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RICE RESEARCH STATION NEWS

Rice Growers Must Consider Second Crop Potential

LSU AgCenter Research & Extension

Southwest Region

During the harvest of the first rice crop is an excellent time to review the status of the crop and its ratoon (second crop) potential. Some of the factors that affect the ratoon crop are harvest date, crop density, weed and disease control, stubble management and soil firmness.

With the ratoon crop you are always working against Mother Nature; temperature and day length are steadily declining. For example, the average temperature in August is 82 degrees F, and day length (sunrise to sunset) averages 13.5 hours. In October these same numbers are 70 degrees F and 12 hours of daylight. While there is no way to control these environmental factors, harvesting the first crop before August 15th provides the greatest opportunity to have an extended growing season for ratoon production in south Louisiana.

Since the ratoon crop grows from buds at the base and lower nodes of rice stems, it is important that the number of these buds be maximized. A satisfactory stand in the first crop with few thinly populated areas provides a good start. LSU AgCenter research has shown that when stand limits first crop yields, then ratoon crop yield will also be reduced. Usually, this occurs when first crop stands are less than 8 to 10 plants per square foot.

Ratoon Research

Competition from weeds in the first crop can reduce the ability of plants to tiller. Lack of disease control, particularly diseases that affect stem health such as sheath blight, can reduce the number of healthy stems and buds that serve as the foundation for ratoon growth. LSU AgCenter research has shown that poor sheath blight control in the first crop can reduce ratoon crop yields by as much as 30%.

Also, it is important to observe the stubble that remains after harvesting the first crop. Sometimes stem diseases are suppressed by fungicides or develop late in the first crop. The symptoms may not appear at the top of the canopy but may have developed on the lower portions of stems. This can affect ratoon crop development.

Stubble height can be lowered by reducing cutting height of the

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Uniform Regional Rice Nursery

The Uniform Regional Rice Nursery (URN) is a cooperative endeavor among the public rice variety development programs in Arkansas, Louisiana, Mississippi, Missouri and Texas. It serves as a valuable tool in making release decisions on new rice varieties. The nursery is a yield-testing program conducted at the primary research location in each of those states. The “Uniform” comes from the fact that the same rice lines are tested at each of the five locations. The test currently contains 200 rice lines (or genotypes). The 200 entries in the test are made up of the elite lines from each breeding program that the breeders think might have the attributes to qualify for consideration as a new release, as well as the currently grown commercial varieties. Each of the breeding programs contributes a number of lines to the testing program. The yield

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Uniform Regional Nursery, 2005 Rice Research Station

Inside this issue:

Special Dates of Interest:

Rice Technical Working Group (RTWG)

February 26 — March 1, 2006

The Woodlands, Texas

Rice Research Station Field Day

Thursday, June 29, 2006

Crowley, LA

Rice Growers Must Consider Second Crop Potential (cont.)

combine header or following the combine with a mowing device such as a flail mower. One of the important factors about stubble height is that enough stubble needs to remain to serve as a foundation for ratoon growth. In addition to containing the buds that serve as the "seed" for ratoon growth, there is also carbohydrate stored in the stubble. The carbohydrate serves as the energy source for the buds to grow. The carbohydrate in stubble serves the same purpose as starch in the endosperm of seed in acting as an energy source during germination. LSU AgCenter researchers are conducting studies to determine the impact of first crop stubble height on ratoon crop growth, development and yield. Initial results have shown that reducing stubble height can increase ratoon yield. In the same studies, the ratoon crop was slower to develop from short stubble and later maturing by several days compared to a conventional stubble height of 18 inches. There was also 8 times more straw left on the soil surface with the shorter stubble. An increase in biomass may affect nitrogen utilization and water quality in the ratoon crop and result in lower biomass available for crawfish production later.

A wet field at harvest will cause stems to be mashed into the mud. These tracked areas will have fewer healthy stems, and the stems that do survive will produce ratoon growth with delayed maturity. If the dry conditions extend through harvest, the status of soil moisture will be of little concern. If tropical disturbances cause more rain, then soil moisture at harvest could become an issue. Stormy conditions during the ratoon crop could provide a benefit and reduce pumping costs. At the same time, these conditions could reduce sunlight, increase disease potential, interrupt pollination and have the standard adverse effects that stormy weather has on the first crop.

"LSU AgCenter researchers are conducting studies to determine the impact of first crop stubble height on ratoon crop growth, development and yield."

As with all crop production, economics must be considered. The ratoon crop is generally a low input production system. The costs of diesel fuel and fertilizer must be considered along with the price of rice.

Dr. Richard Dunand
rdunand@agcenter.lsu.edu

Uniform Regional Rice Nursery (cont.)

test is then conducted at the research station in each state using the best cultural practices for that region. Data on numerous characteristics are collected during the course of the testing program. Examples here include: 1) emergence date, 2) seedling vigor, 3) heading date, 4) height at maturity, 5) lodging, 6) harvest maturity date and 7) yield. Milling samples also are collected at harvest maturity, and these are later milled to provide quality data. These lines are concurrently evaluated by cooperating researchers at each location to provide data on such characteristics as disease resistance, insect resistance and tolerance to various herbicides. Cooperating breeders at the Rice Experiment Station in Biggs, Calif., also evaluate the lines and provide additional data on performance under the environmental conditions at that location.

All data from the testing program is then provided to each cooperator. This allows the breeders to have a great deal more information on a potential releases than could be generated in each individual state. It allows a breeder to see how lines performed in five additional unique environments, all while comparing the experimental lines to the best currently grown varieties. In addition, the program allows a better idea of how releases from other breeding programs perform and helps provide information to growers on whether these varieties may have a good fit. For example, the new varieties Presidio from Texas and Spring from Arkansas were tested for a number of years in Louisiana in the URN.

The breeders and other cooperating researchers meet each year at one of the research centers to discuss the URN as well as other topics. The group evaluates URN results and the pros and cons of potential releases from each state. In addition, the meeting provides an opportunity to plan the next cycle of URN testing.

Dr. Steve Linscombe
slinscombe@agcenter.lsu.edu

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Applying Common Research Tools in Rice to Improve Marsh Plants

The Rice Research Station has a long track record of research in marsh plants. Extensive research has been conducted on both smooth cordgrass (*Spartina alterniflora*) and California bulrush (*Schoenoplectus californicus*). Several research tools commonly used in rice such as tissue culture, DNA markers and breeding have been used to improve these plants.

Tissue Culture Work: Some of the early research in this area involved the use of tissue culture techniques to mass propagate or clone smooth cordgrass. Thousands of clones were produced. Through this approach, some of the resulting clones were coated with alginate gel, a protective gel coat, to allow these small tissue culture-derived plantlets to be handled, transported and grow like natural seeds. Currently, suspension cell culture is used to produce a mass of fine cell clumps consisting of 2 to 50 cells. Hundreds of millions of suspension cells can be produced weekly. Cell selections are being conducted to develop herbicide-resistant smooth cordgrass. Since novel mutants normally occur at a low rate, millions of cells need to be screened. A suspension cell system is suitable for this purpose. During screening, cells are exposed to a toxic herbicide concentration. Hundreds of small plantlets have been recovered. They will be grown in the greenhouse for further evaluation. Since coastal erosion affects a great portion of Louisiana coastal marshes, methodology for restoration of large areas is needed. This can be achieved through cultivation of this species. The demand for smooth cordgrass seed for planting may provide the opportunity for rice farmers to grow smooth cordgrass as an alternative crop. Herbicide resistant smooth cordgrass will provide a greater weed control and, therefore, will improve its farming efficiency.

A similar cellular selection approach is being carried out to develop smooth cordgrass lines that can tolerate low pH and metal toxicity. In 2000, a massive coastal marsh dieback was found in parts of Texas and Florida and throughout coastal Louisiana. About 44,500 out of 158,000 ha of intertidal saltmarshes in the Barataria-Terrebonne region that are mostly composed of smooth cordgrass were seriously affected by the dieback. At least 6,800 ha of the affected areas converted from dense vegetation to open mud flats with little or no vegetation. New smooth cordgrass lines that can tolerate extremely low pH and toxic concentration of Al, Fe, and Mn may provide a better chance of survival in a recurring problem of massive die-back.

Smooth Cordgrass Breeding Research

DNA Marker Approach: DNA markers can provide precise quantification of genetic diversity. In addition to selecting lines with superior agronomic traits for coastal erosion control, efforts are also being directed toward preserving the existing diversity. Providing planting materials that have high genetic diversity may address long-term survival and other ecological concerns related to the use of plants for erosion control and habitat restoration. A marker was used to select California bulrush parental lines to represent its natural genetic pools. AFLP (Amplified Fragment Length Polymorphism) marker data reveal major genetic clusters. Six potential parental lines were selected and are being used in the development of blend cultivars.

A foundation plot of smooth cordgrass of the cultivar “Vermilion” is being established at the Rice Research Station. DNA markers were used to determine the genetic purity of each plant used to develop the foundation plot. Results from DNA marker analysis indicated that of the 257 single plants used for the foundation planting, 16 plants were off-types. These off-types have been removed from the field.

Breeding Activities: Thirteen elite lines of smooth cordgrass are currently being increased in isolated plots at the Rice Research Station. The plots will be maintained in the vegetative stage and will serve as a source for parental materials. These parental lines will be used to develop blend cultivars to produce smooth cordgrass populations that have a wide array of genetic diversity for erosion control. These lines were developed by LSU AgCenter scientists using the original collection of 40 Rice Research Station entries together with the NRCS collection of 126 accessions. In addition to the superiority of their vegetative traits, these lines have a range in seed set of 33 to 94% and a range in germination rate of 53 to 90%. Wild types have much lower fertility and seed viability.

California Bulrush genotype evaluation

Selection has been conducted among 48 entries of California bulrush collected from various growing regions in Louisiana. Data from a freshwater site at the Rice Research Station indicated significant differences among the 48 accessions evaluated for important traits including spread, number of tillers, stem diameter, plant height, seed set, and germination rate. The top 10 accessions performed significantly better than “Restorer,” a California bulrush cultivar released by the USDA-SCSA Plant Material Center, Americus, GA, in 1993. These top 10 lines are being increased and will be used for performance trials in multiple locations.

Dr. Ida Wenefrida
iwenefrida@agcenter.lsu.edu

Researchers Make Progress on New Aromatic Rice Varieties

Dr. Xueyan Sha evaluating aroma of experimental rice lines

The quantity of imported aromatic rice has dramatically increased over the past two decades. More than 12% of the food rice consumed in the United States was imported, primarily aromatic Jasmine from Thailand and Basmati from India and Pakistan. These imports have increased from small quantities in 1982 to more than 360,000 metric tons in 2004. Most of the consumers of imported aromatic rice are Asian-Americans. Based on the current growth rate of Asian-Americans, as well as the increased selective taste preference of other American consumers, aromatic rice markets are expected to expand in the future.

There are three major types of aromatic rice in the U.S. market, which in order of importance are Jasmine, Basmati and Della types.

- Jasmine rice, which originated and is largely produced in Thailand, makes up about 80% of U.S. aromatic rice imports. It is renowned for its aroma, flavor, translucent slender kernels and soft-cooking characteristics.
- The unique kernel elongation ability of cooked Basmati rice and extreme slenderness distinguishes it from other aromatic rices. Basmati rices made up about 20% of U.S. aromatic rice imports but are sold at a much higher price.
- The typical U.S. long-grain aromatic varieties such as Della, Dellmont and Dellrose have a different market, which is composed of non-ethnic American consumers who prefer the popcorn-like aroma in an otherwise typical U.S. long-grain rice.

Both Jasmine and Basmati rices are genetically different from high-yielding, semi-dwarf and photoperiod-insensitive U.S. long-grain varieties including Della-type aromatic rice. They are *Indica* types, while most U.S. long-grain varieties belong to the tropical *Japonica* class. Crosses among these different types of rice show varying levels of sterility and do not produce a full spectrum of recombinants. Because most specialty characteristics such as aroma and kernel elongation are quantitative traits, it is difficult to combine genes for all of these traits into the same line. The lack of satisfactory methods for evaluating the degree of aroma and texture of cooked rice of breeding lines further hinder the worldwide efforts to develop improved aromatic rices.

At present, only Della-type and limited quantities of Jasmine- and Basmati-type aromatic rices are being grown in Louisiana and other southern states. There are only a few adapted specialty rice varieties available in the U.S. However, specialty characteristics such as aroma, flavor and appearance of these domestically produced Jasmine and Basmati rices do not match those of imports.

Since its initiation in 1992, the specialty rice breeding program at the LSU AgCenter Rice Research Station has been committed to the development of improved aromatic rice varieties adapted to Louisiana environmental conditions, with competitive grain and milling yield and superior specialty characteristics that match those of imported rice. Numerous breeding lines were selected with improved fertility, short stature, less photoperiod sensitivity, and some of the specialty characteristics from the initial crosses between Basmati or Thai Jasmine and elite U.S. long-grain varieties.

Since 2000, a program involving stepwise intercross among these lines and recurrent selection has been carried out to combine and enhance all specialty characteristics, to further improve the fertility, and to incorporate the high grain and milling yield potentials and disease resistance into these aromatic lines. A number of advanced breeding lines have been developed that possess cooking quality attributes approaching those of imported aromatic rices, while also having good yield potential and milling quality. These lines have been tested in a number of locations across Louisiana and other southern states and have shown good yield potential and acceptable milling and grain quality.

LSU AgCenter researchers at the Rice Research Station anticipate that improved semi-dwarf, early-maturing, and high-yielding Jasmine- and Basmati-type varieties will be available for commercial production in Louisiana in the next few years.

Dr. Xueyan Sha
xsha@agcenter.lsu.edu

Off-Station Research in Northeast Louisiana

Each year, Rice Research Station scientists conduct rice research at on-farm sites in Northeast Louisiana. These studies are conducted to provide information and recommendations for that specific rice production area, which has quite different environmental conditions from those at the Rice Research Station in Crowley. These studies are conducted by the Rice Agronomy Project under the direction of Dr. Jason Bond. Mr. Doug Walker is a research associate in Dr. Bond's project who is domiciled permanently in Bastrop and is responsible for the day-to-day management of these research sites.

These trials have been conducted at several locations in recent years including sites in Catahoula, East Carroll, Morehouse and Richland parishes. This year the research sites are located on Woodsland Plantation in Richland Parish and on the Zaunbrecher farm in Morehouse Parish. The trials this year address a numbers of specific agronomic areas. Optimum nitrogen fertilizer rate/application timing for commercial varieties and hybrids are being established at the Woodsland plantation site. At the Zaunbrecher farm, one experiment is testing the relationship between rice seeding rate and nitrogen fertilizer level. A separate experiment will determine the tolerance of common rice varieties to the herbicide Grasp. In addition, the rice breeding project has Commercial/Advanced yield trials at both locations as well as a trial of advanced experimental Clearfield lines at the Woodsland site. These on-farm research trials are valuable for fine-tuning recommendations for Northeast Louisiana. In addition, the variety trials provide information to help make decisions on varietal releases, as well as provide growers in the region information on how varieties can be expected to perform in this environment.

Northeast Louisiana Research on Woodsland Plantation

Dr. Steve Linscombe
slinscombe@agcenter.lsu.edu

Fall Fertilization of Rice

As fall approaches, rice producers must make decisions concerning the 2006 crop. With the high costs of fuel, labor and fertilizer, choosing some form of reduced tillage (fall stale seedbed or no-till) could provide savings and possibly allow earlier planting of the 2006 crop. Careful attention should be given to the amount and kind of tillage and the timing of phosphorus and potassium fertilizer applications in conjunction with tillage operations.

Phosphorus and potassium fertilizer should be applied when soil test results indicate a need for these nutrients or when deficiency symptoms have been diagnosed. If needed, phosphorus and potassium fertilizer should be soil-applied when land is prepared for planting. The most efficient application timing for phosphorus and potassium to rice is a soil-incorporated application immediately before planting but no later than flooding. However, if reduced tillage is used, then phosphorus and potassium fertilizers need to be applied before the last tillage pass in the fall.

Fall applications of phosphorus and potassium fertilizers can be advantageous because a wider window for application exists in the fall, so ground application can be used. However, because potassium is a soluble nutrient, it could be lost to leaching during the winter months when a fall application is made to a sandy soil. Phosphorus availability is influenced by fertilizer placement, soil pH, iron and aluminum content of the soil, and wetting and drying cycles. Flooding increases phosphorus availability, but alternating cycles of wetting and drying can cause fixation of phosphorus in the soil, especially on low pH soils with high levels of iron and aluminum. Therefore, if reduced tillage and fall fertilizer applications are planned, then consideration should be given to the soil type and how the field will be treated during the winter months.

Phosphorus and potassium application rates should always be based on soil test results. A typical range of rates would be 25 to 60 pounds P_2O_5 per acre and 30 to 60 pounds K_2O per acre. Under the right conditions and management practices, fall tillage and fertilizer applications can jump-start next year's crop.

Dr. Jason Bond
jbond@agcenter.lsu.edu

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Rice Research Station
1373 Caffey Road
Rayne, LA 70578

Phone: 337-788-7531
Fax: 337-788-7553
E-mail: slinscombe@agcenter.lsu.edu

This newsletter is produced by:

Karen Bearb
Bruce Schultz
Don Groth
Darlene Regan
Steve Linscombe
Linda Benedict
Frankie Gould

Focus on Research Associates

Bill Leonards maintains the farm at the Rice Research Station near Crowley. He has worked at the station for almost 31 years, the longest continuous employment at the facility among staff members.

He started in August 1974 after graduation from Nicholls State University, and he first worked in the breeding program, before moving to the fertilizer program. He has been the coordinator of farm management since 1993.

Leonards' department of 10 employees makes sure that farm operations are carried out. That means equipment has to be repaired and maintained, and buildings have to be kept in good shape. "Here and at the South Farm," Leonards said.

"I like it because it's the closest thing to farming without taking the risk of farming," Leonards said. "And it gives me the opportunity of personnel management."

The youngest of 10 children, Leonards was raised on a farm run by his father, William Leonards Sr.

He said automation has resulted in big changes at the station. No longer are breeding plots planted by hand, and small harvesters have reduced the need to cut plots by hand. All that has enabled the station to undertake more research projects, he said.

Leonards and his wife, Barbara, "Bobbi" Leonards, have three children, two daughters and a son.

One look on his office wall reveals his favorite past time, hunting deer and turkey. Numerous turkey beards and deer antlers attest to his hunting prowess. And a look around the station is a good indicator of his talent at making sure he hits his target at managing the farm operations of the research facility.

"Bill is the consummate research station manager," Dr. Steve Linscombe, the station's director. "He comes to work each day looking for ways to upgrade the station to improve its productivity for the Louisiana rice industry. He has a genuine desire to see this station be successful in its mission and will do whatever he can to accomplish this."

Bruce Schultz

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