Texas Rice

Texas A&M University System
Agricultural Research and Extension Center
Beaumont, Texas

August 2004 Volume IV Number 6

Bacterial and Fungal Endophytes in Rice

Endophytes are plant-associated organisms that often form mutualistic associations with their host plant. The term encompasses a wide variety of organisms, including bacteria and fungi. Some of these associations are beneficial to plants, while others can be detrimental to plants and/or to the herbivores that feed on them.

Benefits of these associations might include nitrogen fixation from the air, enhanced nutrient uptake, production of plant hormones that stimulate growth, enhanced grain quality, heightened resistance to pathogens and increased drought tolerance.

Endophytic associations that are detrimental can have two effects. In the case of phytopathogenic endophytes, the result is disease symptoms or reduced vigor of the plant. Conversely, non-phytopathogenic endophytes can negatively affect the species that consume them, but not the host plant. From the human perspective, this can be bad or good. In the case of fescue toxicity in sheep, we see this as a negative outcome. But there is mounting evidence that suggests this same mechanism, in other plant/endophyte associations, may infer resistance to insects such as aphids and armyworms.

The following is a layman's review of research conducted by scientists worldwide on endophytic associations that pertain to rice production.

Wheat seeds treated with bacteria like those colonized in this petri dish are nearly immune to wheat take-all, a root-destroying fungal disease. The sequencing gel in the background bears the genetic code for bacterial enzymes that synthesize natural antibiotics.

To lay the groundwork, we will start with an article by V.V. Shenoy (2001) titled 'Towards Nitrogen Autotrophic Rice", as it presents a clear picture of where we would like to go, and defines critical terminology to understand the issues. Dr. Shenoy begins by expressing the belief that developing rice with biological nitrogen fixation capacity, i.e. autotrophy for nitrogen, could reduce nitrogen nutrition limitations and increase productivity, while reducing dependency on chemical nitrogen fertilizers.

It would be desirable to produce cultivars with better Nitrogen Use Efficiency (NUE), the capability of Biological Nitrogen Fixation (BNF), and a high Nitrogen Acquisition Efficiency (NAE). These three factors are key to a plant's overall yield potential.

The ability of non-leguminous plants to stimulate N fixation in their rhizosphere is known as the Nitrogen Fixation Supportive (NFS) trait. Genetic variability for the NFS trait exists in rice. The trait is heritable, selectable and can be used in breeding rice genotypes with high BNF.

The microbes capable of BNF are called 'diazotrophs', as these convert atmospheric di-nitrogen (N2) to ammonia (NH3). The diazotrophic systems are broadly grouped into exophytic diazotrophic systems (when the diazotrophs remain outside the host plant) and endophytic diazotrophic systems (when the diazotrophs are found within the host plant). Shenoy reasons that the endophytic associations are potentially more beneficial, as they reduce the amount of nitrogen lost back into the atmosphere.

The paper concludes with a discussion of a workshop organized by the International Rice Research Institute (IRRI) in 1992, which af-

continued on page 4

From the Editor...

July was a great month for the Center. Both of our Field Days had near record attendance with about 250 people attending the program at Eagle Lake and about 450 attending the program at Beaumont. While rain kept us out of the field at the Eagle Lake Field Day, the evening program made up for it by having hardly an empty seat at the community center. The rains let up just in time for the Beaumont Center Field Day, with the fields made ready with one day to spare before the start of the field tour. It is always good to hear positive comments about our fields and research plots. Special thanks to all of our faculty and staff, county agents, ag committee members, contributors who financed the meals and displays, the speakers, and our rice producers who provide research funding that allowed this year's field days to be a success.

July was also a busy time for visitors from different states and nations. During the last week in July alone, the Center received visitors from Australia, Colombia, Louisiana, Taiwan, and Washington D.C. August is turning out to be just as busy with visitors from Brazil spending time at the Center.

Sometimes, when the public thinks of scientists visiting University/USDA Research Center, they see this as a negative, with information viewed as primarily flowing from the Center to the visiting scientists. A more appropriate description would be a two-way street, with information going back and forth. The greater the number of collaborative efforts, the greater the potential benefits to both parties. A case in point of how Texas has benefited from collaboration with other countries involves the semi-dwarf rice trait. The semi-dwarf gene results in plants that are slightly shorter in stature, and which are less likely to lodge as the rice crop matures. The major gene responsible for the semi-dwarf trait came from the Philippines through a collaborative partnership between U.S. and Philippine rice breeders. The semi-dwarf gene is now found in almost every rice variety grown in Texas, and has relegated lodging to late-planted rice and rice that receives too much nitrogen.

Another good example of how Texas rice producers have benefited from exchange of rice material with scientists in other countries, are genes obtained from Chinese varieties that confer high tiller vigor. Still another example of benefits to Texas involves rice breeders from Arkansas and Louisiana, and from the USDA, who have shared their advanced rice breeding lines with Dr. Rodante Tabien, the Beaumont Center state rice breeder. This sharing has allowed Dante to literally jump-start his rice-breeding program, in the process saving at least a couple of years of work. Open sharing and exchange of these and many other rice traits has been a win-win situation for all involved, both here and abroad. Increasingly, the open exchange of plant genetic material between researchers has been hampered by commerce, particularly as it relates to the use of plants that have been modified using genetic engineering. Let's hope our universities and federal agencies never forget the value of sharing.

As a final comment, please mark your calendars. In late October, the University of Arkansas, University of Missouri, Texas A&M University, and the USDA/ARS unit at Manhattan Kansas will be holding three, one-day workshops on post-harvest grain storage (Dexter, Missouri, Oct. 26; Little Rock, Arkansas, October 27; Beaumont, Texas, Oct. 28). Participants will receive information on the benefits of grain aeration to reduce post-harvest insect pest problems. More information will be provided in the next issue of *Texas Rice*.

Keep on sending us your suggestions.

Sincerely,

L. T. Wilson

L.T. Wilson
Professor and Center Director
Jack B. Wendt Endowed Chair
in Rice Research

Inside This Issue

Celebrating the Rice Harvest in Southeast Texas

The Texas Rice Festival celebrates everything to do with rice and good times! Chartered in 1969, the festival is a week-long event held annually in Winnie, Texas, beginning the last weekend in September with the BBQ Cook-off. The event, currently in its 35th year, is held as a celebration of the rice harvest and features entertainment for the entire family, with a down-home country flair.

More than 100,000 people crowd the Winnie-Stowell Park annually, starting off the festivities with a Fajita Jackpot and BBQ Cookoff, Horseshoe Pitching Tournament, TRF Queen Coronation and free street dance music by Cheap Whiskey held on September 24 & 25, 2004. On Sunday afternoon the finale of the cook-off weekend will be the Gospel Singing.

Festival activities the next week begin on Wednesday, September 29th include Wright's Amusement Carnival (with a pay-one-price bracelet available each day), vendor booths, street dances nightly, rice education exhibits from the Texas A&M Research and Extension Center in Beaumont, and a multi-million dollar farm equipment display. The entertainment is non-stop along with lots of great food, including rice balls, gumbo, ettouffe, pistolettes, blooming onions, crab balls, boudain balls, pork-ka-bobs and many other delicacies! The event is renowned for its outstanding cuisine.

Wednesday, September 29th, is opening night and features entertainment by Jimmy & The Jokers, Django Walker and Cross Canadian Ragweed.

Thursday, September 30th will begin with Kaiser Brothers Band, Jason Boland & The Stragglers and ending with Roger Creager.

Friday, October 1st is dedicated to youth. Included in Youth Day Activities are a 4-H & FFA Livestock Show, TRF Junior Queen Contest, Miss LaPetite Contest, Little Rice King Contest, Diaper Derby, Baby (Costume) Contest, face painting, Youth Day Parade, Ice Cream Eating Contest, Poster, Photography & Art Contests. Then later in the evening you will be entertained by the sound of cajun music beginning with Brian Jack & the Zydeco Gamblers, then Mr. Zydeco himself Wayne Toups, closing the evening with The Grateful Geezers.

Saturday, October 2nd, the harvest celebration features non-stop entertainment beginning with the Grand Parade followed by live entertainment all day long on two stages. The entertainers for the 2004 festival will begin with Aimee Breaux & Rockin' Texas (Aimee was the 2003 Talent Search Winner). Later that evening, John Anderson will perform his big hits that span over 30 years. Kevin Fowler will entertain with his high-energy Texas music and will keep your feet tapping! Activities for the day also include a Rice Cooking Contest, Craft Show featuring 30 booths, Quilt Exhibit, Photography and Art Exhibits, and will conclude the 2004 festival with an evening street dance with music by Al White & Chapparel. So come "let the good times roll" and enjoy the great food and entertainment offered by the Texas Rice Festival.

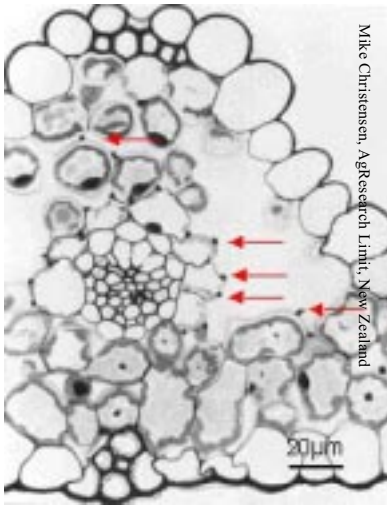
Admission is $6.00 for adults; students (6-18yrs) $4.00; children under 6 and senior citizens (65 & older) are free.

For information call (409) 296-4404 or check out their web site at www.texasricefestival.org *

firmed such opportunities do exist for cereals and recommended that rice be used as a model system. Subsequently, in 1994, IRRI developed a Frontier Project on assessing opportunities for nitrogen fixation in rice. The International Rice Biological Nitrogen Fixation Group, made up of scientists worldwide, were given the responsibility for coordinating collaborative efforts towards reducing dependency of rice on fossil fuel for a source of nitrogen.

In a paper presented in 2000 at the 8th International Symposium on Nitrogen Fixation with Non-Legumes in Sydney, Australia, Youssef G. Yanni and associates summarized the initial findings of this multinational collaborative effort. They reported that diverse, indigenous populations of *Rhizobium leguminosarum* bv. *trifolii* (the clover root-nodule endosymbiont) intimately colonize rice roots in the Egyptian Nile delta where this cereal has been rotated with berseem clover since antiquity. Laboratory and greenhouse studies demonstrated that, with certain rhizobial strain–rice variety combinations, the association promotes root and shoot growth, which significantly improves seedling vigor, leading to significant increases in grain yield at maturity.

They postulated that the benefits of this association, leading to greater production of vegetative and reproductive biomass, more likely involve rhizobial modulation of the plant's root architecture for more efficient acquisition of certain soil nutrients [e.g. N, phosphorus (P), potassium (K), magnesium (Mg), calcium (Ca), zinc (Zn), sodium (Na) and molybdenum (Mo)], rather than biological N_2 fixation. In addition, studies using a selected rhizobial strain indicated that it produced auxin and gibberellin, compounds representing two major classes of plant growth hormones.



Hyphae (shown with red arrow) within leaf blade of *N. coenophialum*-infected 'Resolute' tall fescue. The extent of leaf blade colonization is dependent on the plant and endophyte.

A field of red clover, which is colonized by the clover root-nodule endosymbiont, *Rhizobium leguminosarum* bv. *trifolii*.

Their findings indicate some rhizobia have evolved an additional ecological niche enabling them to form a three-component life cycle including a free-living heterotrophic phase in soil, a N_2-fixing endosymbiont phase within legume root nodules, and a beneficial growth-promoting endocolonizer phase within cereal roots. The authors propose that the opportunity exists to exploit this newly described plant/rhizobia association by developing biofertilizer inoculants that may assist low-income farmers in increasing cereal production (especially rice) with less N fertilizer inputs.

In another paper published that same year, researchers at the Laboratoire des Symbioses Tropicales et Mediterraneenes in France reported the presence of endophytic rhizobia within the roots of the wetland wild rice *Oryza breviligulata*, which is the ancestor of the African cultivated rice *Oryza glaberrima*. They found that nitrogen-fixing activity, measured by acetylene reduction, was detected in rice plants inoculated with endophytic isolates.

The researchers found that photosynthetic strains of rhizobia, which are usually known to induce nitrogen-fixing nodules on the roots of legumes, are also natural endophytes of *O. breviligulata,* and could significantly enhance cultivated rice production.

Another collaborative project established between IRRI and the Max-Planck Institute of Terrestrial Microbiology in Germany sought to develop novel endophytic and symbiotic associations in rice. Lead by Dr. B. Reinhold-Hurek, the team found that coloniza-

continued on next page

tion of rice by diazotrophic bacteria indeed occurs, in many cases, in significant numbers. However, affirming Yanni's observations, they postulated that the endophyte-mediated growth enhancement in rice might be due to growth promoting characteristics of endophytes, rather than their nitrogen-fixing activity.

The team also confirmed Shenoy's finding that the genetic machinery needed for developing nitrogen-fixing rhizobial symbiosis is at least partially conserved in rice, thus laying a foundation for future explorations, and for formulating strategies to genetically modify this major cereal crop to form an intimate symbiosis with rhizobia.

Soybean yields are higher after seed inoculation with a nitrogen-fixing strain of bacterial endophyte. Developed by ARS, this inoculant has been rapidly growing in popularity, and results in better plant health.

In a 2001 report to the Rural Industries Research and Development Corporation of Australia, Dr. B.G. Rolfe described his findings regarding rice cultivars and endophytic bacteria. Rolfe postulated that the possibility of establishing a more effective type of *Rhizobium*-non-legume interaction is potentially available in rice because many of the plant compounds that could interact and stimulate rhizobia are present in rice roots.

Rolfe's project set out to describe the types of interactions which occur between seedlings of Australian rice cultivars and a range of bacterial and *Rhizobium* strains. He found that a number of the bacterial strains significantly altered the growth of a rice seedling and many of these strains colonized and survived inside the rice seedling tissues without producing any gross disease effects.

Further, Rolfe confirmed that *Rhizobium,* which normally nodulates legumes and benefits the plant mostly through fixing atmospheric nitrogen, may also provide growth promotion through phytohormones, and facilitate the uptake of soil phosphates and other nutrients.

In a recent study published in 2004 by the American Society for Microbiology, Kiwamu Minamisawa and associates at Tohoku University in Japan reported the existence of anaerobic nitrogen-fixing consortia (ANFICOs) consisting of N_2-fixing clostridia and diverse nondiazotrophic bacteria in nonleguminous plants, including many rice species.

Their work indicates that clostridia are naturally occurring endophytes in gramineous plants and that N_2 fixation by the clostridia arises in association with nondiazotrophic endophytes in culture. The team concluded that the detection of ANFICOs in plants indicates that clostridia should be candidates for diazotrophic endophytes in grasses. This work also demonstrates a new principle in environmental microbiology, namely that consortia of bacteria, rather than monocultures, may be responsible for a particular activity within a very complex environment.

Regarding fungal endophytes, a 2004 study lead by Kanokwan Inban at the School of Bioresources and Technology in Thailand found that a number of endophytic fungi were isolated from fragrant and non-fragrant rice varieties grown in the central and northeastern parts of Thailand. They discovered that endophytic fungi (including *Aspergillus* spp., *Curvularia* spp., *Drechslera* sp., and *Penicillium* sp.) are capable of producing aromatic compounds such as 2-Acetyl-1-Pyrroline (2-AP), the major compound contributing jasmine-like aroma in cooked rice. The majority of the aroma producing endophytes were obtained from the varieties Pathumthani and Khao-Dawk-Mali 105, (a parent to Jasmine 85 released by the Beaumont Center in 1989.) This finding prompts a new assumption on the association of endophytic fungi and their capability to enhance fragrance production in rice. Whether this characteristic can contribute to the efficiency in fragrance production of jasmine rice remains to be investigated.

Many endophytic fungi are known to produce alkaloids in plants that have a negative effect on organ-

continued on next page

Endophytes continued...

isms that feed on them. As mentioned before, this can be seen as a negative or positive attribute.

In the case of tall fescue, toxicosis problems in livestock are the result of grazing wild-type endophyte-infected (**E**+) plants. Tall fescue endophytes *(Neotyphodium coenophialum)* reside within the plants, imparting positive agronomic qualities, such as enhanced drought tolerance and improved vigor. However, researchers at the University of Georgia College of Veterinary Medicine have developed non-ergot alkaloid-producing endophytes that still impart plant vigor, without causing the negative effects of toxicosis or reduce vigor.

In the case of insects feeding on plants, however, fungal endophytes are friends rather than foes. In 1997, Stephen Clement at Washington State University documented the occurrence of *Neotyphodium* fungal endophytes in Pullman grass germplasm, and the need to preserve this 'microbial germplasm. His research led to the first discovery of this germplasm in wild barley, and linked the presence of the fungi in wild barley and other grasses to aphid resistance.

In 1995, T.L. Bultman and D.T. Ganey found that another fungal endophyte, *Acremonium lolii*, in association with perennial ryegrass, has a negative affect on fall armyworm development. Bultman also studied *Neotyphodium* in tall fescue and found that it may protect its host from insect feeding through production of the same alkaloids that cause toxicosis in mammals. The fungus can also modify plant resource allocation, regrowth dynamics, and drought tolerance, and these changes may also influence herbivores. They concluded that *N. coenophialum* does not provide universal resistance to insects, but rather, the endophyte-mediated resistance varies with insect species, and is a complex function of environmental stress, including drought and prior plant injury.

Clearly, research conducted thus far indicates that bacterial and fungal endophytes could have a tremendous impact on rice production worldwide, but there are many questions that remain unanswered. Still, enough evidence exists to suggest that nitrogen autotrophic rice could one day be a reality. *

To get a copy of the references and web addresses used to compile this article please contact Jay Cockrell at 409-752-2741 or email j-cockrell@aesrg.tamu.edu

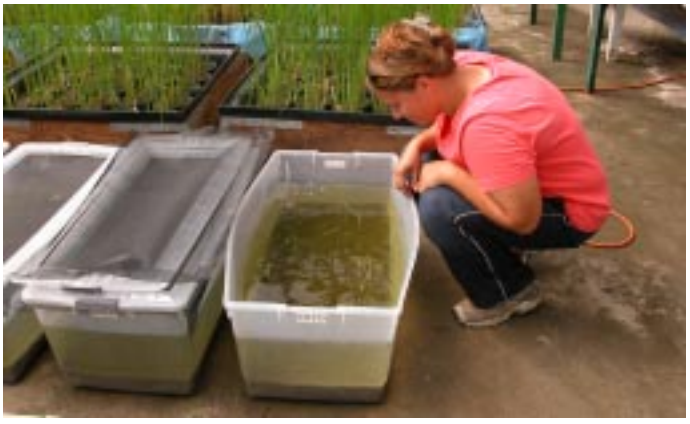
Student Contributes to Rice Research Efforts

Becky Wolff is a student at Lamar University in Beaumont completing her Master's Degree in Biology. She has been working for Dr. Mo Way since the spring of 2003, and is conducting a research project that promises to shed light on the problem of seedling survival in water-seeded rice.

Her thesis topic is "The Effects of Icon 6.2 FS and Karate Z on Aquatic Non-target Insects: Potential Stand Reducers in Water Seeded Rice." The idea for her thesis developed from discussions with Dr. Way about the number of aquatic beetles found floating on the surface of the water after insecticide applications, and Becky's observations of a water scavenger beetle, *Tropisternus* sp., dislodging rice seedlings from the soil. Once the seedlings become 'floaters' there is very little chance that they will survive to maturity.

In the greenhouse, Becky constructed holding tanks that simulate field conditions. The rice was planted at a uniform rate into flooded conditions. Aquarium type aerators provide oxygen and the adult beetles are introduced at three different population densities. Each day Becky collects the floaters and takes detailed measurements on each seedling. The objective is to identify which non-target aquatic insects are uprooting rice seedlings.

Becky plans to repeat the experiment with *Tropisternus* sp. to determine if the male and female both cause damage. Preliminary observations suggest that females dislodge the seedlings, possibly in connection with egg-laying. Future experiments will evaluate two additional aquatic insects, *Berosus* sp. and a water boatman, to determine their effects on seedling survival. Becky will continue working with Dr. Way on the aquatic insect experiments, and plans to graduate in May of 2005. *



Industry Profile...

Louis Broussard at Beaumont Rice Mill

For Louis and Ben Broussard, the rice business is family business, as they continue on in a tradition that their great-grandfather started over 100 years ago.

The Beaumont Rice Mill, established by Joseph E. Broussard Sr. in 1892, is one of Jefferson County's oldest business establishments. Of Acadian descent, J.E. was born on December 18, 1866, son of Eloi and Mary (Hebert) Broussard. After Eloi's early death, Mary married Lovan Hamshire, so J.E. was raised on the family ranch near the present site of Hamshire, Texas.

After attending school in Galveston for three years, J.E. spent some time working cattle, and delivering mail on horseback in the Taylor's Bayou area of Jefferson County. When a post office was established there in 1885, he became the first postmaster and named the town LaBelle, after his fiancé Mary Belle Bordages. The couple was married in 1889 and moved to Beaumont, where J.E. bought one-third interest in a gristmill. In 1892 he converted the facility to process rice, making Beaumont Rice Mill the first commercially successful rice mill in Texas.

At the time Beaumont Rice Mill was established, there were only 1,500 acres of rice being grown in Jefferson County. The main limitation to the expansion of rice acreage was water, as the early farmers had to depend on timely rainfall to bring in a crop. That is how the term 'providence rice' came into being.

Just prior to converting the mill, J.E., along with W. G. Lovell and B. C. Hebert, built small pumping plants on Taylor's bayou. These plants brought about the formation of the Beaumont Irrigation Company, which was incorporated in 1898. Next, they built a pumping plant on Pine Island bayou, with 3000 acres watered from this canal the first year. Gradually, the canal system increased until it was watering 25,000 acres, which later led to the formation of the Lower Neches Valley Authority.

Concrete storage tanks at Beaumont Rice Mill.

Another limiting factor to the expansion of rice production in Texas at that time was the lack of capital available to farmers for planting. Since the industry was in its infancy, banks did not consider loans to rice farmers an acceptable credit risk. As a result of J.E.'s foresight and leadership, Beaumont Rice Mill became the first institution in the state to loan farmers money to plant their crop.

In 1907, J.E. became the first president of the Rice Millers and Dealers Association, forerunner of the present Rice Millers Association of America. When the industry faced financial crisis in 1909, due to overstocks in the domestic rice market, J.E. again stepped up to take a leadership role in fostering the fledging industry. He was part of a two-man team that traveled to Europe and successfully opened new markets for U.S. rice.

J.E. served as President of the Rice Millers Association until 1918, but remained very active in the organization up until his death in 1956. Today, Louis Broussard Jr. and his brother Ben, great-great grandsons of

continued on next page

Beaumont Rice Mill continued...

J.E., continue to operate the family business in the tradition of excellence that began over a century ago. Louis said, "It's easy when you can follow in the footsteps of your great-grandfather (J.E. Broussard Sr.), grandfather (J.E. Broussard Jr.), great uncle (Clyde Broussard), cousin (Joe Broussard II) and father (Louis Broussard Sr.)"

According to Louis, an important thing he learned from his family is the importance of establishing good relationships with their farmers and business clientele. "The mindset cannot be millers against farmers, if the industry is to thrive," said Louis. "We all have to work together, as each group is dependant on the other." To this end, Louis works closely with the US Rice Producers Association to insure that the lines of communication remain open and active.

Louis and his younger brother Ben at the mill office.

Louis started working at the mill in 1978, while completing a general business degree at Lamar University. In 1986, he moved up to the position of Sales Manager and in 1992, Louis became President. He has two sons, Joshua (14) and Jacob (12). The boys are active in extracurricular sports, and both enjoy duck and dove hunting with their dad.

Ben also started at the mill after completing a business degree at Lamar University in 1987. He is currently Vice-President of the company, but emphasizes the fact that, like his older brother Louis, he started at the bottom of the totem pole then worked his way up over the years. He and his wife Jamie have two children, Kathleen (12) and Ross (8).

Johnny Setliff is no stranger to the rice business, as he worked for American Rice Growers for 42 years, and has been at Beaumont Rice Mill since 1994.

Beaumont Rice Mill's signature brand is the Sunset label, but they also do custom packaging for domestic and foreign clients. They deal mainly in long grain rice, but occasionally handle medium grains, depending on their clients needs. The rice bran and brokens left over after milling is marketed for industrial uses, primarily for animal feeds.

In the past 10 years, the brothers have incorporated several new technologies that have improved the efficiency and productivity of the mill. The old McGill milling machines were replaced by vertical whiteners, which utilize abrasive milling techniques. This process produces higher quality milled rice with a smoother surface, and less broken kernels. They also invested in two ScanMaster Color Sorters, which utilize ultraviolet light to detect any off-color kernels or other foreign objects such as weed seeds. These machines can quickly sort through the milled rice, resulting in a much cleaner final product.

Over the past century, the Broussard family has had a tremendous impact on the rice industry in Texas. As testament to this legacy, two rice varieties developed at the Texas A&M Rice Research Center in Beaumont, Belle Patna and LaBelle, were named in honor off J.E. Broussard's wife, Mary Belle.

Today, Louis and Ben Broussard continue to uphold the values and traditions that have established Beaumont Rice Mill as a cornerstone of the Southeast Texas business community. *

For more information contact Louis Broussard at 409-832-2521.

International Collaboration to Tackle Sheath Blight

Rice scientists from the U.S. have teamed up with the International Center for Tropical Agriculture (CIAT) on a USDA-NRI grant to develop molecular markers for milling yield and sheath blight resistance. Based in Columbia, CIAT is a non-profit organization that conducts research aimed at reducing hunger and poverty and preserving natural resources in developing countries. The grant is for $5 million over 4 years, and scientists from all of the U.S. rice producing states as well as Kansas, Wisconsin, and Ohio will be involved.

USDA scientists at the Beaumont Center and CIAT scientists will be focusing on identifying molecular markers that are associated with sheath blight resistance. To succeed in this, the team will evaluate screening methods to find the technique that gives the most accurate, consistent results.

Historically, screening for sheath blight was done primarily in the field. The problem with field testing, though, is that there are invariably plants that escape inoculation, making it difficult to accurately and quickly identify resistant lines.

Two novel techniques for sheath blight screening in the greenhouse will be evaluated by the research team, one using micro-chambers and seedlings, the other using a larger misting chamber with older plants. The tests will be conducted in Arkansas, Texas, Louisiana and at CIAT in Columbia to insure that the technique is replicable. Once a technique is established, the researchers will then begin the work of evaluating populations to identify the markers for sheath blight resistance.*

Beaumont Center scientists with their CIAT collaborators. *L to R:* Bob Fjellstrom, Fernando Correa, Anna McClung, Lee Calvert, Cesar Martinez and Toni Marchetti.

Visiting Scientist Shares Research Information

Ta-Ping Hsuan (far right) is a rice scientist at the Hualien District Agricultural Research and Extension Station in Taiwan who recently visited the Beaumont Center. In a presentation to Center scientists, he described many challenges they face that are similar to those in the U.S. rice industry. The average age of farmers is increasing steadily, as many young people there are not interested in farming as their fathers did. They are also faced with high input costs, and high labor cost.

In their rice breeding efforts, they too are looking for better milling quality, higher yields, disease and insect resistance, and good cooking quality. One major difference between our countries is the average size of rice farms, which in Taiwan is only 3 to 5 acres. Still the country produces rice on nearly 700,000 acres annually.*

Riviana Foods Acquired by Spanish Company

Riviana Foods Inc. (NASDAQ/NMS: RVFD) announced their acquisition by Ebro Puleva, S.A., headquartered in Madrid, Spain for $25.75 per share in a transaction valued at approximately $380 million.

"Over the past 94 years, Riviana has built brands that have become some of the most recognized names in rice in the United States," said Frank A. Godchaux III, Riviana's Chairman. "Now, we look forward to joining forces with Ebro Puleva to become a global business, creating one of the most dynamic rice companies in the world."*

Excerpted from http://www.riviana.com/

Researcher in the News...

Michael Bange with the Australian Cotton Cooperative Research Center

Down under, where land is abundant but resources are limited, there is a tremendous amount of pressure on farmers to produce high quality crops and high yields. According to one scientist, the key to their success is government and private industry working together.

L to R: Ted Wilson, Michael Bange and Yubin Yang. Bange is conducting a sabbatical with Texas A&M University, visiting with researchers across Texas and Florida.

Dr. Michael Bange is a Research Agronomist and Crop Physiologist with the Australian Cotton Cooperative Research Center (CRC), whose mission is to enhance the development and growth of the Australian cotton industry through the application of collaborative research, education and the adoption of sustainable farming systems. Cotton CRC is a collaborative effort between government, university and private corporations.

Based at the Cotton CRC headquarters in Narrabri, Dr. Bange is the program leader for the Cotton Management Support Systems. His major focus is providing farmers with decision-making tools that will help them succeed in a very competitive market.

According to Bange, Australia has a landmass equal to the continental United States, but their population is just barely greater than that of Texas. This leads to high taxation pressure and a strong emphasis on economic excellence. Their farmers, in turn, must stay on the cutting edge of technology regarding crop production.

An estimated 95% of Australian cotton farmers employ one or more new technologies such as Integrated Pest Management, precision agriculture and transgenic crops. And nearly every farmer is on-line and computer literate. Actually, Australian farmers where utilizing computer networks *before* the World Wide Web even existed. In the late 70's, the Institute created SIRATAC, a dial-in network for farmers to access a cotton management model designed to help them make better management decisions. As a side note, Dr. Ted Wilson was a core member of the research team that developed SIRATAC.

The researchers work very closely with the farmers to insure that they are providing the services and tools that are most needed. Farmer feedback comes through the Cotton Research and Development Corporation (CRDC) and the Australian Cotton Growers Association. CRDC collects a levy from the farmers (similar to our check-off program in Texas). The farmers vote periodically on whether to continue the program, and this last year the funds were actually increased.

Besides working closely with farmers, Bange emphasized the importance of close relationships among researchers. Within Cotton CRC, there is a strong mandate to cross scientific disciplines as well as crop commodities when designing research projects. They have been so successful because they pool resources, both human and monetary, and they invest in positions that will facilitate collaboration. Communication avenues are given a high priority, and not just communication to the farmers. They have specialists whose specific task is to see that research information gets circulated to other scientists *and* to the extension agents that work directly with farmers.

Given the challenges that the agricultural industry faces in Australia, such as severe water shortages and a host of plant eating insects, limited funding opportunities forces the scientists to evaluate their projects with a critical eye. Said Bange, "Evaluation is a large

continued on page 12

State, National and International News...

VICE CHANCELLOR FINALISTS ANNOUNCED

COLLEGE STATION – Interim Chancellor Benton Cocanougher has announced that Dr. Elsa Murano, Dr. John Owens and Dr. Thomas L. Payne are the finalists for the position of Vice Chancellor and Dean for Agriculture and Life Sciences, and Director of the Texas Agricultural Experiment Station to replace retiring Dr. Ed Hiler.

Elsa Murano, is Undersecretary for Food Safety with the U.S. Department of Agriculture. She holds a B.S. in Biological Sciences from Florida International University, an M.S. in Anaerobic Microbiology from Virginia Polytechic Institute and State University, and a Ph.D. in Food Science and Technology, also from Virginia Tech.

John Owens is Vice President and the Neal and Leone Harlan Vice Chancellor of Agriculture and Natural Resources at the University of Nebraska. He holds a B.A. in Biology from West Texas A&M, an M.S. in Entomology from Texas Tech , and a Ph.D. in Entomology from Iowa State University.

Dr. Thomas L. Payne is the Vice Chancellor and Dean, College of Agriculture, Food & Natural Resources, University of Missouri. He holds a B.A. in Zoology, a M.S. in Entomology and a Ph.D. in Entomology, all from the University of California.

NOMINATIONS FOR FSA COUNTY COMMITTEES

WASHINGTON - Agriculture Secretary Ann M. Veneman announced that the county committee election process has begun and that America's farmers, ranchers and other agricultural producers are urged to nominate local producers to serve on USDA's Farm Service Agency County Committees. Farmers who serve on county committees help to ensure FSA agricultural programs adequately serve the needs of local producers. Sept. 3, 2004, is the last day to file nomination forms. Ballots will be mailed to eligible voters on or before Nov. 8, 2004. To receive a ballot by mail, voters must register with their local FSA offices by Oct. 1. Nomination forms can be obtained at http://forms.sc.egov.usda.gov/eforms/mainservlet

Contact Ben Noble, (703) 236-2300, bnoble@usarice.com

CONSERVATION ASSESSMENT PROGRAM

WASHINGTON - Secretary Veneman has announced a five-year effort to study the collective environmental benefits of government conservation programs on agricultural land. "The advantages of conservation programs are widely recognized, from reducing soil erosion and enhancing water and air quality to promoting wetland and wildlife habitat preservation and restoration," Veneman said. "However, the environmental benefits of these programs have not been measured at the national level. This effort will provide an accounting of the benefits achieved through conservation programs."

Through the Conservation Effects Assessment Project (CEAP) the Department of Agriculture will study the environmental benefits of conservation practices implemented through 2002 Farm Bill programs: the Environmental Quality Incentives Program, Wetlands Reserve Program, Wildlife Habitat Incentives Program, Conservation Reserve Program, Conservation Security Program and Conservation Technical Assistance.

Additional information about the program can be obtained at: http://www.nrcs.usda.gov/technical/nri/ceap

Contact Sean Adams, (301) 504-1622, SeanAdams@ars.usda.gov

LIFE SPAN LEFT FOR LOW-CARB MOVEMENT

The low-carb craze is a "fad" (not a "trend") that is slowing down but will take another four years to play out, Arnie Schwartz of research firm NPD Foodworld told the RMA in June. NPD's annual "Eating Patterns in America" report showed that carbs have replaced fat as the key dietary concern for consumers, who have cut back on carbs to loose weight. There is a lag between concern and behavior, Schwartz said. While awareness of low-carb, high-protein diets such as Atkins and South Beach ranks high among consumers, only about 6-7% of adults are actually following the diets, but many more are cutting down on carbohydrate foods like sandwiches, cereal, bread and rice. Schwartz said he based his four-year life span prediction on the low-fat craze where concern about fat last peaked in 1994, but eating of reduced fat products did not begin declining until five years later.

Contact Anne Banville, (703) 265-1465, abanville@usarice.com

Bange continued...

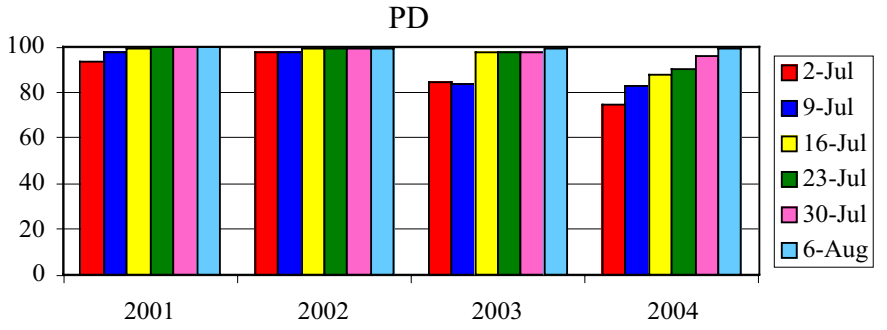
focus, we are constantly looking at ways to improve and there is a willingness to accept change. In our world, ideas are survival driven." He described a philosophy that is ingrained in the Australian culture called the 'Triple Bottom Line'. At every level, from the laboratory to the farm, they are mandated to be environmentally responsible, socially responsible and economically viable. "Forcing us to meet the triple bottom line makes researchers look at our work much differently," said Bange, "It isn't enough to produce a super high-yielding variety if you have to saturate the environment with chemicals for it to grow."

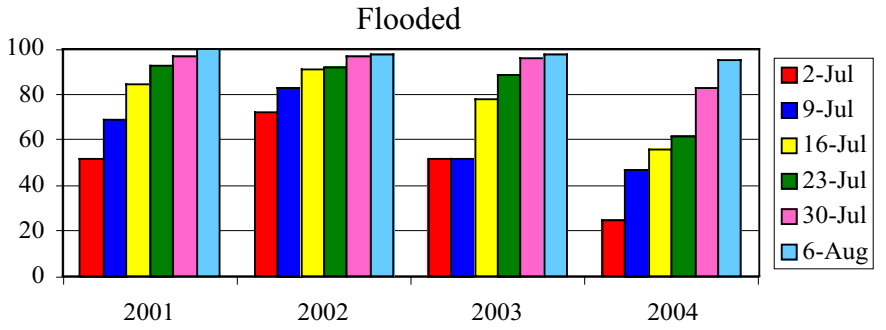
Dr. Bange is on sabbatical in the U.S. with his wife, Gina, and their two girls Oliva (4) and Kim (2). After a week in Beaumont he traveled to Florida to work with USDA researcher Dr. Tom Sinclair.

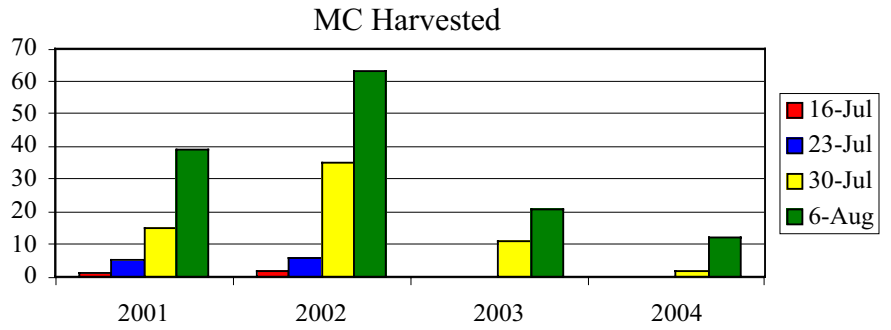
Besides gathering information and ideas to bring home, Dr. Bange is spending a great deal of time talking to scientists in private and government organizations about the importance of working together, and how well that philosophy has served the people of Australia.*

Rice Crop Update

As of August 6th, 95% of the Texas rice crop was headed, closely following 2003 when 98% of the crop was headed on this date. As for main crop harvest, 12% was reported in, lagging behind the 2003 figures, when 21% of the main crop had been harvested.







Professor and Center Director: L.T. (Ted) Wilson
lt-wilson@aesrg.tamu.edu
Ag Communications Specialist: Jay Cockrell
j-cockrell@aesrg.tamu.edu
Texas A&M University System Agricultural Research and Extension Center
1509 Aggie Drive, Beaumont, TX 77713
(409)752-2741
Access back issues of *Texas Rice* at
http://beaumont.tamu.edu

Texas Rice is published 9 times a year by The Texas A&M University System Research and Extension Center at Beaumont. Interviews, writing and layout by Jay Cockrell. Editing by Ted Wilson, Jay Cockrell and Brandy Morace, with additional support by Jim Medley. Information is taken from sources believed to be reliable, but we cannot guarantee accuracy or completeness. Suggestions, story ideas and comments are encouraged.

Texas A&M University System
Agricultural Research and Extension Center
1509 Aggie Dr.
Beaumont, TX 77713

NONPROFIT
ORG.
U.S. POSTAGE
PAID
BEAUMONT, TX
PERMIT NO. 367