fulfilling the NCNPR's goal of developing new medicines from natural plants, said Dr. Alice Clark, director of the NCNPR.

"Translating our research results from laboratory and experimental plots to scales of production appropriate for selected medicinal plants is the focus of our collaboration with MAFES," Clark said. "Our research focuses on the chemistry and biology of medicinal plants that can be developed as crops, and with large crop production a strong suit of Mississippi State, we believe this will be a strong and productive alliance."

"The project is particularly timely, with interest in medicinal herbs at an all-time high," said Dr. Reuben Moore, head of the North Mississippi Research and Extension Center.

"We were already interested in medicinal herb production, but instead of taking a shotgun approach, we decided it would be better to look at some plants that were already being studied for medicinal properties," Moore said.

When MAFES researchers determine the best way to grow and harvest mayapple leaves, the MSU Extension Service will share that information with farmers and commercial producers, he said.

The work is promising, but farmers should not plan to start planting mayapple for a few more seasons, Moraes said.

"There's still a lot of work to be done," she said. "I don't want anyone to think this will be on the market next year, but mayapple can be a potential commercial source for podophyllotoxin. I'm so glad to see the work moving to this phase after five years, but it still will take several more years of work to complete."

Trade Policy affects Mississippi Farmers

By Bonnie Coblentz

Decisions made in Washington, D.C., Brussels and Tokyo affect everyone, a fact not lost on Mississippi farmers impacted by international trade policies.

Mississippi's top agricultural exports are soybeans, cotton, poultry, rice, live animals and meat. When looking at the value of these exports compared with the value of farm production, in 1999, state agribusiness firms exported almost 50 percent of the soybean crop, 33 percent of cotton, about 10 percent of poultry, 85 percent of rice, and 10 percent of meat and live animals. In some cases, value added to the farm products may be reflected in export value.

Bill Herndon, an international trade specialist with the Mississippi Agricultural and Forestry Experiment Station, said Mississippi farmers are dependent on international trade and exports for their economic livelihood.

"Without the export market, ag prices would fall to unacceptably low levels. Farmers would have to take one out of every four acres out of production since about 25 percent of all our production is exported," Herndon said.

Recent trade agreements such as the North American Free Trade Agreement have made Canada and Mexico top importers of Mississippi agricultural products. Herndon said state exports had some problems in 2000, one being the high value of the U.S. dollar compared with foreign currency. Lingering effects of the Asian financial crisis of 1998 and continued trade sanctions against Cuba and Iraq further reduced the state's ability to export.

"In general, ag exports across the United States and Mississippi have increased since 1999,"

ets

Exports are very important to Mississippi farmers and the rest of the economy.

– Albert Allen

Herndon said. “A bright prospect in the future is permanent normal trade relations with China. That is expected to have a very positive impact on agricultural exports of grain, oilseeds and cotton.”

Albert Allen, MAFES agricultural economist who specializes in international trade, said 1999 was a fairly typical year for exports.

“Exports are very important to Mississippi farmers and the rest of the economy,” Allen said. “As exports have increased revenue for farmers, they have also created off-farm jobs in transportation, processing and financing.”

Exports, and the money they generate, are influenced by free trade and trade barriers. Allen said the World Trade Organization and the European Union were both established to protect the trade interests of member countries.

“The United States normally favors free trade, and many times the European Union is just the opposite,” Allen said. “Japan, a major soybean importer, often has its own trade barriers.”

Allen said trade barriers are most often imposed to protect a country’s new industries and domestic producers. Problems arise when these trade barriers aren’t lifted and exports from other countries are never allowed to enter that market.

Other reasons for establishing trade barriers include a desire to protect the health of the people or the environment, or to be self-sufficient. Allen said the European Union imposed trade barriers they say will protect their people’s health, such as bans on genetically modified crops. Japan has barriers to foreign trade to protect its own rice crop from foreign competition.

Sanctions are another factor influencing trade. Trade sanctions prohibit the export of goods to certain countries and usually are imposed to meet foreign policy or national security goals.

“The only problem with trade sanctions is you have to have other countries participating with you to make them work,” Allen said. “For example, the United States has trade sanctions against Cuba, but as long as some of the European Union countries trade with Cuba, our sanctions have little effect.”

Allen said free trade is a two-way street, requiring both imports and exports. Many countries limit imports to reduce competition with domestic production, but Allen said the economically efficient companies and industries will make adjustments and survive free trade.

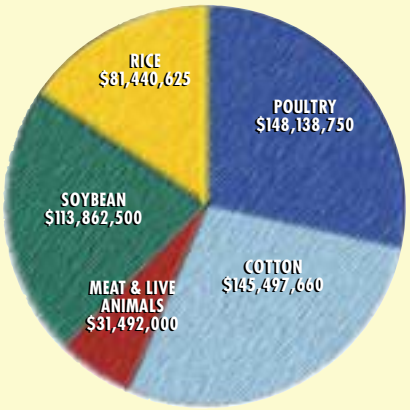
“The overall benefit of free trade is consumer welfare – the consumer getting the best product for the best price,” Allen said.

American farmers sometimes say imported products are inferior and don’t meet the same standards U.S. products must meet, Allen said.

“A lot of countries are not on a level playing field with the United States. They don’t have high wages, emissions limits, environmental quality standards and other restrictions we face,” Allen said. “American products cannot compete on the world market unless there is a level playing field.”

Getting that level playing field requires governments working together to make trade truly free since many countries want to export, but not import. This situation only benefits those opposed to trade, Allen said, and it’s not trade until product moves both ways.

“Consumers are basically left out of this debate,” Allen said. “There are numerous consumers, but they’re disorganized. The smaller number of farmers, manufacturers and distributors are well-organized with lobbyists, and they usually want trade barriers to protect their specific interests. They call for free trade as long as free trade doesn’t impact them adversely.”



Export value of Mississippi goods, 1999

selecting the best from MOTHER NATURE

By Linda Breazeale

Corn has come a long way from the lifesaving grain that Native Americans taught early European settlers in this country to grow. Today's farmers still worry about survival, but mostly from an economic point of view.

Like trainers in a boxing ring, Mississippi State University researchers are teaming up with U.S. Department of Agriculture scientists to develop corn that is able to fight its own battles. Costly pesticides to control insects and diseases are last resorts for growers watching their profit margins and wanting to protect the environment.

For more than 30 years, researchers at the USDA Agricultural Research Service Corn Host Plant Resistance Research Unit at MSU have sought traits that will make corn more resistant to insects and diseases.

"The goal is to develop corn that fights its own pests without added insecticides and fungicides," said Paul Williams, USDA research geneticist. "Insect damage to ears can be the entrance point for disease and/or can add stress to plants to the point of making them more susceptible to diseases."

Williams' team is working to develop corn with pest resistance. They screen germplasm to find resistance, then release a line to seed companies. Martha Willcox, a USDA geneticist, diligently maps out the genes for resistance so they can be transferred to hybrids.

MAFES biochemist Dawn Luthe and her team are attempting to find out exactly what mechanisms make plants resistant. She wants to discover if the taste, texture or toxic effect discourages insects from attacking the plants.

"Plants are fixed in their environment," Luthe said. "They have to change their biochemistry to defend themselves. They can't run away. We want to find out what triggers the plant to protect itself. We look at the proteins in plants with resistance and compare them with plants that are susceptible."

Part of Luthe's research is a quest for proteins that might be related to resistance to *Aspergillus flavus*, the fungus that produces aflatoxin. *Aspergillus* fungus is abundant in the soil and may accumulate under the hot, dry conditions of the South. Aflatoxin can contaminate developing corn ears and is toxic to animals, especially young animals and poultry, that consume fungus-infested meal. Aflatoxin-contaminated grain can also result in significantly lower corn prices or unmarketable corn.

Growers can minimize the likelihood of aflatoxin contamination by using sound agronomic practices, proper-

> Our philosophy is if we can prevent aflatoxin in the field, then you won't have to worry about postharvest accumulation.
>
> — Paul Williams

ly storing and drying grain, maintaining grain quality, and sanitizing grain-handling equipment. However, almost no plant resistance exists, and few, if any, decontamination methods have proven successful and been granted federal approval.

Despite the hot, dry conditions in 2000, aflatoxin wasn't a major problem statewide, most likely because of earlier-than-normal plantings. Last summer, Luthe's team started the groundwork for some new research on aflatoxin. Williams planted susceptible varieties and some of the resistant lines. Gary Windham, a USDA plant pathologist, produced the *Aspergillus flavus* fungus for the inoculations and helped analyze plants after harvest.

Luthe and Olga Pechanova, a graduate student in molecular biology, spent the summer keeping track of corn development, injecting cobs with the fungus and harvesting the ears for study.

"We tried to mimic Mother Nature with a silk channel inoculation. Next, we will be looking at the different proteins that accumulate in response to the fungus and comparing resistant and susceptible plants," Luthe said.

"Our philosophy is if we can prevent aflatoxin in the field, then you won't have to worry about postharvest accumulation," Williams said. "The research will take several years and various environmental conditions. Some genes that make corn resistant to aflatoxin may also make it resistant to drought."

Williams said the ultimate goal is developing corn that is resistant to pests.

"The more we understand, the better we will be able to reduce pesticide usage. We need to be sure the corn is not only resistant to pests, we also need to make sure it will produce well," he said. "When USDA and MSU release germplasm with genetic resistance to aflatoxin or an insect pest, commercial seed companies use the germplasm in their breeding programs.

"The companies' goal is to produce hybrids that combine pest resistance with high yield," Williams added. "A poor-yielding hybrid is not going to sell, so it only gets to the farmers if companies believe the seeds have high-yield potential."

Williams said USDA cooperated with two seed companies this summer by evaluating some of their new hybrids for aflatoxin resistance, while the companies evaluated them for yield and other agronomic qualities.

Williams said the cooperative work between USDA, MSU and seed companies is mutually beneficial. Government and university scientists gain additional expertise from each other. They share facilities, funding and plant lines, and they publish their findings jointly.

LINDA BREAZEALE

MAFES biochemist Dawn Luthe, left, and graduate research assistant Olga Pechanova inject corn silks with *Aspergillus flavus* fungus. Corn silk inoculation mimics the natural route of fungal infection and allows researchers to examine the factors affecting corn resistance to fungus out in the field.

LINDA BREAZEALE

The types of proteins found in corn plants after fungus treatment may determine corn resistance or susceptibility to fungal attack. Graduate research assistant Olga Pechanova harvests fungus-infected corn for protein analysis.

putting a damper on charcoal rot

In 2000, Mississippi soybean producers lost 14 percent of their crop to this disease, making charcoal rot the number one disease of soybeans.

By Rebekah Ray and Charmain Tan Courcelle

One of Mississippi's leading row crops is being stalked by a ubiquitous killer and MAFES is waging war on it.

Soybeans have very little resistance to the fungal pathogen *Macrophomina phaseolina*, the cause of charcoal rot. In 2000, Mississippi soybean producers lost 14 percent of their crop to this disease, making charcoal rot the number one disease of soybeans. There are no known chemical controls for this root and stem disease. MAFES plant pathologists Gabe Sciumbato and Bob Keeling, MAFES tissue culturist/genetic engineer Nancy Reichert, and MAFES seed scientist Paul Meints are coordinating their research efforts to help the state's producers fight this fungus.

"This worrisome disease can wipe out an entire field of soybeans overnight and has been a problem in Mississippi for the last 20 years," Reichert said. "We're researching various approaches to find a way to reduce its presence and limit the damages it causes."

charcoal rot

JIM LYTLE

MAFES seed scientist Paul Meints, right, and graduate research assistant Sherry Bell examine soybean roots for microsclerotia.

JIM LYTLE

Soybean plants infected with *Macrophomina* showing one of the symptoms of charcoal rot – prematurely yellow leaves.

Also called summer wilt or dry wilt, the disease is most often referred to by its common name, charcoal rot, because it appears as a sprinkling of powdered black specks, or microsclerotia, on infected stems.

Numerous other plants, including corn, alfalfa, white clover and sorghum, are susceptible to the fungus, which may lie dormant in many soil types. Mississippi State University Extension Service plant pathologist Mukund V. Patel has compiled a lengthy list of host plants for charcoal rot (*see accompanying list*).

Unlike many other plant pathogens that prefer moderate temperatures and damp conditions, charcoal rot likes very hot and dry soils. Charcoal rot is most often a problem when plants are under severe moisture stress. However, it can attack crops throughout the growing season.

The disease spreads through microsclerotia that can "hide" in soil and rotting plant residue. Microsclerotia are the spores, or seeds, of this fungus, and are between 0.1 and 1 millimeter in diameter (no larger than the head of a pin). The spores have thick walls that allow them to withstand adverse conditions, including cold, for three years or more. Under the right conditions, they reawaken and the fungus undergoes active growth.

Microsclerotia enter plants through lateral roots, then spread into the tap root and move up the stem base. Although root infection can occur anytime during the season, external symptoms are not usually visible during the early stages of disease development. Microsclerotia appear during later stages of development.

Symptoms of charcoal rot on soybeans include premature yellowing of leaves, making infected plant leaves appear scorched. Lower stems and taproots may be light gray or silvery, and pods fail to fill out properly. Entire plants wilt and die with most of the leaves remaining attached. *Macrophomina* "plugs" the xylem, or water transport system, of plants, and the symptoms of charcoal rot are the result of reduced water movement.

To date, methods to limit charcoal rot have included rotating crops, planting early, planting wide-branching cultivars, and maintaining adequate levels of soil moisture, potassium and iron. The object is to close the crop canopy as quickly as possible to reduce soil temperatures so that charcoal rot fungus will be reduced.

Because there are no completely effective chemical or management controls for this fungus, MAFES researchers are looking at different approaches to reduce its impact. The Mississippi Soybean Promotion Board provided some of the funding for this research using producer checkoff funds.

GENETIC RESISTANCE TO CHARCOAL ROT. Genetic differences occur between soybean seeds and varieties, and some varieties of soybean may be naturally resistant to charcoal rot. Sciumbato is using a screening process to identify soybean varieties with the lowest susceptibility to charcoal rot.

At the Delta Research and Extension Center in Stoneville, Sciumbato allows soybean seeds to germinate in the presence of *Macrophomina* toxin. After a seven-day incubation period, he measures the length of any shoots and roots, using these measurements to assess the level of charcoal rot resistance. Results from this study may provide farmers with information that they can use to choose charcoal-

rot-resistant soybean varieties.

But identifying resistant plants is only one avenue that MAFES researchers are exploring. Reichert is using a cell selection technique to generate soybeans with resistance to this fungus. Small pieces of soybean seedling (hypocotyl) are exposed to fungal toxin, which acts as a selective growth pressure and is a known mutagen. Following this process, cells containing genetic modifications for charcoal rot resistance, selectively regenerate fungus-resistant soybean plants. Soybean varieties showing resistance to charcoal rot toxins will be grown in greenhouse and field trials to determine resistance levels.

QUANTIFICATION OF MACROPHOMINA TOXIN. The ability of different *Macrophomina* strains to cause disease – their virulence – is directly related to the amount of fungal toxin produced; the greater the amount of toxin produced, the more severe the charcoal rot. Reichert is developing a method to isolate and quantify phaseolinone, one of the toxins produced by *Macrophomina*.

Precise phaseolinone measurements are required to standardize the amounts of toxin applied to soybean cultures, allowing for accurate assessment of charcoal rot resistance. This technique would also provide scientists with a way to identify highly virulent strains that may cause major problems for farmers, as well as strains that produce little or no toxin, which could be used as biological control agents.

BIOLOGICAL CONTROL AGENTS FOR SEED. Charcoal rot can reduce crop yields under wet conditions in the early spring and under hot, dry conditions when seeds are developing. Because sclerotia persist in soil, as well as on and within the seed coat, Meints is looking for a means to control charcoal rot spread at the seed level.

"Development of a seed-borne inoculum against charcoal rot would give producers early control over the fungus during seedling establishment. This would allow for season-long control because the biological control agent would be present and in close proximity to the plant throughout all stages of development, which would help reduce yield losses to charcoal rot," Meints said.

"I'm investigating ways to introduce preventive measures into soybean seeds that will help reduce the occurrence of charcoal rot," Meints said. "We are testing ways to make soybean seeds resistant to charcoal rot before the seeds are ever planted."

Meints is developing three methods to protect plants from the disease: peat inoculation using the biological control agent *Trichoderma harzianum*; seed pelletization with the control agent; and seed priming. He hopes to extend these studies to include avirulent (non-disease causing) *Macrophomina* strains identified by Reichert's screening process.

Seed pelletization and peat inoculation have been used successfully without altering current production practices. Seed pelletization incorporates the seed, inoculum (*Trichoderma* or avirulent *Macrophomina*) and a coating material into a single pellet for planting. Peat inoculation uses peat moss as a carrier for the inoculum.

During seed priming, seed is imbibed – allowed to take up water – to initiate the early stages of germination. The seed is then redried for conventional handling and planting. Using this technique, all of the seed to be planted is brought to the same point of germination, allowing for a more rapid growth process.

Meints will also examine a field inoculation system that uses an antagonistic fungus, *Trichoderma harzianum*, to keep *Macrophomina phaseoli-*

Soybean seeds inoculated with biological control agents may reduce yield losses to charcoal rot. MAFES seed scientist Paul Meints and graduate research assistant Sherry Bell look for charcoal rot in soybean plants grown from pretreated seeds.

JIM LYTLE

na from overwintering in barren fields. *Trichoderma* is thought to induce production of chemicals by the host plant that are detrimental to *Macrophomina* growth.

"Research has shown that *Trichoderma* overwinters successfully in wheat fields to reduce levels of other pathogenic fungi, so we're looking at culturing it in soybean fields in Mississippi. Although *Trichoderma* works well, we don't have a protocol to make it practical for Mississippi producers yet," Meints said.

The fungus will be evaluated in a simulated killed vegetation, no-till system. Ryegrass or wheat, which are vegetative hosts for *Trichoderma*, spread in a layer over a no-till bed before planting may provide the necessary control for charcoal rot throughout the entire season. The mat may also provide early-season weed control, Meints said.

JIM LYTLE

Retired USDA plant pathologist Bob Keeling is involved in a screening project to identify soybean varieties with resistance to charcoal rot.

charcoal rot

Host Range - Charcoal Rot

(dry weather wilt, or summer wilt)

Macrophamina phaseolina (Tassi) Goidanich

Compiled by Mukund V. Patel, Extension Plant Pathologist

Aeschynomene sp. (vetch)
Aloe sp.
Alysicarpus rugosus
Alysicarpus vaginalis (alyce clover)
Amaranthus sp.
Arachis hypogaea (peanut)
Asparagus sp. (Asparagus)
Baccharis sp. (Groundsel-bush)
Begonia sp. (Begonia)
Brassica oleracea (broccoli, cabbage, cauliflower)
Buxus microphylla
Capsicum annuum var. *annuum* (cultivated pepper, bell, red pepper)
Chamaecyparis obtusa (Hinoki cypress)
Citrullus lanatus (watermelon)
Citrus aurantiifolia (key lime)
Citrus limon 'Rough' (rough lemon, Milam lemon)
Citrus maxima (pummelo)
Citrus medica (citron)
Citrus x *paradisi* (grapefruit)
Coleus x *hybridus*
Cornus florida (flowering dogwood)
Crotalaria sp. (hemp)
Crotalaria spectabilis (showy crotalaria, rattlebox)
Cucumis melo (cantaloupe, muskmelon)
Cupressus arizonica (Arizona cypress)
Cupressus sempervirens (Italian cypress)
Glycine max (Soybean)
Hedera helix (English ivy)
Hibiscus cannabinus (Kenaf)
Hibiscus rosa-sinensis (hibiscus)
Ilex opaca (American holly)
Indigofera hirsuta (hairy indigo)
Ipomoea batatas (sweet potato)
Juniperus virginiana (eastern red cedar)
Koelreuteria elegans (golden raintree)
Lavandula sp. (lavender)
Ligustrum sp. (Ligustrum)
Ligustrum japonicum (wax-leaf privet or Ligustrum)
Ligustrum lucidum (glossy privet)
Liriope sp. (monkey grass)
Lisianthus sp.
Lupinus sp. (lupine)
Mandevilla sp.
Medicago sativa (alfalfa, lucerne)
Nicotiana tabacum (tobacco)
Nyssa sylvatica (black gum)
Ocimum basilicum (sweet basil)
Origanum vulgare (oregano, origano)
Paulownia sp.
Pelargonium peltatum (ivy geranium)
Pennisetum purpurem (Napier grass)
Phaseolus vulgaris (snapbean)
Pinus sp. (pine)
Pinus clausa (sand pine)
Pinus elliottii (slash pine)
Pinus palustris (longleaf pine)
Pinus taeda (loblolly pine)
Prunus persica (peach and nectarine)
Psidium guajava (strawberry guava)
Pyracantha coccinea (firethorn)
Quercus sp. (oak)
Rhododendron sp.
Ricinus communis (castor bean)
Rumohra adiantiformis (leather-leaf fern)
Rosmarinus officinalis (rosemary)
Sabal palmetto (cabbage palm or common palmetto)
Salvia sp. (sage)
Salvia splendens (scarlet sage)
Satureja montana (winter savory)
Schefflera actinophylla (Schefflera)
Sesbania exaltata (hemp sesbania)
Solanum tuberosum (Irish potato)
Sorghum bicolor (Sorghum)
Stokesia laevis (Stokes' aster)
Tagetes sp. (marigold)
Thuja orientalis (oriental arbor-vitae)
Trifolium incarnatum (crimson clover)
Vicia faba (broadbean)
Vigna sp.
Vigna unguiculata (cowpea, field pea)
Vitis sp.
Washingtonia robusta
Zea mays (maize, Indian corn)
Zea mays var. *Rugosa* (sweet corn)

MARCO NICOVICH

Nitrogen, phosphate and potash levels determine the amount of litter that can be used as fertilizer. MAFES poultry scientist Tim Chamblee prepares a litter sample for nutrient analysis.

RESEARCH DEFINES NEW LITTER

By Charmain Tan Courcelle

The Mississippi poultry industry has experienced rapid growth in the past 15 years, with more than 720 million broiler chickens produced per year – more than twice the number of birds produced in 1986. Results from a recent MAFES study may provide relief for Mississippi broiler producers faced with the problem of disposing a larger amount of poultry litter.

Traditionally, poultry litter, which is a combination of bedding material and poultry manure, has been used as a fertilizer or soil amendment. Poultry litter is a rich source of nutrients for crops, but overapplication of this material can lead to increased levels of nitrogen and phosphorus in field runoff with significant environmental consequences. To prevent problems, nutrient management plans are designed to monitor nitrogen and phosphorus levels in poultry litter.

Nutrient management plans previously established by the Natural Resources Conservation Service (NRCS) of the U.S. Department of Agriculture were based on a mathematical formula generated from data collected in other states. This formula predicted that litter nutrient levels and amounts of litter produced increase linearly with each successive flock produced. In other words, after five years of production, the litter would contain five times more nutrients and a producer would have five times more litter compared with one year of production.

MAFES researchers have found that this formula does not always apply.

"With implementation of comprehensive nutrient management plans coming to all broiler farms, we realized that we did not have the data describing the nutrient value of broiler litter on Mississippi farms," said Tim Chamblee, MAFES poultry scientist.

Litter nutrient values vary among states, as well as within a state, based on the type of feed and nutrients chickens receive, Chamblee explained. Therefore, existing nutrient management plans might not accurately reflect the situation in Mississippi. Existing guidelines had the potential to overestimate the nutrient value and amount of poultry litter produced in Mississippi, severely restricting the use of litter as fertilizer on pastureland.

"We set out to look at what happens to nutrients over time as litter ages and the amount of litter produced in Mississippi," Chamblee said.

Chamblee and graduate research assistant Ricky Todd collected litter from 197 Mississippi broiler houses over the course of 28 flock growing cycles. Samples were then analyzed for the amounts of nitrogen, phosphate and potash (N-P-K) present to obtain a complete litter nutrient profile.

"We found that while tonnage of litter increased over time, it did not increase at a linear rate," Chamblee said. "We also found, on a pound-per-ton basis, that N-P-K concentrations increased greatly from the first flock to the fifth flock, or first year of

Poultry litter is a rich source of nutrients for crops and is commonly used as a fertilizer or soil amendment.

JIM LYTLE

PRACTICES

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production, but remained constant after the fifth flock, out to 28 flocks of production.

"The bottom line is we don't have as much litter, nor are the levels of nutrients in the litter as high as was once thought," he added. "Part of this result is because of natural decomposition and microbiological breakdown that occurs in the litter while it is in the chicken house."

Chamblee began his studies with broilers due to the magnitude of broiler production in Mississippi. However, he plans to extend his work to provide producers with information on breeder and pullet litter.

Because of Chamblee's research, Mississippi will be able to revise nutrient management plans for broiler producers, allowing them to use more of their litter while preserving the environment.

"Tim Chamblee's work will allow us to do a better job of planning the requirements for land application of poultry by-products," said Larry Oldham, MSU Extension nutrient management specialist. "His research showing that the quantity of litter is less than we originally thought lessens our concerns of oversupply of poultry by-product in south-central Mississippi."

MARCO NICOVICH

Litter samples are weighed to give dry-weight amounts.

Understanding Poultry Litter Composition

By Charmain Tan Courcelle

Poultry is big business in Mississippi. Ninety percent of the chickens produced in this state are exported, bringing in more than $1.4 billion and making poultry Mississippi's top source of agricultural income.

MAFES has continued to support poultry industry growth through its research, including studies into optimizing nutrient management practices. Poultry scientist Yvonne Vizzier Thaxton leads one of the newest efforts in effective litter management.

"We're looking at the general microbial populations of poultry litter to try to predict the optimum time to clean out a poultry house and when the litter can be used as fertilizer," Thaxton said. "We're also looking for alternative uses for litter."

Thaxton has completed a preliminary analysis of litter samples from poultry houses around the state to determine its microbial composition and stability over time. She said she hopes that the work will lead to a better understanding of the factors affecting litter quality.

"We know that litter changes in composition over time in a poultry house. We suspect that if we take litter at a particular time, there would be benefits," Thaxton explained. "Some of these benefits include antibiotic effects and possible effects on parasitic insects. We also know that bacteria in poultry litter can produce chemicals that are beneficial to plants, and we're looking at the overall microbial population as a first step to understanding litter characteristics."

WEATHER DATA AIDS FARMERS' decisions

By Bonnie Coblentz

A farmer has a much greater need to know local weather information than someone trying to decide whether or not to carry an umbrella, so for the last four years, Mississippi State University has provided this detailed data to Delta growers.

In 1996, the National Weather Service stopped offering agricultural weather and climate services from Stoneville and other similar locations nationwide. When this happened, farmers no longer could get agricultural weather forecasts, advisories and observations, frost forecasts, 30-day agricultural weather outlook or specialized agriculture services.

"Producers need immediate radar and weather information and cumulative data to make day-to-day decisions," said Charlie Estess, northwest district Extension Service program director at the Delta Research and Extension Center in Stoneville. "We're trying to help producers develop their plans and have the data and information they need at their fingertips to make wise decisions as they spend their resources."

Since 1997, MSU has received U.S. Department of Agriculture funding to collect and provide important weather data for agriculture through MAFES and the Extension Service. Today, nine Automated Weather Stations, the National Weather Service in Jackson, and the Southern Regional Climate Center in Baton Rouge supply weather data that is processed and offered to farmers.

One important use of this information is in helping cotton and rice farmers reduce production costs. The data collected known as DD60s aid cotton growers, while DD50s are for rice producers. DD stands for degree days, which are heat units based on a day's maximum and minimum air temperatures. For example, DD60 is an accumulation of heat units per day based on average temperatures of more than 60 degrees.

"Cotton is our number one row crop and has traditionally generated the most revenue," Estess said. "Cotton also has the highest operating cost, and the margin of profit has dramatically reduced over the last several years."

Cotton insecticides cost an average of $85 to $90 per acre each year. A team at the Delta Research and Extension Center has researched and promoted a formula to lower insecticide costs by $30 an acre by eliminating an average of 2.5 insecticide applications a year. This program requires heat unit accumulation data to determine when pesticide applications can end. Armed with this data, farmers can stop spraying earlier than if they simply followed a calendar.

The rice DD50 program uses similar information. Farmers input the variety of rice and set the program according to the date of a particular development point. This program uses current weather data, along with historical data, to project the rice growing season and to alert farmers to when they should do such things as fertilize, flood the field or watch for water weevils.

"The vital thing we needed was area-specific heat unit accumulation data for producers, researchers and others in the industry to be able to determine when to take certain actions," Estess said.

Last year, about 55 percent of the Delta's 1 million acres of cotton used the DD60 system.

"The Weather Project provides data on heat unit accumulation that saved Delta farmers $16 million in 2000 by enabling some to eliminate an average of two insecticide applications on their fields," Estess said.

Farmers access current and archived data from a website. From this site, viewers can see raw interactive daily weather data, radar and satellite information, forecasts, crop updates and other information.

Bart Freeland, geographic information system and weather research assistant in Stoneville, said the website offering the detailed weather information gets about 10,000 hits a month during the growing season.

"Some farmers use it on a daily basis to help monitor their crops' progress," Freeland said.

Information from the Delta Weather Project is updated daily. Producers can access this information online at *www.deltaweather.msstate.edu*.

mafes publications

Following is a list of selected bulletins, technical bulletins and research reports published over the past five years by the Mississippi Agricultural and Forestry Experiment Station. Most of these publications are available online (go to MSUcares.com). For more information, or to order copies of these publications, send an e-mail to robynh@ext.msstate.edu or write a letter to this address:
MAFES Publications
Office of Agricultural Communications
Box 9625
Mississippi State, MS 39762-9625

Bulletins

(B1028) – Effects of Bioregulators on Development and Reproduction of Root-knot Nematodes in Cotton
(B1029) – Strategies for Improving Physiological Seed Quality – A Conceptual Framework for Seed Quality Related Research and Development
(B1030) – Management Practices for Culture of Freshwater Prawns in Temperate Climates
(B1031) – Spodosols in Mississippi.
(B1032) – Cow-Calf Management Calendar
(B1033) – Propanil-tolerant Barnyardgrass Confirmed in Mississippi.
(B1034) – Seed Quality
(B1035) – Weed Control in Rice with Propanil Plus Triclopyr Combinations
(B1036) – Seed Maturation and Establishment of Hardseededness in Pinkeye Purple Hull Southern Peas
(B1037) – Evaluation of Rates and Methods of Application of P and K in a Conservation Tillage System
(B1038) – Catfish Nutrition Production Research
(B1039) – Rice Water Use and Costs in the Mississippi Delta
(B1040) – Evaluation of Nectarine Cultivars in Northern and Southern Mississippi.
(B1041) – A Practical Guide to Nutrition, Feeds, and Feeding of Catfish (Revised)
(B1042) – Japanese Plum Cultivar Evaluations in Northern & Southern Mississippi.
(B1043) – Turf Performance of St. Augustinegrass Cultivars in North Mississippi.
(B1044) – USDA and MAFES Cooperative Soil Conservation Studies at Holly Springs, 1956-1996
(B1045) – Broiler Litter as a Feed Supplement in Replacement Heifer Diets
(B1046) – The Effect of Post-directed and Over-the-top Applications of Herbicides on Kenaf
(B1047) – Evaluation of Kenaf Growth Media as a Substitute for Pine Bark
(B1048) – Lime and Nitrogen for Bahiagrass Production
(B1049) – Influence of Various Compounds and Temperature on Activity of Drop Defoliant on Cotton
(B1050) – Costs and Returns for Cotton, Rice, and Soybeans in the Delta Area of Mississippi, 1994
(B1051) – Cost and Changes of Cotton Insect Control in Mississippi, 1992-1996
(B1052) – Perceptions of Mississippians Concerning the Poultry Industry
(B1053) – Preemergence Herbicide Trials in Kenaf
(B1054) – Productivity in Mississippi Delta Prime Farmlands Drastically Disturbed by Simulated Surface Mining
(B1055) – Peach Bloom Delay and Tree Response to Fall Application of Ethephon
(B1056) – Cost of Producing Narrow-row Cotton in Mississippi.
(B1057) – Sharkey Soils in Mississippi.
(B1058) – Economic Evaluation of Overseeded Ryegrass and Hay Quality for Wintering Beef Cows in South Mississippi.
(B1059) – Bermudagrass Variety Evaluations in South Mississippi.
(B1060) – MS-Choice, MS-Express, and MS-Pride: Three New Turf-type Bermudagrasses
(B1061) – Weather and Cotton Growth: Present and Future
(B1062) – The Impact of the Turfgrass Industry on Mississippi s Economy
(B1063) – An Economic Evaluation: Straight versus Contour Levee Rice Production Practices in Mississippi.
(B1064) – Pendimethalin as a Delayed Preemergence Herbicide in Rice
(B1065) – Beef Cow-Calf Production as Influenced by Forage Management System
(B1066) – Costs and Returns for Cotton, Corn, and Soybeans in the Brown Loam Area of Mississippi, 1995
(B1067) – Soils of Native Prairie Remnants in the Jackson Prairie Region of Mississippi.
(B1068) – Monitoring Node Above White Flower for Cotton Insecticide Treatment Termination
(B1069) – Pedigrees of Upland and Pima Cotton Cultivars Released Between 1970 and 1995
(B1070) – 1994-95 Mississippi Sweetpotato Cultivar Evaluations
(B1071) – Beef Production from Holstein Steers on No-Till Ryegrass Pastures
(B1072) – A Modified Implement for Constructing Wide Beds for Crop Production
(B1073) – Storage Stability and Some Costs of Cryogenically Frozen, Whole Freshwater Prawns
(B1074) – Alfalfa Variety Trials in South Mississippi, 1992-1996
(B1075) – Costs and Returns for Corn, Cotton, Rice, Soybeans, and Wheat in Mississippi, 1996
(B1076) – Nematode Management Investigations in Mississippi, 1997
(B1077) – Development of Sustainable, Cost-Efficient Strategies for Managing Cotton Insects - An Interim Report
(B1078) – Catfish Vitamin Nutrition
(B1079) – Evaluation of Diatomaceous Earth Topdressing for Cyanobacterial Suppression
(B1080) – Comparison of Two Treatment Methods and Four Insecticides for Control of Individual Fire Ant Mounds
(B1081) – Estimated Costs and Returns for Strawberries in South Mississippi, 1997
(B1082) – Costs and Returns for Corn, Cotton, Rice, Soybeans, and Wheat, 1997
(B1083) – Insecticide Trials for Control of Tarnished Plant Bugs
(B1084) – Group IV Soybean Seed Quality as Affected by Planting and Harvesting Date
(B1085) – ForPlanner: A Computer Program for Planning Future Forestry Activities
(B1086) – Operational and Cost Characteristics of the Cotton Ginning Industry in Mississippi.
(B1087) – Understanding Crop Insurance Principals: A Primer for Farm Leaders
(B1088) – Turf Performance of Seeded Bermudagrass Cultivars in Mississippi.
(B1089) – Effect of Seeding and Tillage Method on Yield of Jackson Ryegrass
(B1090) – Catfish Protein Nutrition
(B1091) – Nematode Management Investigations in Mississippi, 1998
(B1092) – Cotton and Annual Weed Response from Normal and Reduced Herbicide Input Practices
(B1093) – Influence of Nitrogen Source and Calcium Fertilizer on Fire Blight Susceptibility of Gala Apple Trees
(B1094) – Potassium Nutrition of Cotton
(B1095) – MSU Cattle: A Windows-oriented Computer Program for Cattle Production Management and Reports
(B1096) – Estimated Costs and Returns for Sweet Potatoes, Mississippi, 1999
(B1097) – Economic Analysis for the Use of Dairy Effluent to Produce Kenaf for Whole-stalk Freestall Bedding
(B1098) – Costs and Returns of Corn, Cotton, Rice, Soybeans, and Wheat in Mississippi, 1998
(B1099) – Proceedings: 1998 Catfish Processors Workshop
(B1100) – Public Perception about Agricultural Pollution in Mississippi.
(B1101) – Impact of Diuron Usage in the Mississippi Catfish Industry, 1999
(B1102) – Fall Deep Tillage of Tunica and Sharkey Clay: Residual Effects on Soybean Yield and Net Return

Technical Bulletins

(TB203) – FISHY 3.0, A Comprehensive Fish Production Management System
(TB204) – Open Storage of Soybean Seed in Mississippi.
(TB205) – Knowledge-Base of rbWHIMS: An expert System for Managing Cotton Arthropod Pests in the Midsouth
(TB206) – Revised Protocol for Scouting Arthropod Pests of Cotton in the Midsouth
(TB207) – User s Guide for rbWHIMS: An Expert System for Managing Cotton Arthropod Pests in the Midsouth
(TB208) – Rearing Tobacco Budworm and Bollworm for Host Plant Resistance Research
(TB209) – Insecticide Trials for Control of Aphids on Cotton in Mississippi, 1986-1998
(TB210) – Effect of a Long-Juvenile Trait upon Flowering in Soybeans Grown in Short and Long Periods
(TB211) – Broadcast Fertilizer Losses in Runoff
(TB212) – Virus and Virus-like Particles Found in Southern Pine Beetle Adults in Mississippi and Georgia
(TB213) – Form-Fill-Seal Machine for Mass Rearing Noctuid Insects
(TB214) – Effects of Vegetative Filter Strip Width on Reducing Fluometuron and Norflurazon Losses in Surface Runoff
(TB215) – Effects of Soybean Tillage on Imazaquin Persistence
(TB216) – Potential Stale Seedbed Herbicide Combinations for Cotton
(TB217) – A Study of Cotton Insect Control Problems in Mississippi During 1995
(TB218) – Major Diseases of Heliothis virescens and Helicoverpa zea in Mississippi Fields and Insectaries
(TB219) – MSTAX: A Computer Simulation for Mississippi Counties and Cities Designed for Tax Appraisal, Assessment, and Settlements
(TB220) – Influence of Spike-tooth Aeration on Permanent Pastures in Mississippi.
(TB221) – Sodium Soils in Mississippi.
(TB222) – Price Volatility in the Harvest Contract for Cotton
(TB223) – Impact of Imported Fire Ants on Mississippi Soils
(TB224) – European Corn Borer in Mississippi. Cotton
(TB225) – Malathion Fate in Water and Catfish
(TB226) – Costs and Returns of Catfish Pond Production in the Mississippi Black Belt Area
(TB227) – Crop Insurance in the Midsouth

Research Reports

(Vol. 23, No. 10) – Efficacy of Biological Feed Additives for Improving Feed Conversion Ratio and Growth of Channel Catfish
(Vol. 23, No. 11) – Influence of Repeated Soil-applied Herbicides on Cotton Growth and Yield
(Vol. 21, No. 1) – Survey of Plant-Parasitic Nematodes in Mississippi.
(Vol. 21, No. 2) – Slow-release Fertilizer Evaluation with Container-grown Plants
(Vol. 21, No. 3) – Effect of Cow Densities in a Year-round Grazing System
(Vol. 21, No. 4) – Grazing Strategies for Developing Replacement Heifers on Endophyte-free Fescue Pasture
(Vol. 21, No. 5) – Performance of Blackberry and Raspberry Cultivars in Northern Mississippi, 1992-1995
(Vol. 21, No. 6) – Crape Myrtle Cultivar Evaluation
(Vol. 21, No. 7) – Effect of Cultivar and Foliar Nutrients on Fire Blight Susceptibility in Apple
(Vol. 21, No. 8) – KENAF: A Guide for Production in Mississippi.
(Vol. 21, No. 9) – Efficacy of Fungicides for Turfgrass Disease Control in Mississippi.
(Vol. 22, No. 1) – Economics of Monocrop Winter Wheat on Clay Soils in the Delta Area of Mississippi.
(Vol. 22, No. 2) – Preplant Use of 2,4-D in Rice
(Vol. 22, No. 3) – Cotton Germplasm: Root-Knot Nematode Resistance in Day-Neutral Primitive Accessions
(Vol. 22, No. 4) – Residual Effects on Cotton from Broadstrike + Treflan Applied to Soybean and Broadstrike SF + Dual Applied to Corn
(Vol. 22, No. 5) – Minimal Effects of Foliar Applications of Gibberellic Acid and Carbohydrates on the Yield of Cotton Lint
(Vol. 22, No. 6) – Earthworm Castings Increased Germination and Seedling Development of Cucumber
(Vol. 22, No. 7) – Poinsettia Cultivar Evaluation, 1997
(Vol. 22, No. 8) – Aflatoxin Accumulation in Commercial Corn Hybrids in 1998
(Vol. 22, No. 9) – Managing Common Rust on Field Corn
(Vol. 22, No. 10) – Evaluation of Selected Seed Treatment Fungicides and Combinations for Kenaf Stand Establishment
(Vol. 22, No. 11) – Ivyleaf Morningglory and Slender Amaranth Control in BXN Cotton
(Vol. 22, No. 12) – Performance of Apple and Pear Cultivars in Northern Mississippi, 1987-94
(Vol. 22, No. 13) – Yield Performance of Clearfield Corn Hybrids

Legislators Learn at Research Facility

The Senate Agriculture Subcommittee on Institutional Farming visited Stoneville as part of a tour of statewide facilities. MAFES agricultural engineer Gordon Tupper, far left, discusses equipment research with committee members, from left to right: Sen. Bill Canon, Sen. Nickey Browning, Sen. Billy Harvey, Sen. Rob Smith and Sen. Joe Stogner.

By Doreen Muzzi,
Delta Farm Press

The next time a funding request arrives at the Mississippi Capitol from Mississippi State University, the Delta Research and Extension Center, or the Thad Cochran National Warmwater Aquaculture Center, legislators may remember their visit to these institutions' research facilities in the Delta.

The thanks for that go, in part, to Delta Council. The Stoneville-based organization recently hosted a tour of state and federal research facilities in the Delta area. Five members of the Mississippi Senate Subcommittee on Institutional Farming – Billy Harvey, Nickey Browning, Rob Smith, Bill Canon and Joe Stogner – participated in the tour.

"We're all members of the Senate Agriculture Committee, and our visit here allows us to meet the best researchers in the world and get a closer look at the current agricultural-related research going on in Mississippi," said Sen. Browning of Ecru. "We are seeing that the industry that we have here today won't be here in 10 years without this research, because new problems crop up every day and continual research is needed to find the answers to these problems."

"We've got to do enough research to keep agriculture and aquaculture going in the state of Mississippi," said Sen. Stogner, who is chairman of the Senate Agriculture Committee and a key member of the Senate Appropriations Committee in the Mississippi Legislature.

Sen. Smith of Richland agreed, saying, "Visits like these let us actually get to see researchers and agricultural leaders face-to-face, which helps us develop relationships with the people who are affected by the agricultural funding bills we have before us in the Senate.

"The importance of visits like this is that a lot of state legislators are unfamiliar with MAFES and what MAFES does," Sen. Smith added. "This is my third visit to Stoneville, and I'm more impressed every time I visit."

Sen. Harvey, chairman of the Mississippi Senate Forestry Committee, said he believes it's important for the state's politicians to be exposed to the research going on at Mississippi facilities. "Anybody that comes up here can't help but be extremely impressed. Before this visit, I was unaware this aquaculture center was equipped to do the things it does."

Sen. Browning added, "This helps me be better able to understand the agricultural issues I'm voting for."

The Senate Subcommittee on Institutional Farming is responsible for state policy related to agricultural research projects undertaken by MAFES and MSU, as well as the management of state-owned cropland such as the Parchman Penitentiary.

"If anything good happens in agriculture in the state of Mississippi, then someone on this state senate committee likely had something to do with it," said Delta Council Executive Director Chip Morgan. "They treat agriculture in the Delta just like they treat constituents in their own districts."

"MAFES is fortunate to have a group of legislative leaders who understands the importance of research and its impact on the Mississippi economy," said Vance Watson, MAFES director. "We appreciate the opportunity to discuss our research programs through this type of visit."

(Modified version, reprinted with permission from Delta

Annual Livestock Production *Sale*

The 18th annual MSU-MAFES production sale brought more than 480 people to the Mississippi Horse Park, Agricenter and Fairgrounds. There were 86 animals for sale at the November 16 event.

"The sale was better this year than last reflecting the strength of the cattle industry," said MAFES animal scientist Mike Boyd. "Leading the way was the increase in average sale price of bulls and bred heifers."

Animals at the 2000 sale brought a total of $75,325, which will go back into MAFES livestock research programs.

JIM LYTLE

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MAFES and USDA-ARS Release New Soybean Germplasm

By Allison Matthews

MAFES and USDA Agricultural Research Service scientists have announced the release of a new soybean germplasm line for breeding and experimental purposes.

Line D96-1217 has the advantage of resistance to the pathogen that causes the disease *Phytophthora* rot. Scientists used the backcrossing method to transfer the gene controlling the disease resistance into the Bedford soybean variety.

The new germplasm line was released in October 2000 for use as a parent to develop high-yielding, multiple-pest-resistant varieties. It is also resistant to races three and 14 of the soybean cyst nematode.

Thomas Kilen, a research geneticist with the USDA-ARS, said he expects that soybean breeders in commercial companies will be the first primary users of the line, and farmers will eventually feel the benefits as they acquire seeds with built-in genetic resistance against two serious pests.

Phytophthora rot occurs most often in the slow-draining clay soils, and nematodes are often found in sandy loam soils. Kilen said farmers with mixed fields may especially benefit from this germplasm line.

A sample of 50 seeds will be available for research purposes from Kilen, P.O. Box 196, Stoneville, MS 38776.

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Experiment Station

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