MAFES Research Highlights

Fall 1998
Volume 61, Number 4

Contents

From the Director

Vance H. Watson

Fall brings with it images of harvests, plenty of food and Thanksgiving celebrations.

Menus for Thanksgiving have changed considerably since the first one was observed at Plimoth Plantation[1] in Massachusetts in 1621. Records indicate that probable fare for the two-day event included wild game, fowl, bread puddings, beer,dried fruits and spices.

More recent spreads of food have added different food items, as the profusion of food choices in this country has increased.

Through MAFES research, the selection, safety and quality of food has certainly improved. Hunger is a very present problem in many countries and with some segments of the population in this country. World hunger statistics indicate that 40,000 people die of hunger or hunger-related diseases each year. That extrapolates to one in six people in the world that die each day from a lack of safe and secure food or food products. World Hunger Day is observed in the fall to emphasize the significance of these statistics and as a reminder of this country's bountiful harvests.

MAFES supports research to help assure a safe and dependable supply of food through studying preservation techniques, testing new treatments to extend product shelf lives and even developing new and different food products like blueberry wine, sweetpot ato flour and soybean cheese.

MAFES scientists Juan Silva and Doug Marshall are researching ways to preserve and improve food products. MaryAnne Drake is investigating protection of food products from a deadly bacterium, *Escheriola coli 0157:H7* or *E. coli 0157:H7*. Kei th Cadwallader and Zee Haque are developing new food products from what has been thrown away in the past. Not only are we researching new foods, we're discovering new uses for what we already have.

MAFES recently added another feather to its food production cap. The Thad Cochran National Warmwater Aquaculture Center was dedicated July 1, as a part of the MAFES Delta Branch Experiment Station in Stoneville. Catfish is a major food commodity for Mi ssissippi, and we are thankful the Aquaculture Center is located in the center of catfish country.

It is appropriate that this fall issue of Highlights centers on MAFES' production of food, its safety, quality and preservation. What better time to think of food than in the fall, as our forefathers did more than 370 years ago. As we enter the holiday season, let us pause and give thanks for the blessings of living in a state and country that have a dependable, economical and safe supply of food.

[1]This is the correct spelling for the site of the first Thanksgiving observation in this country.

MAFES Cooks Up Safer Foods

By Rebekah Ray

Food. The substance of life. The center of our lives. Three meals a day and snacks in between. It's an intriguing commodity that we may consume too much of, yet hope we never have to be without.

MAFES research in food and food technology strives to make sure there is a safe and secure food supply in Mississippi and this country.

Through food science and technology research at Mississippi State University, MAFES continues to improve and develop food products so that we can have more and varied choices. Imagine life without low-fat cheese, soybean oil, catfish nuggets, sweetpota to flour and muscadine ripple ice cream, all of which are MAFES food products.

"There's a lot going on in our program with food and food quality," said Charles White, MAFES food scientist and department head. "Our faculty is involved in many areas of food research and is testing various methods of preservation to e xtend shelf life of food."

Research includes developing biological, chemical and physical intervention strategies to reduce bacteria growth and lengthen shelf life, White explained. MAFES food and food security research emphasizes three areas: food quality, food safety and value-added products.

Food Safety and Food Quality. Safety and quality have long been important issues in the food science industry. Often, technologies designed to improve the safety of a food item also improve its quality and vice versa. Tried-and-true food preservation methods used over the years have included refrigeration, dehydration, fermentation and canning, invented during the Napoleonic Wars. Now, as scientific discoveries have advanced, so has the need for newer, more effective i ntervention strategies.

For example, refrigeration has been one of the first lines of defense against microbial food pathogens, but recent research has revealed that refrigeration alone does not protect against some microbial problems. Effective preservation is even more chal lenging as microbiologists discover new types of bacteria that are immune to currently used precautions. Bacteria such as *Listeria monocutogenes, Yersinia enterocolitica* and *Aeromnas hydrophylia* can survive in temperatures as low as 4 degree s Celsius.

To help overcome pathogenic micro-monsters, MAFES food safety researchers are experimenting with more advanced treatments such as modified atmosphere packaging (MAP) and antimicrobials, biopreservation and rapid detection methods. Scientists use what t hey call a hurdle technique by combining two or more of these approaches to leap a problem, extend shelf life and improve the quality and taste of food products.

"We have a very safe supply of food in this country. Food safety is probably the most important research we do," said White. "In addition to researching and improving methods of food preservation, we're also creating new food products. W e're using more of the food for additional food products. Instead of throwing it away, we're making valued products out of formerly discarded materials."

"Catfish is an important agricultural product to Mississippi, but we have a problem preserving it for safe distribution because it goes bad so quickly," said Juan Silva, MAFES food engineer. "Modified atmosphere packaging (MAP) increases catfish shelf life three to four times."

Using MAP, Silva changes concentrations of atmospheric gases such as carbon dioxide and oxygen to extend the shelf life of catfish, increasing it from about seven days to almost 30 days when stored between zero and 2 degrees Celsius.

Because oxygen aids the growth of bacteria, Silva removes oxygen from within the package, injects carbon dioxide into it to inhibit growth of spoilage bacteria, and thus lengthens its shelf life three or four times.

While the presence of oxygen can cause problems, decreasing it can be detrimental as well. Reducing oxygen levels encourages the growth of some pathogens, including *Clostridium botulinum type E*, a type of botulism that grows at low temperatures. By hurdling MAP with other treatments, such as low temperatures and anti-microbial and organic acid washes, both shelf life and levels of food safety increase.

Silva is also testing the use of MAP on fruits and vegetables. That plastic wrapping covering pre-packaged tomatoes in the produce section may really be a preservative.

Each type of fruit and vegetable exhales its own gases. Shelf life increases when each type of produce is wrapped in plastic films specifically developed for its gases.

MAFES food microbiologist Doug Marshall also is researching catfish preservation by adapting some preservation techniques already tested in the beef industry.

"There's really no need to reinvent the wheel. Some procedures being used in the beef and poultry industry are applicable to the catfish industry as well," Marshall said.

His research retrieves "processing byproducts" of catfish. After fillets have been cut, he uses meat-bone separators to extract remaining meat from between the fish ribs, and then "reprocesses" it into surimi, which is used to make nuggets and imitation crabmeat.

In another investigation, Marshall analyzes food microorganisms present on a product. Part of his research includes biopreservation, in which he uses good bacteria to fight bad bacteria. "Good" bacteria such as *Lactobacillus, Lactococcus and Bifidobacterium are normal naturally occurring organisms that are harmless when consumed. Not only are they innocuous, they are presently used as commercial food preservatives.*

Lactobacillus and Lactococcus aid in fermenting dairy products such as cheese, yogurt and sour cream. Bifidobacterium colonizes in human intestines to create a protective film against bad bacteria in the body.

Foods may also carry "bad" bacteria like pathogenic Salmonella, Listeria, Campylobacter and E.coli.

"Most all foods have toxic chemicals in them, but the levels of toxins (dose) in them are well below amounts that cause dire consequences," said Marshall. "Similarly, infection by pathogens depends on an individual's degree of susceptibi lity for a disease, as well as the dose of the pathogen consumed."

Each person has a different degree of susceptibility for a particular disease. Those with high levels of disease resistance, or low levels of sensitivity to infections, may be referred to as having "cast-iron stomachs." An adult can absorb sm all amounts of E. coli without any damage but that same amount may be fatal to a small child.

"The data we have suggest that between 10 and 81 million people suffer foodborne diseases each year. Of those, 9,000 will die," said Marshall. "These are large numbers. There are a quarter of a billion people in the United States, so eac h of us has about a 10 percent chance of getting a foodborne illness every year. Our research is helping uncover foodborne illnesses and pathogens that haven't been revealed before."

Many cases of foodborne illnesses are not reported. People pick up these ailments from food without even realizing that it is a result of a foodborne pathogen. They simply endure the diarrhea, upset stomach, low fever and lethargy, without seeing a hea lthcare provider.

For the last 20 years, the primary way to determine the presence of pathogenic bacteria in food was to grow a sample in the lab, a process that might take from three to eight days, depending on the pathogen.

Around 1990, new detection methods based on specific DNA or RNA sequences were developed. Even though these methods shortened pathogenic detection time to between eight and 16 hours, they did not reveal whether cells were living or dead. Both give off signals. Further investigation was needed to determine which cells were viable, so the

traditional time-consuming methods were used as well. MAFES food scientist MaryAnne Drake is testing a new method to detect viable foodborne pathogens that does not pick up signals from dead pathogenic cells.

"In my lab, we're pushing the limit with technology and bacteria detection. The molecular techniques used in rapid detection methods quickly differentiate live from dead pathogens. A negative means the absence of live pathogens while a positive me ans viable ones are present. This technology is so accurate, there's no need to confirm findings with a backup method," Drake said. "This is one time when a negative is good."

Until this point, rapid detection has been used only in microbiology. Drake is developing ways to make it applicable to the food industry.

"Rapid detection hasn't been used in the food industry at all. Soon, I hope to apply it to any food item, but right now I'm looking at dairy products," Drake said.

Drake is particularly interested in E. coli 0157:H7, a foodborne pathogen with deadly potential.

First identified in 1982, 0157:H7 has been found in meat, dairy products and apple juice, and it is now the leading cause of acute kidney failure in children.

Ongoing studies in the lab show that bacteria such as 0157:H7 easily survive in common foods such as buttermilk, a food equipped with two intervention techniques, its acidity and its need for refrigeration, said Drake.

"It's really important to keep abreast in the area of food safety. More and more pathogenic bacteria are discovered every year," Drake said.

Value-added Products. *In addition to researching food safety and food quality, MAFES conducts research and development of value-added products.*

Value-added products are food byproducts, or normally discarded food parts, that have been changed into useable items. Commonly thrown-away items such as shrimp heads become value-added when used as compost or feed ingredients for livestock.

MAFES food scientist Keith Cadwallader is developing processes to convert shrimp processing by-products (shrimp heads) into "natural" shrimp flavorings, a value-added product that is rich in free amino acids and can be used to flavor soups an d gumbos or seafood analog products such as surimi.

The challenge is in producing a flavoring that has the same flavor as shrimp meat.

"There are hundreds of volatile compounds in cooked shrimp, but only a few impact its aroma quality. By knowing the identities of these compounds and their concentrations we can have a better idea of how to recreate authentic shrimp flavor," said Cadwallader.

Currently Cadwallader and his students are developing seafood extracts from the various seafood byproducts of crabs, crawfish, and shrimp. Due to changes during processing, these products have flavor attributes that are somewhat different from their re spective seafood meats. Recent studies are determining how to match the authentic seafood flavor

by fortification with additional flavor compounds or flavor precursors.

To determine the aroma-impact components of a food, Cadwallader prepares an aroma extract from the food sample and analyzes it by a method called gas chromatography-olfactometry (GC), a process that separates the complex aroma extract into its individu al components. The human nose is used as a chemical detector to indicate the attributes and intensities of aroma-active compounds as they exit the GC.

The process is repeated for several serial dilutions of the aroma extract presumed to have the greatest impact on the overall flavor of the food. Once the identities of these compounds are known, then their concentrations in the food are determined.

Aroma is extremely important in food flavor and acceptance. Flavor is actually a combination of aroma and taste. Aroma of a food is sensed "retronasally," either by sniffing or during eating. Aroma is perceived only when a volatile "arom a-active" compound reaches the sensory nerves.

Flavors of foods such as beef or chicken are difficult to distinguish based on their tastes alone. The tongue, the taste organ, is only capable of detecting five basic tastes, salty, sour, sweet, bitter and umami (as from MSG). Chicken and beef probabl y taste very similar when eaten with a closed nose.

"My major emphasis is flavor chemistry. As a food scientist, I have two concerns, developing new technologies to improve food flavor quality and transferring this information to the food industry in Mississippi and the U.S.," said Cadwallader .

MAFES food scientist Zee Haque works with protein functionality, specifically whey, a milk byproduct.

"In this country, between 30 and 40 percent of milk produced is converted to cheese. After the cheese is made, whey remains. In the past, whey was thrown away," said Haque.

Haque is researching ways to "recycle" this nutritious, healthy byproduct. Even our ancestors knew it was beneficial and used it as a health drink. Whey has many components that might help overcome health problems, such as reducing blood pres sure.

In his research, Haque is reshaping whey into foams and gels that are more easily consumed to check for functionality.

The United States has one of the lowest, if not the lowest, costs of food in the world. As consumers in this country, we spend less than 11 percent of our disposable income on food, allowing us to enjoy a higher standard of living than the rest of the world. MAFES food research ensures we have a safe supply of food.

Aquaculture Center Honors Cochran

By Rebekah Ray and Bonnie Coblentz

Catfish has such a hearty following that its production and related services have become vital to Mississippi's economy.

As the fourth largest agricultural product in the state, the industry contributes more than $2 billion to the economy each year. To assure further growth, Mississippi's catfish production needs solutions to significant problems. Government, industry an d university leaders have joined forces to establish the Thad Cochran National Warmwater Aquaculture Center at the Delta Branch Experiment Station in Stoneville.

"I am flattered and honored to have the aquaculture center named for me, but many others deserve credit for making this dream a reality," Cochran said during recent dedication ceremonies.

Construction of the new research facility in Stoneville is a major development for the industry that is continuing to grow in the South.

"In 1991, then-MAFES Director Verner Hurt suggested how a catfish research center could advance development of the catfish industry, so we began meeting with Mississippi State University, the Delta Branch Experiment Station and U.S. Department of Agriculture officials. Funds from Congress led to the development of a national warmwater aquaculture center. It was a dream that has now become a reality," said Cochran.

Mississippi produces more than 72 percent of the catfish used in the United States, with 60 percent of it coming from within a 60-mile radius of Stoneville.

"I don't think anyone could have imagined that when Delta farmers first started building ponds on former row-crop lands in the 1960s and 1970s, the production would be where it is today," said John Dillard of Leland, who has been raising catf ish for almost 30 years.

Construction of the $8.5 million facility started in October 1996. The Mississippi Board of Trustees of the Institutions of Higher Learning voted at the time to name the facility for the Mississippi senator whose leadership brought it to the state.

The Aquaculture Center includes 243 earthen ponds, a 32,000-square-foot office/laboratory building, an 8,000-square-foot nutrition laboratory, a genetics complex, a 6,000-square-foot aquaria facility of tanks and laboratories for conducting disease res earch and associated shops and runway buildings.

"In order to reach the point where we are today, there are plenty of people who should be recognized, but one name stands out -- Sen. Thad Cochran. When problems arose, he stepped forward to help the catfish industry and ensure that it was treated like every other agricultural enterprise," Dillard said.

Despite the hot, humid weather, 320 people attended the July 1 dedication of the new center. Dedication activities included an evening reception for Sen. Cochran and a visit by the senator to one of more than 200 catfish ponds that are part of the aqua culture center's facilities. His hosts included MSU President Malcolm Portera and Catfish Farmers of America President Austin Jones. Other special guests included Congressman Chip Pickering, Under Secretary of Agriculture Miley Gonzalez, Delta Council President Tom Robertson and Luther Alexander, president of the Washington County Board of Supervisors.

"The growth of catfish aquaculture in Mississippi is one of great success stories in agriculture. In the blink of an eye, aquaculture has transformed catfish from a wild species

into domestic production," Portera said.

The facility fosters cooperative research efforts of the USDA Agricultural Research Service, MAFES and MSU's College of Veterinary Medicine.

Getting federal and state catfish researchers under one roof will pay greater dividends than keeping them housed separately. Until the construction of this warmwater facility, catfish researchers and Extension specialists were housed in three separate buildings in Stoneville. Consequently, they didn't have much contact with each other to share ideas. The new facility should bring cohesion into the program.

Ed Robinson, center coordinator, said the facility provides a single contact for those needing information on catfish. Farmers who called with questions sometimes ended up being transferred several times before reaching the office they wanted.

"We'll have one point of coordination for the total aquaculture program at Mississippi State," said Robinson. Built with federal money and operating on state and federal funds, it will house 17 MAFES and USDA scientists, Extension personnel a nd a diagnostic center run by the College of Veterinary Medicine.

"Information developed at the center will benefit catfish production throughout the southern United States," said Jim Smith, head of the Delta Research and Extension Center. "The catfish industry is still relatively young and all areas n eed research."

Researchers at the center will study solutions to the most pressing problems of the aquaculture industry using basic and applied research, extension and diagnostic services. Catfish production throughout the South will benefit from the center's efforts .

Research programs at the center will focus on all aspects of catfish production, including nutrition, water quality, genetics, engineering, the management of harvesting and grading, and the relationship between fish behavior and environmental factors. Farmers bring their sick catfish to the lab for help with diagnosing disease and water problems. The diagnostic lab is a vital link between farmers and researchers.

"This facility will strengthen the already impressive corps of scientists working together for the good of the aquaculture industry," said Rodney Foil, vice president for MSU's Division of Agriculture, Forestry and Veterinary Medicine. " We expect productivity, stakeholder input and consumer benefit to increase rapidly during the next several years."

"The farm-raised catfish industry is still very young, and there are tremendous challenges that we face which do not always have proven answers. Sen. Cochran laid the foundation for the center, which will act as a nerve center for farmers and othe rs seeking information on catfish," Foil said.

Catfish aquaculture is such a success story in Mississippi that there are more the 110,000 catfish ponds in the state. Served year-round, catfish has moved from a traditional Southern delicacy to the fifth most popular fish in America.

"The catfish industry is a classic example of a successful partnership between the public and private sector," Dillard said. "The center's dedication is simply a physical manifestation of a true American success story, whereby government and the American

farmer have worked together to create a multi-billion dollar economic machine that has raised the standard of living of an estimated 25,000 people right here in the Delta."

U.S. Ag Under Secretary Briefed on MAFES Work

By Bonnie Coblentz

Miley Gonzalez, U.S. under secretary of agriculture for research, education and economics, visited MAFES facilities and Mississippi State University in July to learn about emerging research projects.

Nancy Cox, assistant MAFES director, introduced plans for an MSU Biotechnology Center that will offer programs combining science, technology transfer and education.

"An MSU Biotechnology Center will provide a nucleus for world-class programs in biotechnology research and commercialization," Cox said.

MSU's biotechnology research focuses on plant and animal resistance to disease and pests, waste bio-remediation, biomedical engineering and diagnostic expertise.

Gonzalez also learned about MCARS, the Mississippi Coalition for Applications of Remote Sensing, a two-year major cooperative project of MAFES, NASA and various MSU departments. MSU has the needed computational power at the Engineering Research Center to process data collected by NASA satellites from Mississippi's farmlands. MAFES researchers are developing ways to use this precision farming technique to make practical strides in agriculture.

David Shaw, MAFES weed scientist, said once formulas have been established to interpret aerial map images, there are numerous possible applications of the data. This technology can offer remote monitoring of environmental issues, yields, forest invento ries, soil fertility, nutritional stress, water quality, weeds and more.

This kind of detailed information can help farmers make better management decisions, save money and increase profits.

Nancy Reichert, MAFES plant scientist, demonstrated genetic engineering protocols developed in her lab for DNA introduction and plant regeneration through tissue culture. These transformation and regeneration protocols were developed for five crops: co rn, cotton, kenaf, rice and soybeans.

"We're waiting to hear if patents for four of these unique processes have been approved," said Reichert. "We will apply for the rice later this year."

Gonzalez, responding to the briefings, said, "If we could take just 10 percent of what we're saving (from these biotechnology advances) and capture it for research, we wouldn't have to worry about funding."

Mississippi Blueberries Yield a "Fine Wine"

by Marcela Cartagena

Strawberry wine may have a place on country music charts, but Mississippi State University wine researchers are looking to top the charts with the state's blueberries.

"Blueberry wine tastes different," said Juan Silva, MAFES food scientist. "It has a softer and less acidic flavor than grape wine."

Silva said the blueberries are shipped from South Mississippi, near Collins and Poplarville, to make this 12-percent-alcohol wine.

Like muscadine grapes, blueberries are low in sugar, an important fact in the wine-making process.

"Once we select the fruit, we place the berries in steel tanks and wait for three to five days to extract its color," Silva said. "During these days, the berries begin to ferment, converting sugars into alcohol."

When the blueberries are fermented, wine makers press the fruit to extract the juice. Sugar and yeast are added to the blueberry juice and it then is poured into a special five-gallon container. The container, called a carboy, has an airlock to avoid a ir but allows carbon dioxide to exit so fermentation can occur.

"When fermentation is finished in six to eight weeks, yeast and other solid particles, called racking, fall into the bottom of the carboy," Silva said. "We filter the racking off the wine several times to make sure there is not a single solid particle left. Then, we taste the wine."

Silva added that after the tasting, they add preservatives so no molds or yeast grow in the wine.

"Preservatives are only added when sugar is used because sugar can cause mold growth in the wine," Silva explained.

When the entire wine-making process is done, the wine is bottled, sealed and placed in a dry and temperate room to be preserved. Silva said it is unknown how long blueberry wine can be stored.

"We have kept some bottles of muscadine wine for nearly six years, but we're still researching the aging process for blueberry wine," Silva said.

Silva stated the goal of wine research is a product that would be accepted by the customers. Then researchers submit their recipes to different trade publications.

He said there are possibilities of making wine with other fruits, such as peaches and strawberries.

"Our work really depends on what Mississippi grows because we prefer to do research with Mississippi produce," Silva said.

In Brief

MAFES Scientists Co-author Award-Winning Paper

Two MAFES scientists from Mississippi State University have received national recognition for their research on DNA of the sweetpotato.

Kittipat Ukoskit, research assistant, and Paul Thompson, MAFES horticulturist, co-authored "Autopolyploidy versus Allopolyploidy and Low-density Randomly Amplified Polymorphic DNA Linkage Maps of Sweetpotato." Named the most outstanding resea rch paper published in 1997 by the American Society for Horticultural Science, this paper detailed the genetic linkage of randomly amplified polymorphic DNA in Ipomoea batatas.

Considered for years a southern staple, sweetpotato is the seventh most important food crop in the world. It ranks third in value of production and fifth in calorie consumption in developing countries.

Very little genetic research has been done on the sweetpotato. In their research to develop a genetic map, Ukoskit and Thompson discovered that genetic markers were inherited in an autopolyploid pattern in 'Vardaman' and 'Regal' varieties, useful infor mation for breeding and crop improvement.

Many plant species develop from accidents in cell division that result in extra sets of chromosomes with characteristics different from those of the parents, a condition called polyploidy. Polyploidy has been of great importance in the production of oa ts, wheat, cotton, tobacco, potatoes, bananas, coffee and sugar cane.

Autopolyploids develop when an individual has more than two chromosome sets, all derived from a single species, that produce fertile new and different species almost instantaneously. This occurs most frequently in plants.

Allopolyploids develop when two different species contribute to a polyploid hybrid. Genetically, a mule is an allopolyploid.

MAFES Scientists Create Chick Carbonated Yogurt

Considered a health food 20 years ago, yogurt is now enjoying such a reception that it has become a trendy fast and nutritious snack. MAFES researchers are looking for ways to make it even more appetizing.

MAFES food scientists Y.K. Yuceer, Patti Coggins, Julie Wilson and Charles White compared consumer acceptance of carbonated plain, strawberry and lemon low-fat yogurts to the same flavors of non-carbonated low-fat yogurts. The test evaluated the effect carbonation had on perception of various flavors and texture properties.

Scientists added carbon dioxide to cooled yogurt, which was evaluated by a consumer panel after 21 days.

Panelists preferred the carbonated version for flavor and texture. Adding carbonation did not adversely affect consumer acceptance of flavored and plain yogurt products, and had no significant effect on the shelf life of the product.

Yogurt was first introduced in the United States as a health food in 1940. Since 1974, per capita consumption of yogurt has steadily inreased as Americans have become more health conscious. In 1995, individual consumption peaked at 2.32 kilograms. Carb onating yogurt could enable it to make a significant move into the snack food area.

MAFES Scientists Guide Top Winning Team

By Bonnie Coblentz

Four academic teams coached by MAFES scientists recently won top honors in national competitions and brought distinction to their college, departments and MAFES.

The Agricultural Economics, Horticulture, Poultry Science and Dairy Products Judging teams all won first place in their respective national competitions in the last academic year.

The Dairy Products team won first place last November at the 76th Annual Collegiate Dairy Products Evaluation Contest held in Chicago. Charles White, MAFES food scientist and team coach, said the department's five wins in 12 years give it the best reco rd in the country.

"Food companies are very anxious to have individuals trained in sensory evaluation, and these skills are tested in the competition," White said. "Students learn to taste a product and know whether it is good or bad, and how to fix anythi ng that is wrong with it."

Students with a natural ability in this field, diligence and a desire to work do well in this competition, White said. These same skills enable them to perform well in jobs after graduation.

"These abilities are very much in demand in the food industry, and our graduates get many very attractive job offers," White said.

Dairy products team members this year scored twice as many points as the second-place winner. Members included Joe Rained, Jennifer Ormon and Suzann Reddin, with alternates Eric Smith, Caroline Betbeze and Daryl Parker.

The Poultry Science Club placed first in the National Collegiate Poultry Judging Contest in November in Fayetteville, Ark. Team coach Tim Chamblee, MAFES poultry researcher, said this was the fourth win in five years for MSU's poultry judging team.

"The students who compete get hands-on experience with learning how to think and evaluate both live animals and market products," Chamblee said. "This competition gives students practical experience and helps prepare them for the real wo rld."

Members of the winning team were Brian Lott, Jason Green, Jason Stewart, Brian Massengale and alternate Gerald Jones.

Stan Spurlock, a MAFES agricultural economist and advisor for the agricultural economics team, coached a three-man team in the Academic Quiz Bowl during the annual meeting of the American Agricultural Economics Association last August in Salt Lake City , Utah.

"Students who competed gained extra knowledge because they spent a little more intense concentration in some areas," Spurlock said.

This was the first win for MSU's agricultural economics team, which was composed this year of students Corey Miller, Tige Hopper and Derrick Surrette. The team never lost a round in the double-elimination tournament.

MSU's Horticulture Club placed first at the American Society for Horticulture Science conference in July in Charlotte, N.C. This year marked the fourth time in five years the club won top national honors.

MAFES horticulturist and team advisor Richard Harkess said the extra time team members spent studying materials for the competition drove home information being taught in class.

"Our students do particularly well in the plant identification part of the competition," Harkess said. "They take three courses in plant material identification and use, and I think they get a good foundation that really helps in the com petition."

Team members were Daniel Ashworth Jr., Karl Gercens, Will Lowery and James Rawson.

Marshall Co-authors Medical Texbook Chapter

Douglas L. Marshall, MAFES food scientist and associate professor in the Department of Food Science and Technology, has written a chapter entitled "Ensuring Food Safety" for the 14th edition of Maxcy-Rosenau-Last Public Health and Preventi ve Medicine, published by Appleton & Lange, Stamford, Conn.

Originally published in 1913, it is the foremost text used in North American schools that offer M.S., Ph.D. and M.D. degrees in public health and medicine. The text also holds a large market share as a reference guide for public health practitioners wo rldwide.

James S. Dickson of Iowa State University co-authored the chapter with Marshall.

Field Days Take Research to the Public

Typically hot months for Mississippi, May, June, July and August also provided some hot tips for the state's farmers and gardeners. Several MAFES branch experiment stations hosted field days around the state for producers to see research being conducte d under conditions similar to their own.

Various topics covered at different sites included dairy production in Holly Springs, spring gardening in Verona, beef-forage in Raymond, horticulture and ornamental plants in Poplarville, sweetpotato production in Pontotoc, crops research in Raymond, agronomy in Verona, and cotton, rice and soybeans in Stoneville.

A part of Mississippi State University, the 16 MAFES research facilities are located in Gulfport, Biloxi, Pascagoula, McNeil, Poplarville, Beaumont, Crystal Springs, Raymond,

Newton, Stoneville, Brooksville, Prairie, Verona, Pontotoc, Holly Springs and Starkville.

North Mississippi Dairy Day Addressed Management

Hosted by the North Mississippi Branch Experiment Station in Holly Springs, the May 14 Dairy Field Day attracted 175 participants from Mississippi, Tennessee, Arkansas and Louisiana.

Geoff Benson, extension economist at North Carolina State University, delivered the keynote address and provided tips on successful, profitable management of dairy farms.

Wagon tours enabled participants to visit field sites to learn about dairy industry research, including tail-docking of dairy cattle, wrapping baleage, managed breeding of dairy cattle, byproduct feeds for lactating dairy cows, and using Internet to im prove management skills. Participants also visited the branch's recently completed dairy parlor and commodity sheds, where suppliers displayed production equipment.

Spring Garden Day Blooms in Verona

The first Spring Garden Day in Verona attracted about 300 people who wanted to see what's growing at the North Mississippi Research and Extension Center. The May 16 event featured seminars; fruit, vegetable and flower gardens; plant doctors; and displa ys.

"The seminars were a big hit, and most were filled to capacity," said Pat Bagley, center head. "The gardens had a lot of visitors, and I don't think the plant doctors got a break all day."

Gardens at the center included roses, perennials, vegetables and fruit, and a greenhouse showcased other varieties. Master gardeners and university personnel answered questions and discussed plots. Indoors, visitors chose from several concurrent semina rs taught by MAFES and Extension specialists. Topics included rose and vegetable gardening, spring and fall perennials, turf management, home composting, decorations and gifts and more.

Visitors brought their damaged or diseased plants to plant doctors, plant pathologist Frank Killibrew and entomologist James Jarratt.

Ornamentals Displayed at Poplarville

About 75 professional horticulturists from south Mississippi and Louisiana met July 2 at the South Mississippi Branch Experiment Station to learn of research to improve typical garden plants, including crape myrtles, azaleas, bedding plants, woody orna mentals and roses. Tour sites also included evaluations of different mulches, herbicides, fertilizer treatments, potting media and weed control methods. Various irrigation products were also demonstrated.

Following lunch in the Pearl River Community College cafeteria, the Mississippi Nurserymen's Association held its annual meeting. MAFES horticulturist Richard Harkess spoke of the importance of the "green industry" in Mississippi.

"In 1991, the green industry ranked 6th nationally of all agriculture commodity groups in total cash receipts in the country, and is projected to be 3rd or 4th by the year 2000," said Harkess.

J. Guy, owner of Carolina Nurseries in Moncks Corner, S.C., demonstrated his company's use of CD-ROM gardening catalogs.

Sweetpotatoes Sampled at Pontotoc

Between 60 and 75 producers from Calhoun, Chickasaw and Pontotoc counties attended the Sweetpotato Field Day at the Pontotoc Ridge-Flatwoods Branch Experiment Station on July 16.

Growers visited field test sites, heard research scientists and learned about current issues concerning sweetpotato production, including fighting feathery mottle virus, an invisible disease that reduces yield and storage life.

"A hot topic right now in sweetpotato production is using virus-free transplants which are free of feathery mottle virus, a disease spread by aphids and leafhoppers that stays in the plant's system," said Benny Graves of the Mississippi Depar tment of Agriculture. "Early experimental results have indicated that virus-free transplants can lead to a 30 percent increase in yield."

Mississippi ranks fourth nationally in sweetpotato production with 9,500 acres planted. Of these, about 9,000 acres are within 30 miles of Vardaman, site of the 25th annual National Sweetpotato Festival hosted on Nov. 7.

Verona Hosted Agronomy Day

Mississippi's Commissioner of Agriculture Lester Spell praised farmers for their economic impact on the state's economy at the Agronomy Field Day in Verona on Aug. 11. About 150 farmers, producers and suppliers gathered at the Lee County Agri-Center at the North Mississippi Research and Extension Center.

"Farmers are great environmentalists because they live off the land and want to pass it on to their children," Spell said as he talked about the impact of agriculture on the state's economy.

Tour stops included demonstrations of how crop row distance affects cotton production, the effects of ultra-narrow row planting and test field sites of cotton, corn and soybeans for north-central Mississippi.

Stoneville Hosted Rice and Soybean Day

About 250 farmers, agriculture suppliers and county agents attended the Aug. 13 Rice and Soybean Field Day hosted by the Delta Research and Extension Center in Stoneville.

Morning tours included soybean variety development, rice water weevil control, soybean and rice diseases, soybean and rice weed controls and rice fertility. Producers were treated to lunch by the Mississippi Rice Promotion Board and the Mississippi Soy bean

Promotion Board.

Cotton Featured in Stoneville

About 200 farmers, extension agents, producers and agriculture product suppliers gathered at Stoneville's annual Cotton Field Day on Aug. 18 to learn about new and better techniques for producing Mississippi's white gold.

Morning field tour stops included demonstrations of ultra-narrow row (UNR) cotton production, effects of simulated hail on cotton yield, cotton variety trials, insect management on varieties of cotton, weed management of UNR and control of cotton seedl ing diseases. Participants viewed new cotton production equipment displayed on the grounds.

Brown Loam Spotlighted Field Crops

Brown Loam Branch Experiment Station in Raymond hosted its annual Field Crops Research Day on Aug. 25. About 75 farmers, extension specialists, agriculture suppliers and county agents attended.

"At Brown Loam Branch Experiment Station, we do a lot of cooperative research with Mississippi State University, USDA scientists and National Resources Conservation Service, and then implement ideas here to see how they will work in the field,&qu ot; said Gregg Smith, superintendent of Brown Loam.

The 1,750-acre site conducts research on crops and cattle. Brown loam is different from other soil types in Mississippi. Developed from loess, or windblown material, brown loam is high in silt content and contains sufficient fertility for rapid plant g rowth, a significant fact for forage production.

Historically, the brown loam area has been used mainly for livestock production.

Beef Producers Met for Beef Forage Field Day

Beef producers from central and south Mississippi met at the Brown Loam Branch Experiment Station near Raymond on May 23 to learn about new developments for successful beef production.

"We had a really great turn out and provided area producers with beneficial information to increase their production rates," said Gregg Smith, superintendent at Brown Loam.

This year the program dealt with heifer development, cow-calf management, marketing strategies, sire selection and stocker grazing programs.

"'The key to successful production is to emphasize new stocker 'contract grazing,'" said Butch Withers, head of the Central Mississippi Research and Extension Center in Raymond.

Mississippi ranks 17th nationally in beef production. Most beef farmers have directed their production toward the sale of stocker cattle which are sold at weaning. The average

weight of calves when sold is 400 pounds. By using this weight, Mississippi producers are not obtaining maximum profits.

A stocker grazing program allows producers more marketing options, such as retaining ownership of calves in a winter grazing program to add value and increase profits.

Following tour stops, participants were treated to lunch sponsored by Cyber Stockyards.

Fertility Testing May Aid Poultry Industry

By Bonnie Coblentz

Mississippi's poultry holds the state's top agriculture spot, with a current farm gate value of about $1.4 billion. Research in rooster fertility can propel the industry even higher.

Chris McDaniel, MAFES poultry scientist, has applied a simple fertility test to the poultry industry. Using such a test could increase egg fertility rates by 5 percent.

"If the poultry industry in Mississippi saw 5 percent more broilers hatch, the state would annually gain 45.8 million broilers at a value of $8.7 million at hatching," McDaniel said. "In the whole United States, a similar 5 percent incre ase in fertility would result in 460 million more broilers and $87 million more value to the industry."

Currently, the broiler breeder industry predicts male fertility based on physical appearances such as the size of the comb on a rooster's head and length of a portion of the leg. This correlation is inaccurate, and the industry currently has an egg fer tility rate of 90 percent. Hen fertility is accurately predicted by egg production.

McDaniel said day-old chicks are worth between 19 and 20 cents. This cost includes feed for the parent bird, space in the incubator and labor. Not all fertilized eggs hatch.

"Every infertile egg costs just as much as a fertile egg, so an increase in fertility not only means more chickens, but less loss to the industry," McDaniel said.

Trying to find a way to more accurately determine fertility in young roosters, McDaniel adapted a sperm quality analyzer, formerly used for humans, for use with poultry.

"The instrument measures sperm concentration, viability and motility, or the sperm's ability to move on its own, and gives a sperm motility index, or SMI," McDaniel said. "These measurements are closely related to fertility."

McDaniel's research had three steps. He first had to prove in the laboratory that sperm concentrations, viability and motility numbers influenced the SMI for chickens. With this proven, McDaniel then moved to field tests.

"I had to show that a high sperm motility index resulted in high numbers of fertilized eggs," McDaniel said.

To do this, he collected semen samples, measured sperm concentrations, viability and the sperm motility index, and then inseminated hens with the same samples. These results proved that the SMI accurately predicts fertility.

The third step involved McDaniel's grouping 27-week-old roosters based on their SMI rating. Hens were artificially inseminated once a week for eight weeks with semen from roosters in these SMI rankings.

"We learned that semen from young males has the highest SMI and fertilized 98 percent of the eggs laid," McDaniel said. "The industry-wide average is about 90 percent fertility, so 8 percent is a big increase."

In the groupings, only about 10 percent of the roosters ranked highest in fertility, but the top 78 percent had a 94 percent fertility rate, and the upper 53 percent had 96 percent fertility. McDaniel found that roosters kept their fertility ranking as they aged, so the SMI test need only be conducted once in a rooster's life.

Updates

Knecht To Lead MSU's Ag Communications

By Jamie Vickers

Thomas Knecht is the new head of the Office of Agricultural Communications with Mississippi State University's Division of Agriculture, Forestry and Veterinary Medicine.

"We are fortunate to have an administrator of the caliber of Tom Knecht to expand our media capabilities even further in the future," said Rodney Foil, MSU's vice president for agriculture, forestry and veterinary medicine. "His abilitie s will build on an already sound foundation and move the programs of the division to new levels."

Knecht will oversee comprehensive agricultural communications services, including graphics, photography, publishing and broadcasting. Located in Bost Extension Center, these services support extension, research and teaching in the Division of Agricultu re, Forestry and Veterinary Medicine. Among the publications generated by the Office of Agricultural Communications is MAFES Highlights.

Before joining the staff at MSU, Knecht served as head of the Department of Agricultural Communications at North Carolina State University. While at NCSU, he also served as production and special projects coordinator and head of publications in the Dep artment of Agricultural Communications.

Nationally, Knecht has received numerous professional awards for his work, which include several Agricultural Communicators in Education awards and American Society of Agricultural Engineers awards. He is also a member of the Society for Technical Comm unication and has received awards for distinguished technical communication.

Knecht received his undergraduate and graduate degrees in English from the University of Illinois at Urbana-Champaign and his doctorate in Adult and Community College Education from NCSU.

Kelly New Fish Scientist

Newly appointed MAFES scientist Anita Kelly will continue her research in finfish by studying catfish development in the east central portion of Mississippi. Her studies will provide useful information for catfish farmers in Lowndes and Noxubee countie s, a section of the state that is testing the waters with farm-raised catfish.

With 10 years of experience in corporate fish production, Kelly will also teach courses in finfish aquaculture in the Department of Wildlife and Fisheries. Before her MAFES appointment, she had been vice president of operations and plant manager of The Great Black Creek Fish Company, a company in Black Creek, Wis., that produces yellow perch for food- fish markets.

Kelly's research will focus on why some brood fish do not spawn each year. Such research could help Mississippi fish farmers reduce overhead and pond size for catfish production. She has an extensive background in aquatics and specializes in reproducti ve physiology.

Kelly earned a B.S. in biology from the University of Iowa, Iowa City, and completed her M.S. and Ph.D in zoology from Southern Illinois University at Carbondale.

Hanson, Hite Are New Assistant Economists

Terry Hanson and Diane Hite are new MAFES assistant agricultural economists in the Department of Agricultural Economics at Mississippi State University.

Hanson will continue researching catfish production, with particular interests in off-flavor, nutrition quality, seasonal feeding differences and cost efficiency.

Before coming to Mississippi, Hanson was a research associate in the Department of Agricultural Economics at Auburn University. His work there included evaluating agricultural water demand on reservoirs and the economic activity generated when water wa s removed and used in other states, particularly Florida and Georgia.

Hanson holds several degrees from Auburn, including a doctorate in agricultural economics, a masters in agriculture with an emphasis on agricultural economics and a masters in aquaculture. His undergraduate degree is from Allegheny College in Pennsylva nia.

Prior to her MAFES appointment at Mississippi State, Hite was a visiting professor in economics at Ohio State University in Columbus, where she received a doctorate and masters in agricultural economics. Hite also earned a fine arts degree in photograp hy from Rhode Island School of Design, and worked in the advertising industry.

Her research has been in environmental and natural resource economics, particularly in evaluating the technology that removes pollutants from coal.

As a MAFES researcher, she will analyze management practices in farming and that effect on water quality, particularly with wetlands in the lower Delta counties of Sharkey and Issaquena.

CSREES Reconginzes Helms for Streamlining Database

Thomas Helms, executive director of the Southern Association of Agricultural Experiment Station Directors, has been recognized for his leadership in streamlining and revamping CRIS, the Current Research Information Systems database, a listing maintaine d by the Cooperative State Research, Education, and Extension Service (CSREES).

Helms, former MAFES associate director, served on an 18-member team to incorporate new technologies, update taxonomy and make the CRIS database more user-friendly. The original database was developed by the USDA in the 1960s and had been revised severa l times through the years but not updated. Two years ago the team began updating the taxonomy.

For example, catfish was not in the 1960s version, but now, as an important commodity in Mississippi and several other southern states, the product is included in the updated version. In addition, redundancies were reduced and one step was completely e liminated. The new database contains more than 35,000 current or recently completed projects.

The CRIS tracking system catalogues areas that are currently being researched and areas that need research. To receive funding, research topics must be approved by a committee. Approved topics are then classified with a computer code listed in this ref erence to facilitate tracing the research.

Nebeker Receives Award for Forest Insect Studies

By Jamie Vickers

MAFES entomologist Evan Nebeker has received an award for outstanding service to southern forest entolomology.

The Southern Forest Insect Work Conference presented Nebeker with the 1998 A.D. Hopkins Award in Asheville, N.C., in August.

"This award is a great honor. He was judged by his peers and colleagues who know him best," said Fred P. Hain of North Carolina State University, chairman of the A.D. Hopkins selection committee.

As a MAFES entomologist, Nebeker's research on numerous forest insects has focused on the southern pine beetle.

He is a member of the Society of American Foresters, where he serves on the editorial board of the Journal of Forestry.

Nebeker holds a bachelor's degree in zoology-botany from Southern Utah State College. His master's degree is in entomology-forestry from Utah State University and his doctorate in entomology-ecology is from Oregon State University.

Geroges Blows Over MAFES, Fish Keep Swimming

Hurricane Georges did not come as much of a surprise to those MAFES coastal branches that were prepared for it.

Researchers at the three MAFES coastal branches battened down the hatches, or fishponds, in Gulfport, Biloxi and Pascagoula against the intense wind and water levels characteristic of hurricanes.

"I'm glad we had time to get ready for the storm," said David Veal, head of the Coastal Research and Extension Center. "We knew it was coming and were able to secure most everything at our centers, but one of the buildings at the Pascag oula branch had some damage."

The seafood lab in Pascagoula suffered significant damage.

Preparing fish research ponds for a hurricane presented a different kind of challenge. "One of our main concerns was securing the aquaculture ponds. We did okay. We lowered water levels in the ponds and screened the drains so the fish wouldn't go down them. Right now, it doesn't look like we lost too many fish or shrimp," said Dav id Long, a research assistant at the Coastal Research and Extension Center.

Researchers were concerned about effects additional water and high winds might have on aquaculture research projects.

"We really won't know yet how our plots fared until the research projects are finished," Veal said. "We may never know the full extent of damage that might have been done."

Parisi Joins MAFES Staff

By Amy Woolfolk

Domenico Parisi has joined the MAFES staff as a rural community development specialist. He also conducts research for the Social Science Research Center and serves as an assistant professor of sociology, anthropology and social work.

Parisi's research involves community development and natural resource management. His expertise is in how agriculture interconnects with communities, and ways the two can respond to the global economy.

"Domenico brings an international flavor to our program at MSU. Communities in Italy have the same environments as those in Mississippi, so MSU has teamed up with two universities in Italy to examine community responses to the global economy," ; said Art Cosby, MAFES social scientist and director of the Social Science Research Center.

Parisi earned a degree in agricultural sciences from the Catholic University in Piacenza, Italy, and completed an M.S. and Ph.D. in rural sociology from Pennsylvania State University.

Mention of a trademark or commercial product does not constitute nor imply endorsement of the product by the Mississippi Agricultural and Forestry Experiment Station or approval over other products that also may be suitable.